Domain Generalization: Cheyenne vowel devoicing
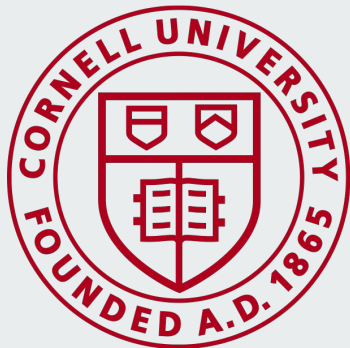
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Cornell Phonetics Laboratory

Outline

- Introduction
    - Cross-linguistic overview of vowel devoicing
    - Domain Generalization
- Cheyenne background
- Vowel devoicing 1: phrase-final devoicing (phonetically grounded)
- Vowel devoicing 2: "penultimate" devoicing (no phonetic motivation)
- Proposal
- Conclusion

Vowel devoicing cross-linguistically

- Vowel devoicing is common areal feature in the Plains region of North America where Cheyenne is spoken

  (Ladefoged and Maddieson 1996; Oberly and Kharlamov 2015)

- Also attested across a wide range of language families and regions of the world

  - e.g., East Asia, South Asia, Oceania, Europe, Africa, the Middle East, and elsewhere in North and South America (Greenberg 1969; Gordon 1998)

Vowel devoicing cross-linguistically

- Vowel devoicing typically fits into one of two categories in terms of the environments in which it occurs (Greenberg 1969; Gordon 1998):
  - Adjacent to voiceless consonants
  - Adjacent to the right edge of a prosodic domain

Common accounts of vowel devoicing

- Phonological analyses typically attribute voicelessness to some laryngeal feature ([-voice] or [spread glottis] e.g., Lipski 1990; Cho 1993; Tsuchida 1997; 2001)

  - Spreads from adjacent voiceless consonant (i.e. assimilation)
  - Or is inserted

- Phonetic accounts attribute voicelessness to

  - Gestural overlap: glottal adduction for vowel and abduction for voiceless consonant
  - Decreased subglottal air pressure at ends of long streams of speech
  - Opening of glottis in anticipation of a pause

    (e.g., Dauer 1980; Jun and Beckman 1993; Gordon 1998; Smith 2003)

Domain Generalization

- Historical phenomenon in which utterance-edge phonetic effect becomes phonologized and then extended to smaller prosodic domains

- Proposed to account for synchronic phonological word-edge processes that are not themselves phonetically grounded but would be at utterance boundaries

  - e.g., word-final obstruent devoicing, avoidance of high tones word-finally

(Myers and Padgett 2014; Padgett 2015)

Cheyenne

- Plains Algonquian, spoken in Montana and Oklahoma

- Data in talk from pre-existing materials:

  - grammar, Leman 2011

  - online dictionary with audio, Fisher et al. 2017

  - papers, e.g., Leman and Rhodes 1978

  - archival recordings of narrative texts, Olson 1965; Leman 1980

  I would like to acknowledge the Cheyenne language and speakers and everyone who has done work to document the language.

Cheyenne

Consonants					
	bilabial	dental	post-alveolar	velar	glottal
stops	p	t		k	ʔ
affricates		(ts)			
fricatives		s	ʃ	(x)	h
nasals	m	n			
approximants	v				

Vowels		
e		o
	a	

Voiceless vowels written with IPA diacritic: ḁ

(Inventory from Leman 2011)

Cheyenne

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All voiceless consonants are **obstruents**

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Voiceless vowels written with IPA diacritic: ḁ

All voiceless consonants are **obstruents**

Two contrastive tones: high (´), low

Word-internal sequences of multiple consonants permitted

[ma̧**ht**ao**ʔk**eme] 'coffee bean'

[heʔékaʔȩ**ʃk**óne] 'girl'

(Fisher et al. 2017)

Morphological evidence for underlying word-final consonants

[póeso**n**-o] 'cats'   /póésó**n**/ 'cat'

[ʃéʔʃenovo**t**-o] 'snakes'   /ʃéʔʃenovo**t**/ 'snake'

[hóhkó**x**-e̥stse] 'axes'   /hóhkó**ʃ**/ 'axe'

(Fisher et al. 2017)

But on the surface, word-final codas are avoided

- Final sonorants are deleted

  /póésó**n**/ [póéso] 'cat'

- Final obstruents are followed by epenthetic <e>

  /ʃéʔʃenovo**t**/ [ʃéʔʃenovo̥**ts**e̱] 'snake'

  /hóhkó**ʃ**/ [hohko̥**x**e̱] 'axe'

(Leman 2011; Fisher et al. 2017)

Extensive vowel devoicing

- Two processes focused on here restricted to one syllable toward end of word or phrase

- Additional word-internal process targeting low tone vowels followed by voiceless fricatives

Red vowels (ḁ) = devoiced by the process I am discussing at the moment

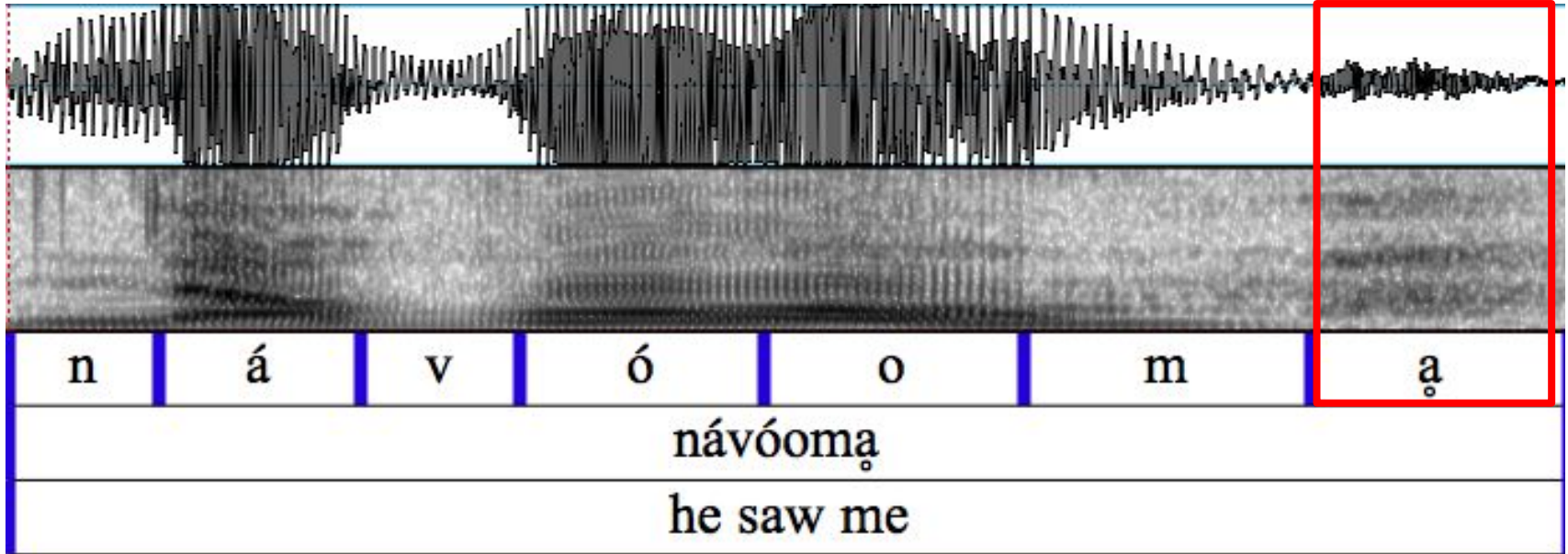Blue vowels (a) = voiced when we'd otherwise expect them to devoice

Vowel devoicing 1: phrase-final devoicing

[návóómo méʃe̥] 'I see the woodtick' (Leman & Rhodes 1978)

- Typical of domain-final vowel devoicing patterns cross-linguistically (cf. typologies in Greenberg 1969; Gordon 1998)

- Phonetically grounded (e.g., Gordon 1998)

Vowel devoicing 1: phrase-final devoicing

| n | á | v | ó | o | m | ą̊ |

návóomą̊

he saw me

Can occur without adjacent voiceless consonant

[návóom**ḁ**] 'he saw me' (Fisher et al. 2017)

- So feature spreading would not work

- Instead, feature inserted (or floating) at phrase boundary

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Vowel devoicing 2: "penultimate" devoicing

- Surface penultimate vowels devoice in *some words* before voiceless consonants in words ending with an [e]

[heʔo̥tse] 'neck' (Leman 2011)

[námeʔtatóne̥ʃévémḁse] 'what in the world should I do?' (Olson 1965; Leman 1980)

[oeʃkese] 'dog' (Leman 2011)

Only occurs before voiceless consonants

- Can be understood as assimilatory process, accounted for with leftward
  spreading of a laryngeal feature from a voiceless consonant to preceding vowel

he?o̥tse 'neck'

[F]

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- Can be understood as assimilatory process, accounted for with leftward spreading of a laryngeal feature from a voiceless consonant to preceding vowel

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- But why in only one specific syllable in the word?

- Assimilatory vowel devoicing typically occurs across an entire prosodic domain

    - e.g., Cheyenne vowel devoicing before voiceless fricatives

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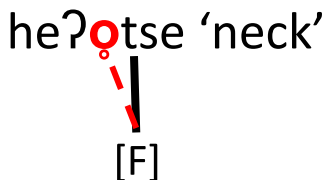
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  - e.g., Japanese, Comanche, Acoma (Tsuchida 2001; Cho 1993)

Cannot be predicted only from surface environment

[vóhpoma**ʔo**htse] 'salt' vs. [nene̜he**ʔo**htse] '(you) go there' (Leman 2011)

- Only in underlying word-final syllables followed by epenthetic <e> on the surface (Leman and Rhodes 1978)

  [seoʔ**o**tse] 'ghost'   [séot-o] 'ghosts' (Leman 2011)

  [nót**a**xe] 'warrior'   [nóta̜xe-oʔo] 'warriors' (Fisher et al. 2017)

- Makes reference to form prior to <e> epenthesis

If this process occurs before <e> epenthesis, it is domain-final

/heʔot/ → he̱ʔo̱ṯ → [heʔo̱tse] 'neck'

- Thus, we are left with a phonetically *un*grounded word-final process but that would be phonetically grounded utterance-finally

- As well as a phonetically well-motivated phrase-final process

  [néméhota̱tse̱] 'I love you' (Fisher et al. 2017)

Two domain-final vowel devoicing processes

	Word-final	**Phrase-final**
Order relative to <e> epenthesis	Before <e> epenthesis	With <e> epenthesis
Segmental environment	Only before voiceless consonants	Any
Source of [-voice]	Spreading	Insertion

Proposal

- Both processes due to same preference for [-voice] at domain edges

- Family of constraints:

    - $*V_{[+voice]}C_0]_{PhPh}$ - no voiced vowels at the end of a phrase
    - $*V_{[+voice]}C_0]_{wd}$ - no voiced vowels at the end of a word

Different sources of [-voice] from different constraint rankings

- $*V_{[+voice]}C_0 \,]_{PhPh}$ >> DEP[Lar] >> $*V_{[+voice]} \, C_0]_{wd}$

  - $*V_{[+voice]}C_0 \,]_{PhPh}$ >> DEP[Lar]: insertion of [-voice]

  - DEP[Lar] >> $*V_{[+voice]} \, C_0]_{wd}$: devoicing only if [-voice] can spread

Different orderings accomplished within Stratal OT
(Bermúdez-Otero 2018; Kiparsky 2000)

- Three strata: stem, word, phrase

  (roughly = cyclic, post-cyclic, post-lexical in lexical phonology)

- Output of one stratum → input to next stratum

- Limited reranking possible: constraint promotion to undominated position from one stratum to the next

- Word-final devoicing at <u>word</u>-stratum

- <e> epenthesis and phrase-final devoicing at <u>phrase</u>-stratum

Word-final devoicing at word-stratum

heʔot	DEP[Lar]	*V$_{[+\text{voice}]}$C$_0$]$_{\text{wd}}$	ID[voice]	*V$_{[-\text{voice}]}$
a. heʔot		*!		
→ b. heʔo̥t			*	*

/heʔot/ → heʔo̥t 'neck'

Word-final devoicing at word-stratum

heʔot	DEP[Lar]	*V$_{[+voice]}$C$_0$]$_{wd}$	ID[voice]	*V$_{[-voice]}$
a. heʔot		*!		
→ b. heʔo̥t			*	*

/heʔot/ → heʔo̥t 'neck'

póésono	DEP[Lar]	*V$_{[+voice]}$C$_0$]$_{wd}$	ID[voice]	*V$_{[-voice]}$
→ a. póésono		*		
b. póésono̥	*!		*	*

/póésono/ → póésono 'cats'

No <e> epenthesis at word-stratum

- DEP, MAX(obs), MAX >> *CODA]$_{wd}$

he?ot	DEP	MAX(obs)	*CODA]$_{wd}$	DEP[Lar]	*V$_{[+voice]}$C$_0$]$_{wd}$	ID[voice]	*V$_{[-voice]}$
a. he?ot			*		*!		
→ b. he?ǫt			*			*	*
c. he?otse	*!				*		
d. he?o		*!			*		

/he?ot/ → he?ǫt 'neck'

Promotion of *CODA]$_{wd}$ and MAX(obs) at phrase-stratum

- *CODA]$_{wd}$, MAX(obs) >> DEP

heʔo̥t	*CODA]$_{wd}$	MAX(obs)	DEP
a. heʔo̥t	*!		
b. heʔo̥		*!	
→c. heʔo̥tse			*

heʔo̥t → [heʔo̥tse] 'neck' (in phrase-medial position)

Two domain-final processes on consecutive syllables at phrase-stratum

he?ǫt]$_{PhPh}$	*CODA]$_{wd}$	MAX(obs)	DEP	V$_{[+voice]}$ C$_0$]$_{PhPh}$	DEP[Lar]	ID[voice]	*V$_{[-voice]}$
a. he?ǫt	*!						*
b. he?ǫ		*!					*
c. he?ǫtse			*	*!			*
→ d. he?ǫtsę			*		*	*	**
e. he?ǫtsę			*		*	**!	*

he?ǫt → [he?ǫtsę] 'neck' (in phrase-final position)

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Conclusion

- Two different domain-final vowel devoicing processes in Cheyenne

- Due to post-lexical <e> epenthesis, domain-final environment of one process is obscured on surface

- Both processes can attributed to same type of markedness constraint that must be satisfied at multiple prosodic domains

- In this way, the word-level process is neither as typologically unexpected nor phonologically unmotivated as it first appears

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Conclusion

- Word-final devoicing does not have phonetic motivation on its own, may be a case of Domain Generalization (Myers and Padgett 2014)

  - In fact, word-final vowel devoicing could be understood this way cross-linguistically

- Post-lexical <e> epenthesis allows us to identify two separate processes

- What has been generalized here is a preferred surface configuration (markedness constraint) rather than a specific phonological process

- Due to different constraint rankings, surface preference for voiceless vowels is achieved by different processes at different domains

References

Bermúdez-Otero, R. 2018. Stratal Phonology. In S.J. Hannahs and A. R. K. Bosch (eds), The Routledge Handbook of Phonological Theory, 100-134.

Cho, Y-M Y. 1993. The phonology and phonetics of 'voiceless' vowels, BLS 19, 64-75.

Fisher, L., W. Leman, L. Pine Sr., & M. Sanchez. 2017. Cheyenne Dictionary. Chief Dull Knife College.

Gordon, Matthew (1998). The phonetics and phonology of non-modal vowels: A crosslinguistic perspective. In Annual Meeting of the Berkeley Linguistics Society (BLS) 24, pp. 93–105

Greenberg, Joseph H. 1969. Some methods of dynamic comparison in linguistics. In Substance and structure of language, pp. 147–203

Kiparsky, P. 2000. Opacity and cyclicity. The Linguistic Review, 17(2-4), 351-366.

Ladefoged, Peter and Ian Maddieson. 1996. The sounds of the world's languages. Vol. 1012. Blackwell, Oxford

Leman, W. 2011. A Reference Grammar of the Cheyenne Language. Lulu Press.

References

Leman, W. & R. Rhodes. 1978. Cheyenne vowel devoicing. In C. Cowan (ed), Papers of the Ninth Algonquian Conference, 3-24.

Lipski, John. 1990. Aspects of Ecuadorian Vowel Reduction. In Hispanic Linguistics. 4.1, pp. 1-19.

Myers, S., and Padgett, J. 2014. Domain generalisation in artificial language learning. Phonology, 31(3), 399-433.

Padgett, J. 2015. Word-Edge Effects as Overphonologization of Phrase-Edge Effects. Proceedings of the 32nd West Coast Conference on Formal Linguistics. In Steindlet, U. et al.(eds.), Somerville, MA: Cascadilla Proceedings Project. 2015.

Oberly, Stacey and Viktor Kharlamov. 2015. The phonetic realization of devoiced vowels in the Southern Ute language. In Phonetica 72.1, pp. 1–19.

Olson, Donald. 1968. Cheyenne Texts and Grammar Notes. Mimeographed ms. Philadelphia, PA.

Tsuchida, A. 2001. Japanese vowel devoicing: Cases of consecutive devoicing environments. Journal of East Asian Linguistics, 10(3), 225-245.

THANK YOU!

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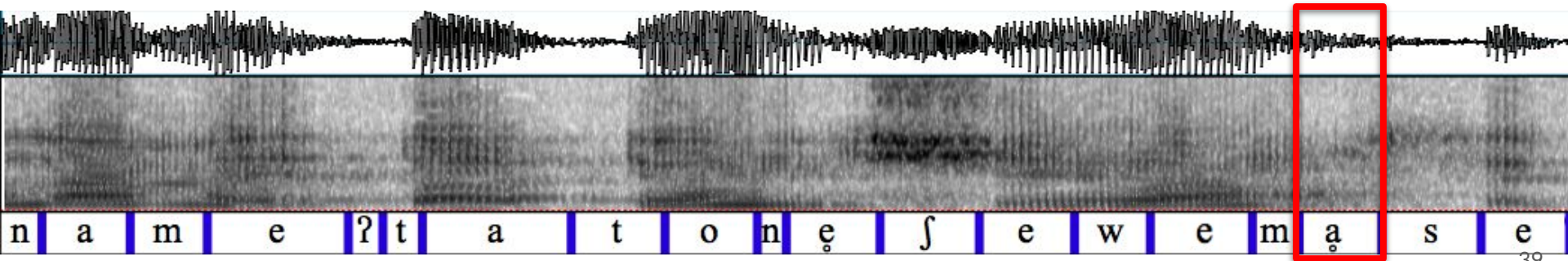
I would also like to thank members of the Cornell Linguistics Department for their feedback on various stages of this project.

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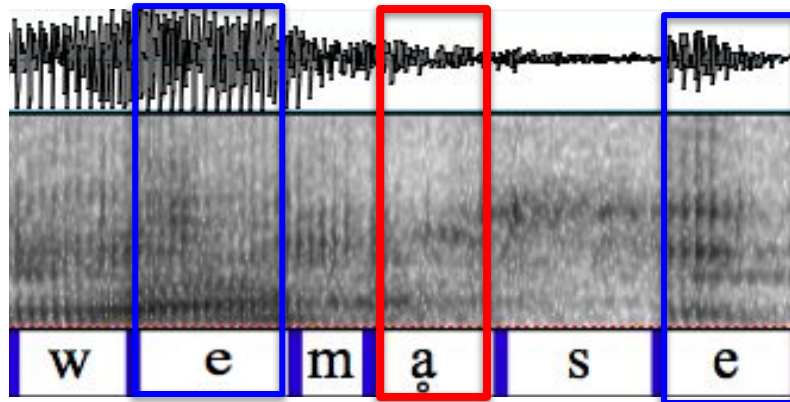
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Word-final devoicing at word-stratum

- *RightSpreading >> *V$_{[+voice]}$C$_0$]$_{wd}$

  - /nótaxe/ → [nótaxe] 'soldier' (not [nótaxe̥])