

## Word-Final Voicing in Hittite?

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## Introduction

• Hittite, a member of the Anatolian branch of the Indo-European language family, has been claimed to show phonologization of word-final voicing.<sup>1</sup>

<sup>1.</sup> Watkins (2004: 10), Watkins (2008: 555), Hoffner, Jr. & Melchert (2008: 35–36), Kas'jan & Sidel'cev (2010: 36), Rieken (2011: 40), Hout (2011: 65), Byrd (2015: 22).



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- Is Hittite one of the rare languages like Lakota that might have synchronic word-final voicing (Blevins, Egurtzegi, & Ullrich 2020)?

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- Is Hittite one of the rare languages like Lakota that might have synchronic word-final voicing (Blevins, Egurtzegi, & Ullrich 2020)?
- In light of the unnaturalness of this sound change (Kiparsky 2006) and the typological rarity of synchronic word-final voicing (Gordon 2016: 151–5; Keating, Linker, & Huffman 1983; J. J. Ohala 1983), it is worth re-evaluating the Hittite evidence.

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## Plan of the presentation

### ► Data

- ▶ Un-naturalness of word-final voicing
- Perception of geminate contrasts
- ▶ Conclusions
- ▶ Appendix



# Unresolved phylogeny of Indo-European (Goldstein 2020)







## **PIE > Hittite and orthographic representations**

Development of intervocalic stops in Hittite (Yates 2019; Melchert 1994) contra (Simon 2020; Patri 2009; Kloekhorst 2021, 2016)

PIE	Hittite	<b>Orthographic Representation</b>
$/*VD^{(h)}V/$	/VTV/	<t d=""></t>
/*VTV/	/VTTV/	<tt dd=""></tt>

<sup>2.</sup> See Patri (2019: 280–283) already for doubts against this interpretation based on cross-linguistic data.



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Traditional views on the development of word-final stops in Hittite (Melchert 1994: 111)

PIE	Hittite	Orthographic Representation
$/^{*}D^{(h)}/\#$	/D/#	<t d="">#</t>
/*T/#	/D/#	<t d=""># (<sup>x</sup><tt dd="">#)<sup>2</sup></tt></t>

<sup>2.</sup> See Patri (2019: 280–283) already for doubts against this interpretation based on cross-linguistic data.



## 1 Data Representative Data

	Orthography	Phonetic interpret.	Gloss	Reconstruction
a.i	<ši-wa-a <mark>t</mark> >	[siwa t ]	day-LOC.SG.N	*/diéuo t /
a.ii	<ši-i-wa-a <mark>t-t</mark> a-aš>	[siwa tt as]	day-GEN.SG.N	*/diéuo t os/
b.i	<mi-li-i<mark>t&gt;</mi-li-i<mark>	[mili <mark>t</mark> ]	honey-NOM/ACC.SG.N	*/méli <mark>t</mark> /
b.ii	<mi-li-i<mark>t-ta-aš&gt;</mi-li-i<mark>	[mili <mark>tt</mark> as]	honey-GEN.SG.N	*/méli <mark>t</mark> os/
c.i	<ú-u <mark>k</mark> =a>	[u k =a]	1SG.NOM/ACC=but	*/hé g (χ)/
d.i	<pa-i<mark>t&gt;</pa-i<mark>	[pai <mark>t</mark> ]	go-3SG.PST.ACT	*/póhi <mark>t</mark> / <sup>3</sup>
e.i	<pa-i<mark>t=aš&gt;</pa-i<mark>	[pai <mark>t</mark> =as]	go-3SG.PST.ACT=(s)he	*/póhi <mark>t</mark> =os/

3. (Melchert 2022)



# Sturtevant's Law in Pre-Hittite and the transphonologization of the durational contrast

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- The debate around the phonetic and phonological interpretation of geminate stops, neatly summarized in Yates (2019: 242–4), has focused on the following issues:
  - Is the etymological distribution a tendency or a law?
  - Does the orthography reflect the outcome of a sound change from PIE, or is it simply an orthographic convention?
  - In what phonological environments did the sound law apply?



## Sturtevant's law according to Yates (2019)

• Sturtevant's law reflects the historical reality of a pre-Hittite conditioned sound change:

### Changes via STURTEVANT'S LAW in intervocalic position

Pre-Hittite	*[p]	*[t]	*[k, k <sup>w</sup> ]	$*[\chi, \chi^w]$	*[b]	*[d]	*[g, g <sup>w</sup> ]	$*[R, R_m]$
Hittite	[p:]	[t:]	[k:, k <sup>w</sup> :]	$[\chi:, \chi^w:]$	[p]	[t]	$[k, k^w]$	$[\chi, \chi^w]$



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Hittite	[p:]	[t:]	$[k:, k^w:]$	$[\chi :, \chi^w :]$	[p]	[t]	[k, k <sup>w</sup> ]	$[\chi,\chi^{\rm w}]$

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Hittite	[p]	[t]	$[k, k^w]$	$[\chi,\chi^w]$	[p]	[t]	$[k, k^w]$	$[\chi,\chi^w]$



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Hittite	[p]	[t]	$[k, k^w]$	$[\chi,\chi^w]$	[p]	[t]	$[k, k^w]$	$[\chi, \chi^w]$

• Yates' restriction of the geminacy contrast to non-pre-obstruent position due to perceptual and production factors raises the question:



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Can the consistent singleton spelling in word-final position reflecting a [-heavy] obstruent be due to the same markedness constraints that prohibit geminacy in pre-obstruent position?



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## Voicing contrasts in word-final position

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- Word-final voicing is rare because articulatory, aerodynamic, perceptual, and acquistion factors favor word-final de-voicing. (Blevins 2004: 104, 112, Blevins 2006: 136).
- The development should not be *a priori* ruled out for Hittite, but the structural factors that might lead to word-final voicing should be ruled out for Hittite.



## Possible trajectories to word-final voicing

### Blevins' explanation of the emergence of word-final voicing

• Final degemination followed by the transposition of a geminate/singleton opposition into a voiceless/voiced one.



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- Final degemination followed by the transposition of a geminate/singleton opposition into a voiceless/voiced one.
- Intervocalic obstruent voicing followed by final vowel loss
  - 1. Necessary that language has no other historical source for word-final voiceless obstruents.
  - 2. The transposition of geminate/singleton opposition to a voiceless/voiced opposition needs to be a context-free change.



# Lack of structural conditions for the emergence of word-final voicing in Hittite

• Hittite does not meet the structural conditions discussed by Blevins that might lead to word-final voicing.

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- Rather, Hittite shows the opposite trajcetory and develops a durational contrast from an original voicing contrast.

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- In short, Hittite, either in any synchronic or diachronic way, does not meet the structural requirements for word-final voicing.



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**Proposal**: Hittite neutralized voicing in [+cons, -son] segments in word-final position through word-level generalization of a phrase-final neutralization process.



# Phrase- and word-final lengthening and neutralization of lengthening

• In many languages, a phrase-final syllable is longer in duration than a segmentally identical phrase-medial syllable (Klatt 1975; Wightman et al. 1992; Fougeron & Keating 1997).



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- Due to the mechanics of perception, it is perceptually difficult to consistently identify/classify a segment as  $[\pm$  heavy] in the phrase-final position, a cue for voicing distinctions.
- Phrase-final lengthening is one phonetic source of word-final devoicing of stops and fricatives (cf. Blevins 2004: 105).



## Word-final devoicing before Pre-Hittite

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- Domain generalization has also been successfully modeled in an AGL experiment (Myers & Padgett 2014).
- It is precisely this type of overgeneralization that explains the neutralization of voicing contrast in word-final position in the stage before Pre-Hittite.



#### Phrase-final lengthening in verbs

<me-na-ah-ha-an-da</th>ú-ets=a-anLUGAL-ushu-ul-le-etafterwardscome-3sg.pstconn=3sg.accking-nom.sg.mfight-3sg.pst

"Afterwards, he came, and the King fought him."



## Phrase-final lengthening in verbs

<s=a-as sa-ra-a URU-ya pa-it ú-uk=wa LUGAL-us=s-mi-is conn=3sg.nom up city-all.sg go-3sg.pst 1sg=quot king-nom.sg=3pl.dat ki-is-ha>

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"And he went up to the city (and said), 'I am y'all's King."



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"And he went up to the city (and said), 'I am y'all's King."

• The final consonants of phrase- and clause-final verbs would regulary be the locus of phrase-final lengthening and led to word-final neutralization of voicing.



### Phrase-final lengthening in verbs

But why did word-final devoiced [+cons, - son] segments not phonologize as [+heavy] just like their intervocalic counterparts?

#### Changes via STURTEVANT'S LAW in intervocalic position

Pre-Hittite	*[p]	*[t]	*[k, k <sup>w</sup> ]	$*[\chi, \chi^w]$	*[b]	*[d]	*[g, g <sup>w</sup> ]	$*[R, R_{\rm m}]$
								I
Hittite	[p:]	[t:]	$[k:, k^w:]$	$[\chi :, \chi^w :]$	[p]	[t]	$[k, k^w]$	$[\chi,\chi^w]$



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## Dmitrieva's findings on the perception of geminate contrasts in Russian, Italian, and English (2012: 137)

Finding	Experiment				
Lower steepness of the curve	English, Italian*, overall*				
Singleton bias	Russian*, English, Italian				
Evidence for lower distinctiveness in preconsonantal environment.					

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Evidence for lower distinctiveness in word-final position.					



#### Perceptual hierarchies and contrast neutralization

Condition	$\beta$ coefficient
Intervocalic (V_V)	22.53
Word-initial (WI)	24.24
Preconsonantal (_C)	28.23
Word-final (WF)	33.35



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- $\beta$ -co-efficient is inversely related to the steepness of the identification curve in a forced choice experiment.
- Hierarchy of contrast distinctiveness: V\_V > WI > V\_C > WF (Dmitrieva 2012: 153).
- Since Hittite neutralizes the contrast in pre-obstruent position, Dmitrieva's hierarchy implies that the contrast should also be neutralized in word-final position.



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- Since Hittite neutralizes the contrast in pre-obstruent position, Dmitrieva's hierarchy implies that the contrast should also be neutralized in word-final position.
- The neutralization of geminates in *word-final position* can be compared with the incipient loss of *word-initial* geminacy contrasts in Hittite.



#### The development of Hittite word-final stops

#### Changes via STURTEVANT'S LAW in pre-obstruent position

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Hittite	[p]	[t]	$[k, k^w]$	$[\chi,\chi^w]$	[p]	[t]	$[k, k^w]$	$\left[\chi,\chi^{\rm w}\right]$



### The development of Hittite word-final stops

Stage	PIE *C[-voi, +cons, -son]	PIE *C[+voi, +cons, -son]
PIE	$C_{[-voi]}]_{\omega}]_{\phi}$	$*C_{[+voi]}]_{\omega}]_{\phi}$
Pre-Hittite	$C_{[-voi]}]_{\omega}]_{\phi}$	$C_{[-\text{voi}]}]_{\omega}]_{\phi}$
Pre-Hittite	$^{*}C_{[-voi]}]_{\omega}$	$C_{[-voi]}]_{\omega}$
Hittite	$C_{[-voi]}]_{\omega}$	$C_{[-voi]}]_{\omega}$

Table: Diachronic development of word-final stops from PIE to Hittite



# Neutralization of word-final geminacy in a typological perspective

• Jastrow (1997: 336) reports that in the Gubb'ad'īn dialect of neo-Aramaic, word-final geminates were lost in the course of historical sound change.

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- For Hindi, M. Ohala (2007: 363) has noticed that geminates are not usually pronounced in word-final position.<sup>5</sup>
- Hittite is simply another language that does not allow word-final geminates and either had short-lived word-final geminates or never developed them.

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- I have argued that Hittite does not have word-final voicing.
- Hittite word-final stops, just like their pre-consonantal counterparts, resist word-final phonologization of a [+heavy] duration owing to singleton bias in production and perception.
- The development of word-final in Hittite indicates that at least some asymmetries in the contextual distribution of geminates is the result of perceptually- and articulatorily-motivated sound change.



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# Plan of the presentation

#### ▶ Data

- ▶ Un-naturalness of word-final voicing
- Perception of geminate contrasts
- ▶ Conclusions
- ► Appendix
  - Blevins' examples of word-final voicing (2006: 145–153)
  - OT Analysis



### **PIE** -\**t* > **Proto-Italic** -\**d*

- Duenos Inscription from the 1<sup>st</sup> half of the 6<sup>th</sup> cent. BCE (Vine 1999), (Harðarson 2011)
  - 1. IOVESA T :DEIVOS:QOI:ME D :MITA T :NEI:TE D :ENDO:COSMIS:VIRCO:SIE D
  - 2. AS:TE D :NOISI:OPETOI T :ESIAI:PACA:RIVOIS
  - 3. DVENOS:ME D :FECE D :EN:MANO:MEINOM:DVENOI:NE:ME D :MALO:STATO D



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  - 3. DVENOS:ME D :FECE D :EN:MANO:MEINOM:DVENOI:NE:ME D :MALO:STATO D
- One could argue that Proto-Italic developed word-final voicing but then this was lost as a synchronic process in all of the Italic languages (O. <au t i>, and <av t >, <au t > 'or').
- With Kiparsky (2006: 10–11), I analyze the word-final <d>-spellings as reflecting spirantization or a lack of release burst (cf. Davidson 2011 for English) before word-final stops were lost after long vowels in Latin.



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- With Kiparsky (2006: 10–11), I analyze the word-final <d>-spellings as reflecting spirantization or a lack of release burst (cf. Davidson 2011 for English) before word-final stops were lost after long vowels in Latin.
- This type of lenition can be compared with e.g., t > t' > ? ></br> (Middle Chinese to modern Mandarin; Chen 1976).<sup>6</sup>

<sup>6.</sup> Along with Harris, Urua, & Tang (2023: 38), I see spirantization and the lack of word-final burst release both as lenition processes and adopt their modulation carrier approach of unifying both as lenition processes that lead to glottalization (and eventually deletion).



# Welsh word-final voicing

	/b d g/ vs. /p t k/ in Welsh		(Blevins 2006: 146)
	Short vowel + fortis		Long vowel + lenis
(1a)	[map] /map/'map'	(1b)	[ma:b] /mab/'son'
(2a)	[brat] /brat/ʿapron; rag'	(2b)	[bra:d] /brad/ʿtreason'
(3a)	[dət] /dot/'dot; vertigo'	(3b)	[do:d] /dod/'to come'



# Welsh word-final voicing

	/b d g/ vs. /p t k/ in Welsh		(Blevins 2006: 146)
	Short vowel + fortis		Long vowel + lenis
(1a)	[map] /map/'map'	(1b)	[ma:b] /mab/`son'
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(3a)	[dət] /dot/'dot; vertigo'	(3b)	[do:d] /dod/'to come'
	$/p^{h}$ , $t^{h}$ , $k^{h}/vs$ . $/b$ , d, g/ in Welsh		(Kiparsky 2006: 8)
	/p <sup>h</sup> , t <sup>h</sup> , k <sup>h</sup> / vs. /b, d, g/ in Welsh Short vowel + fortis		(Kiparsky 2006: 8) Long vowel + lenis
(1a)	/p <sup>h</sup> , t <sup>h</sup> , k <sup>h</sup> / vs. /b, d, g/ in Welsh Short vowel + fortis [map] /map/'map'	(1b)	(Kiparsky 2006: 8) Long vowel + lenis [ma:b] /mab/`son`
(1a) (2a)	/p <sup>h</sup> , t <sup>h</sup> , k <sup>h</sup> / vs. /b, d, g/ in Welsh Short vowel + fortis [map] /map/'map' [brat] /brat/'apron; rag'	(1b) (2b)	(Kiparsky 2006: 8) Long vowel + lenis [ma:b] /mab/ʿsonʾ [bra:d] /brad/ʿtreasonʾ



# Somali final voicing

Underlying distinction between /t, k/ and /b, d, g/ (Blevins 2006: 147–148)

Input	/?ilkó/	/?ílik/	/?edgó/	/?édeg/
Final Voicing	_	?ílig	_	_
Aspiration (V)	?ilkʰó	_	_	_
Final Neutralization	_	?ilik`	_	?eðek`
Lenition	[?ilkʰó]	[?ílik`]	[?edgó]	[?éðek`]



### Somali final voicing

Underlying distinction between /t, k/ and /b, d, g/ (Blevins 2006: 147–148)

Input	/?ilkó/	/?ílik/	/?edgó/	/?édeg/
<b>Final Voicing</b>	_	?ílig	_	_
Aspiration (V)	?ilkʰó	_	_	_
<b>Final Neutralization</b>	_	?ilik`	_	?eðek`
Lenition	[?ilkʰó]	[?ílik']	[?edgó]	[?éðek`]

#### Underlying distinction between /t<sup>h</sup>, k<sup>h</sup>/ and /b, d, g/ (Kiparsky 2006: 6–7)

Input	/?ilkʰó/	/?ílikʰ/	/?edgó/	/?edeg/
Final Neutralization	_	?ílik'	_	?éðek'
Lenition	[?ilkʰó]	[?ílik`]	[?edgó]	[?éðek`]



#### 6 Appendix Constraint Set

Constraint	Description	
ID(ENT)-T-[long]	Corresponding input and output obstruents must have the	
	same specification for [long].	

<sup>7.</sup> This constraint is contextually equivalent to the \*GEM/1VA constraint of Pająk (2009: 270).
8. Dmitrieva (2012: 166) reports that word-initial geminates are usually suported by epenthesis but word-final geminates are neutralized.



6 Appendix Constraint Set

Constraint	Description	
ID(ENT)-T-[long]	Corresponding input and output obstruents must have the	
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*GEM-T # <sup>7</sup>	A [+heavy] obstruent is not allowed to surface in the word-final	
	position. (cf. Yates 2019: 276 <sup>58</sup> )	
	Dmitrieva (2012: 86); Arabic dialects: Cowell (1964: 23–24), Er-	
	win (1963: 30)); modern Mandaic (Malone 1997: 146)	

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	Dmitrieva (2012: 86); Arabic dialects: Cowell (1964: 23–24), Er-	
	win (1963: 30)); modern Mandaic (Malone 1997: 146)	
DEP-V	An output vowel must have an input correspondent. <sup>8</sup>	
	Wolof (Bell 2003), Hungarian (Ringen & Vago 2011)	

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8. Dmitrieva (2012: 166) reports that word-initial geminates are usually suported by epenthesis but word-final geminates are neutralized.



# Word-final degemination

- By the constraints above, we can generate word-final degemination:
- I am agnostic as to whether there was a stage of the language with word-final obstruent geminates, but consider both possibilites in the following tableaux:

/VT/#	*GEM-T #	DEP-V	ID(ENT)-T-[long]
a. [VTT]#	*!	l	*
₽₽ b. [VT]#			
c. [VəT]#		*!	



## Word-final degemination

/VT/#	*GEM-T #	DEP-V	ID(ENT)-T-[long]
a. [VTT]#	*!		*
☞ b. [VT]#			
c. [VəT]#		*!	

/VTT/#	*GEM-T #	DEP-V	ID(ENT)-T-[long]
a. [VTT]#	*!	1	
▶ b. [VT]#			*
c. [V.TəT]#		*!	
d. [VT.Tə]#		*!	



# Word-final degemination

/VTT/#	*GEM-T #	DEP-V	ID(ENT)-T-[long]
a. [VTT]#	*!		
☞ b. [VT]#		l	*
c. [V.TəT]#		*!	
d. [VT.Tə]#		*!	

/VTTV/	*GEM-T #	DEP-V	ID(ENT)-T-[long]
a. [VTV]			*!
🖙 b. [VTTV]			
c. [V.Tə.TV]		*!	
d. [VT.TəV]		*!	