Indo-European Nasal Infixation and the Mirror Alignment Principle

Klaus Baki, Anthony D. Yates, and Sam Zukoff
University of California, Los Angeles
klausklaus@g.ucla.edu, adyates@ucla.edu,
samzukoff@ucla.edu

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University of California
Los Angeles

Roadmap

- Introduction
- Infixation in Indo-European
- A MAP analysis of PIE infixation
- Morphosyntax of the PIE nasal infix
- Conclusions & discussion

The puzzle of the PIE nasal infix

(1) PIE **yu⟨né⟩g-ti* 'yokes' (⇐ *$\sqrt{}$*yewg* 'yoke')

- The PIE nasal infix **-né-* in (1) poses a puzzle with (at least) two distinct pieces:
  - (i) Morphophonological: How do we explain the (unique) **infixal positioning** of nasal infix?
  - (ii) Morphosyntactic: How do we explain the **disparate attested functions** of the nasal infix?

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  - (ii) Morphosyntactic: How do we explain the **disparate attested functions** of the nasal infix?
- Our analysis provides an integrated solution to both questions:
  - Using Zukoff's (2023) "Mirror Alignment Principle," we derive its unique infixal positioning **from** its unique morphosyntactic properties.

Verbal stem formation in PIE

(2) **Fundamental aspectual opposition in PIE verb**

	Root	Present			Aorist	
a.	*√*$g^{wh}en$ ‘smash, kill’	*g^{wh}én-ti	(simplex)	⇒	*g^{wh}ég^{wh}n̥-t	(derived)
		> Skt. *hán-ti* ‘kill:PRS-3SG’			> Gk. *é-pephn̥-∅* ‘PTC-kill:AOR-3SG’	
b.	*√*$g^{w}em$ ‘come’	*g^{w}m̥-ské-ti	(derived)	⇐	*g^{w}ém-t	(simplex)
		> Skt. *gá-ccha-ti* ‘come-PRS-3SG’			> Skt. *á-gan-∅* ‘PTC-come:AOR-3SG’	

- Traditionally, the PIE verbal system is thought to be organized around an aspectual opposition between “Present” and “Aorist” stems.
- Each verbal root forms a simplex stem that is aspectually either (2a) Present or (2b) Aorist.
- Verbal stems of the opposite aspectual value are derived via (overt) affixation.

Present stem formation in PIE

(3) **Present stem-building affixes**

	Affix	Aorist root	Derived Present stem	
a.	*-ské	*√prek ‘ask’	*pr̥k-ské-ti ‘ask-PRS-3SG’	> Lat. *po-sci-t*, Skt. *pr̥-cchá-ti*
b.	*-é-e	*√deyk ‘show’	*déyk-e-ti ‘show-PRS.3SG’	> Lat. *dīc-i-t*, Goth. *ga-teih-i-þ*
c.	*-yé	*√mer ‘die’	*mr̥-yé-tor ‘die-PRS-3SG’	> Skt. *mri-yá-te*, Lat. *mor-i-tur*
d.	*RED-	*√deh$_3$ ‘give’	*dé-deh$_3$-ti ‘PRS-give-3SG’	> Gk. *dí-dō-si*, Skt. *dá-dā-ti*
e.	*-né-	*√yewg ‘yoke’	*yu⟨né⟩g-ti ‘yoke:PRS-3SG’	> Lat. *iu⟨n⟩gi-t*, Skt. *yu⟨ná⟩k-ti*

- Many Present stem-building suffixes are reconstructible for PIE, e.g., (3a–c).
- However, only one prefix (3d) and one ⟨infix⟩ (3e) are reconstructible.

Present stem formation in PIE

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- Lone prefix in (3d) is a reduplicant, which is independently reconstructible in various verbal stem formations (Keydana 2006, Zukoff 2017, i.a.) and in certain nouns (Lundquist & Yates 2018), hence not unusual here.

Present stem formation in PIE

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- Lone prefix in (3d) is a reduplicant, which is independently reconstructible in various verbal stem formations (Keydana 2006, Zukoff 2017, i.a.) and in certain nouns (Lundquist & Yates 2018), hence not unusual here.
- But ⟨infix⟩ in (3e) is **unique** in PIE morphology.

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- Introduction
- Infixation in Indo-European
  - Phonology of PIE nasal-infix stems
  - Function(s) of the PIE nasal infix
- A MAP analysis of PIE infixation
- Morphosyntax of the PIE nasal infix
- Conclusions & discussion

Infix stem formation in PIE

(4) **Phonology of PIE nasal infix stems**

a.	*$\sqrt{yewg}$ 'yoke'	⇒	*$yu\langle né\rangle g$-*ti*	'yoke:PRS-3SG'	> Skt. *yu⟨ná⟩k-ti*, Lat. *iu⟨n⟩g-it*
b.	*$\sqrt{leyk^w}$ 'leave'	⇒	*$li\langle né\rangle k^w$-*ti*	'leave:PRS-3SG'	> Skt. *ri⟨ná⟩k-ti*, Lat. *li⟨n⟩qu-it*
c.	*$\sqrt{klew}$ 'hear'	⇒	*$\acute{k}l̥\langle né\rangle w$-*ti*	'hear:PRS-3SG'	> Skt. *śr̥⟨ṇó⟩-ti*

- Infix combines esp. with roots that contain a (4a–b) post- or (4c) pre-nuclear sonorant.
  - Root **e* is deleted and the adjacent sonorant consonant becomes syllabic.
  - The ⟨infix⟩ surfaces immediately before the final consonant of the root.
  - Schematically, *$\sqrt{\text{CR}e\text{C}}$, *$\sqrt{\text{C}e\text{RC}}$⇒ *$\text{CR̥}\langle\text{-}né\text{-}\rangle\text{C}$, where R is a sonorant consonant.

Infix stem formation in PIE

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			**yu⟨n⟩g-énti*	'yoke:PRS-3PL'	> Skt. *yu⟨ñ⟩j-ánti*, Lat. *iu⟨n⟩g-unt*
b.	*√*leyk^{w}* 'leave'	⇒	**li⟨né⟩k^{w}-ti*	'leave:PRS-3SG'	> Skt. *ri⟨ná⟩k-ti*, Lat. *li⟨n⟩qu-it*
			**li⟨n⟩k^{w}-énti*	'leave:PRS-3PL'	> Skt. *ri⟨ñ⟩c-ánti*, Lat. *li⟨n⟩qu-unt*
c.	*√*klew* 'hear'	⇒	**kl̥⟨né⟩w-ti*	'hear:PRS-3SG'	> Skt. *śr̥⟨ṇó⟩-ti*
			**kl̥⟨n⟩w-énti*	'hear:PRS-3PL'	> Skt. *śr̥⟨n⟩v-ánti*

- Nasal infix alternates intraparadigmatically.
  - **-né-* when stressed.
  - **-n-* before stress-attracting inflectional endings.

Infix stem formation in PIE

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b.	*√*leyk*^{w} 'leave'	⇒	**li⟨né⟩k*^{w}*-ti*	'leave:PRS-3SG'	> Skt. *ri⟨ná⟩k-ti*, Lat. *li⟨n⟩qu-it*
			**li⟨n⟩k*^{w}*-énti*	'leave:PRS-3PL'	> Skt. *ri⟨ñ⟩c-ánti*, Lat. *li⟨n⟩qu-unt*
c.	*√*klew* 'hear'	⇒	**kl̥⟨né⟩w-ti*	'hear:PRS-3SG'	> Skt. *śr̥⟨ṇó⟩-ti*
			**kl̥⟨n⟩w-énti*	'hear:PRS-3PL'	> Skt. *śr̥⟨ṇ⟩v-ánti*

- Nasal infix alternates intraparadigmatically.
  - **-né-* when stressed.
  - **-n-* before stress-attracting inflectional endings.
- Alternations preserved in Sanskrit, elsewhere (e.g., Latin) one allomorph was generalized.

Nasal infix as Present stem formant

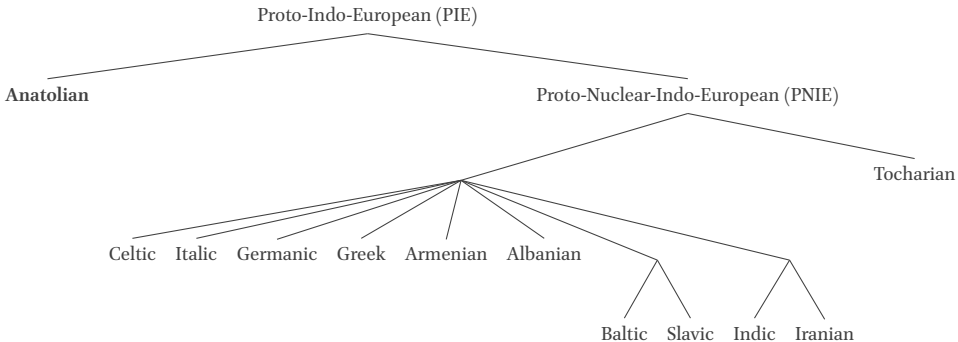
(5) **Nasal infix in present stem formation:**

	Aorist root	Nasal-infix Present	IE Present
a.	*$\sqrt{yewg}$ 'yoke'	**yu⟨né⟩g-ti* 'yoke:PRS-3SG'	> Skt. *yu⟨ná⟩k-ti*, Lat. *iu⟨n⟩g-it*
b.	*$\sqrt{leyk^w}$ 'leave'	**li⟨né⟩k^w-ti* 'leave:PRS-3SG'	> Skt. *ri⟨ná⟩k-ti*, Lat. *li⟨n⟩qu-it*; Gk. *lí⟨m⟩panei*
c.	*$\sqrt{demh_2}$ 'tame'	**dm̥⟨né⟩h$_2$-ti* 'tame:PRS-3SG'	> Gk. *dám⟨nē⟩-si*, OIr. *-dam⟨na⟩i-d*
d.	*$\sqrt{pleh_1}$ 'fill'	**pl̥⟨né⟩h$_1$-ti* 'fill:PRS-3SG'	> Skt. *pr̥⟨ṇā́⟩-ti*; Arm. *l⟨n⟩ow-ē*

- Multiple IE branches support reconstructing nasal infix as **Present stem-forming affix**.
- Present stems (never Aorist) in Vedic Sanskrit and Ancient Greek are commonly formed with **-né-* and its outgrowths (e.g., **-néw* << **-né-w*).
- Nasal infix almost exclusively forms Present stems in Latin, Old Irish, and Classical Armenian (vs. "Perfect," "Preterite," Aorist).

Nasal infix in Anatolian

(6)



- Nasal infix functions differently in Hittite and other Anatolian languages.
- **Anatolian** branch was first to split off from the rest of IE languages.

Nasal infix in Anatolian

(7) **Transitivity alternations in Hittite:**

	Simplex stem/intransitive		⇒	Infix stem/transitive	
a.	*ḫark-zi*	‘die-3SG’		*ḫar⟨ni⟩k-zi*	‘destroy-3SG’
b.	*ištark-zi*	‘get.sick-3SG’		*ištar⟨ni⟩k-zi*	‘make.sick-3SG’

- Anatolian languages lack Present/Aorist aspectual stem contrast.
- Nasal ⟨infix⟩ mediates transitivity alternations in Hittite.

Nasal infix in Anatolian

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⋆ Anatolian data raises the possibility that the nasal infix was **not (always) just a Present stem formant.**

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  - The Mirror (Alignment) Principle
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The Mirror Alignment Principle (MAP)

- Zukoff 2023 introduces the Mirror Alignment Principle (below) as a reliable means of implementing Baker's (1985) **Mirror Principle** generalization:

Mirror Principle

Morphological derivations reflect syntactic derivations (and vice versa).

  - In other words, linear order of morphemes (≈ *morphological derivations*) very strongly tends to align with hierarchical morphosyntactic structure/constituency (≈ *syntactic derivations*).

- The Mirror Alignment Principle is an interface algorithm that captures the Mirror Principle, but will also accommodate seeming exceptions.
  - It relates morphosyntactic structure to morphophonological derivation as follows:

Mirror Alignment Principle (MAP)

If a terminal node α asymmetrically c-commands a terminal node β, then the alignment constraint referencing α dominates the alignment constraint referencing β.

The Mirror Alignment Principle (MAP)

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- In the MAP framework, morpheme order is computed in a parallel Optimality Theoretic (Prince & Smolensky 1993/2004) phonological derivation.
  - Competition between morpheme-specific instances of gradient alignment constraints (McCarthy & Prince 1993) is resolved through ranking, dictated by the MAP.
- The schema for these alignment constraints is given in (8):

(8) a. **ALIGN-*x*-L:** Assign one violation * for each segment that intervenes between the left edge of the word and the left edge of the morpheme that expones *x*.

b. **ALIGN-*x*-R:** Assign one violation * for each segment that intervenes between the right edge of the word and the right edge of the morpheme that expones *x*.

MAP analysis of PIE infixation

- Zukoff 2023 motivates the MAP in part through an analysis of prefix/infix alternations in Arabic's verbal system, focusing on reflexives and causatives.

- According to Zukoff's analysis, the Arabic morphological system is organized as follows:
  - An infix is the **first** morphosyntactic head to combine with Root
  - A prefix/suffix is **separated** from the Root by at least one intervening morphosyntactic head

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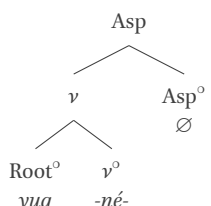
- Applying this to the PIE aspectual system:
  - The nasal infix combines directly with Root
  - Aspectual prefixes/suffixes (i.e., other Present/Aorist stem forming affixes) are separated from the Root by another head (possibly a null *v*)

⇒ The alignment rankings that follow from these structures via the MAP will derive the ordering differences between the nasal infix and the other aspectual affixes.

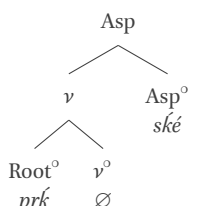
MAP analysis of PIE infixation

- Accordingly, we propose the morphosyntactic structures in (9) and (10) for PIE:
  - The nasal infix is of category *v*, and merges directly with Root (9).
    - *v* has a transitive–causative function.
  - Other aspectual affixes, like **-ské*, are of category Aspect, and merge higher in the tree (10).
  - ∗ We will motivate the labels on the morphosyntactic terminals in the following section.

(9) Nasal infix structure
**yu⟨né⟩g-ti* 'yoke:PRS-3SG'



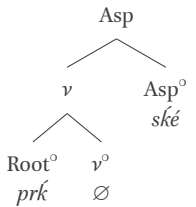
(10) Aspectual suffix structure
**pr̥k-ské-ti* 'ask-PRS-3SG'



MAP analysis of PIE infixation

- For the true aspectual suffixes like *-*ské*, the MAP will rank their alignment constraint above the Root's alignment constraint (11).
  - This is because Aspect^{o} asymmetrically c-commands Root^{o}, due to the intervening (null) *v*.

(10) Aspectual suffix structure
*p*r̥*k-ské-ti* 'ask-PRS-3SG'



(11) MAP ranking for *-*ské*:
ALIGN-*ské*-R ≫ ALIGN-ROOT-R

⇒ This ranking will yield **suffixation**, as we will show immediately below.

MAP analysis of PIE infixation

- For the nasal infix, on the other hand, the MAP will *not establish a ranking* of its alignment constraint w.r.t. the Root's alignment constraint.
  - This is because v^{o} *does not* asymmetrically c-command Root^{o}.
- In this situation, a (language-specific) default ranking is determinative (cf. Zukoff 2023).
- PIE's default ranking is shown in (12). This leads to the specific ranking in (13).

(9) Nasal infix structure
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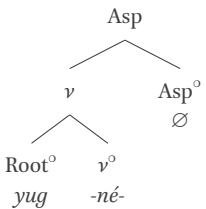


(12) PIE default ranking:
In the absence of a MAP determined ranking, ALIGN-ROOT *outranks* all other alignment constraints.

(13) "Default" ranking for **-né*:
ALIGN-ROOT-R ≫ ALIGN-*né*-R

⇒ This ranking will yield **infixation**, as we will show immediately below.

MAP analysis of PIE infixation

- In PIE, the relevant affixes are all right-oriented:
  - This is self-evidently true of the Aspectual suffixes.
  - It is also true of the infix, which tucks in behind the rightmost/final consonant of the Root.
- This means that each alignment constraint must be an ALIGN-*x*-R constraint (14).
  - This includes the ALIGN-ROOT constraint, whose right-orientation will be significant for the analysis.

(14) a. **ALIGN-*né*-R:** Assign one violation * for each segment that intervenes between the right edge of the word and the right edge of *-*né*-.

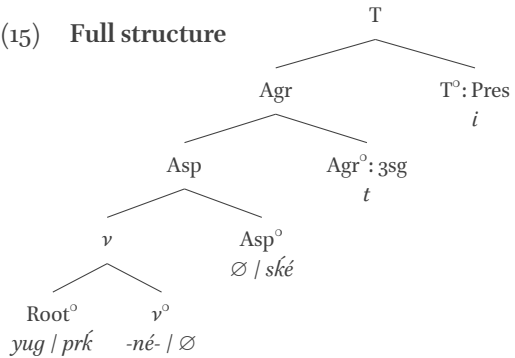
b. **ALIGN-*ské*-R:** Assign one violation * for each segment that intervenes between the right edge of the word and the right edge of *-*ské*.

c. **ALIGN-ROOT-R:** Assign one violation * for each segment that intervenes between the right edge of the word and the right edge of the Root.

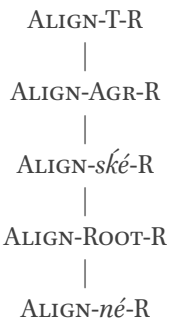
MAP analysis of PIE infixation

- We use whole word forms for our tableaux, namely 3SG.PRS forms (ending in *-*t*-*i*).
- The full morphosyntactic structure for PIE verbs is as in (15).
- The MAP + default ranking yields the total alignment ranking in (16).

(15) **Full structure**



(16) **Alignment ranking for full structure**



MAP analysis of PIE infixation

- The ranking from (16) generates infixation of *-*né*- if ALIGN-*né*-R ≫ CNTG-ROOT (17).
- This is demonstrated in the tableau in (27).

(17) **CONTIGUITY-ROOT:** Assign one * for each string that intervenes inside of the Root.

(18) Derivation of Infixation: **yu⟨né⟩g-t-i*

yug, né, t, i	ALIGN-T-R	ALIGN-AGR-R	ALIGN-ROOT-R	ALIGN-*né*-R	CNTG-ROOT
a. *yug-t-i-né*	*!*	***	****		
b. *yug-t-né-y*		**!*	****	*	
c. *yug-né-t-i*		*	***!*	**	
d. ☞ *yu⟨né⟩g-t-i*		*	**	***	*
e. *i⟨né⟩wg-t-i*		*	**	****!	*
f. *né-yug-t-i*		*	**	****!*	

MAP analysis of PIE infixation

- The high ranking of ALIGN-T-R and ALIGN-AGR-R ensures that *-*né*- cannot be further to the right than T (*-*i*) and Agr (*-*t*), respectively.
- This rules out candidates like (27a,b) where *-*né*- has migrated further to the right.

(18) Derivation of Infixation: **yu⟨né⟩g-t-i*

yug, né, t, i	ALIGN-T-R	ALIGN-AGR-R	ALIGN-ROOT-R	ALIGN-*né*-R	CNTG-ROOT
a. *yug-t-i-né*	*!*	***	****		
b. *yug-t-né-y*		**!*	****	*	
c. *yug-né-t-i*		*	***!*	**	
d. ☞ *yu⟨né⟩g-t-i*		*	**	***	*
e. *i⟨né⟩wg-t-i*		*	**	****!	*
f. *né-yug-t-i*		*	**	****!*	

MAP analysis of PIE infixation

- The ranking ALIGN-ROOT-R ≫ ALIGN-*né*-R explains why it is better to have the Root's right edge closer to the right (27d) than it is to have *-*né*-'s right edge closer to the right (27c).
  - This ranking followed from *-*né*-'s low structural position via the interplay between the MAP and the language's default preference for Root-alignment.

(18) Derivation of Infixation: **yu⟨né⟩g-t-i*

yug, né, t, i	ALIGN-T-R	ALIGN-AGR-R	ALIGN-ROOT-R	ALIGN-*né*-R	CNTG-ROOT
a. *yug-t-i-né*	*!*	***	****		
b. *yug-t-né-y*		**!*	****	*	
c. *yug-né-t-i*		*	***!*	**	
d. ☞ *yu⟨né⟩g-t-i*		*	**	***	*
e. *i⟨né⟩wg-t-i*		*	**	****!	*
f. *né-yug-t-i*		*	**	****!*	

MAP analysis of PIE infixation

- The gradient definition of the alignment constraints explains why *-né-* tucks in immediately before the root-final consonant (27d):
  - Retracting any further (27e,f) induces gratuitous violations of ALIGN-*né*-R.
- In order for (27d) ≻ (27f) (the prefixation candidate): ALIGN-*né*-R ≫ CNTG-ROOT.
  - This is because infixation induces a violation of CNTG-ROOT.

(18) Derivation of Infixation: **yu⟨né⟩g-t-i*

yug, né, t, i	ALIGN-T-R	ALIGN-AGR-R	ALIGN-ROOT-R	ALIGN-*né*-R	CNTG-ROOT
a. *yug-t-i-né*	*!*	***	****		
b. *yug-t-né-y*		**!*	****	*	
c. *yug-né-t-i*		*	***!*	**	
d. ☞ *yu⟨né⟩g-t-i*		*	**	***	*
e. *i⟨né⟩wg-t-i*		*	**	****!	*
f. *né-yug-t-i*		*	**	****!*	

MAP analysis of PIE infixation

- Because *-*ské* (and the other Aspectual affixes) are merged higher in the tree, the MAP ranks their alignment constraints above ALIGN-ROOT-R.
- This results in their realization as suffixes following the root: (19c) ≻ (19d).

(19) Derivation of Suffixation of *-*ské* (and other Aspectual affixes): **pr̥k-ské-t-i*

prk, ské, t, i	ALIGN-T-R	ALIGN-AGR-R	ALIGN-*ské*-R	ALIGN-ROOT-R	CNTG-ROOT
a. *pr̥k-t-i-ské*	*!**	****		*****	
b. *pr̥k-t-ské-y*		**!*	*	*****	
c. ☞ *pr̥k-ské-t-i*		*	**	*****	
d. *pr̥⟨ské⟩k-t-i*		*	***!	**	*
e. *p⟨ské⟩rk-t-i*		*	***!*	**	*
f. *ské-pr̥k-t-i*		*	****!*	**	

Roadmap

- Introduction
- Infixation in Indo-European
- A MAP analysis of PIE infixation
- Morphosyntax of the PIE nasal infix
  - The nasal infix as a *v* head
  - Cooccurence of nasal infix and aspectual suffixes
  - MAP & the diachrony of the PIE nasal infix
- Conclusions & discussion

Predictions of the MAP analysis

- This analysis makes specific predictions about the morphosyntactic properties of the nasal infix and other IE Present-stem forming affixes.

  (i) The nasal infix is the exponent of a different morphosyntactic category than the others.

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- If (i) is true, distinct morphosyntactic behaviors of the two classes should be detectable.
- If (ii) is true, then the nasal infix should be able to co-occur with other Aspectual suffixes.

↓ Looking across the Indo-European languages, we find that both predictions are borne out.

The nasal infix as a *v* head

(20) **Transitivity alternations in PIE verbal stems:**

	Simplex stem/intransitive	⇒	Infix stem/causative
a.	**h₃érg-t* ‘perished’ > Hitt. *ḫark-ta* ‘perished’		**h₃r̥⟨né⟩g-ti* ‘makes perish’ > Hitt. *ḫar⟨ni⟩k-zi* ‘destroys’ (cf. Arm. *harkan-ē* ‘hits, kills’)
b.	*(*s*)*térǵʰ-t* ‘got sick’ > Hitt. *ištark-ta* ‘got sick’		*(*s*)*tr̥⟨né⟩ǵʰ-ti* ‘makes sick’ > Hitt. *ištar⟨ni⟩k-zi* ‘makes sick’ (cf. Skt. *tr̥⟨ṇé⟩ḍhu* ‘let him smash’)
c.	**pl̥h₁-tó* ‘became full’ > Gk. *plê-to* ‘became full’		**pl̥⟨né⟩h₁-ti* ‘fills’ > Skt. *pr̥⟨ṇá⟩-ti* ‘fills’

- Anatolian data in (20) support reconstruction of nasal infix as a **transitivizer** of intransitive simplex verbal stems (Meiser 1993; cf. Clackson 2007; Lundquist & Yates 2018).
- Traces of this function detectable via comparison of other IE languages, e.g., (20c).

The nasal infix as a *v* head

(21) **Nasal infix in deadjectival derivation:**

	Adjectival root	⇒	Nasal-infix/causative
a.	*$\sqrt{sewh_3}$ ‘full’ > Hitt. *šuw-uš* ‘full’		**su⟨né⟩h₃-ti* ‘fills’ > Pal. *šū⟨na⟩-t* ‘filled’
b.	*$\sqrt{pewh_x}$ ‘pure’ > Lat. *pū-rus* ‘pure’, MIr. *ú-r* ‘fresh’		**pu⟨né⟩hₓ-ti* ‘purifies’ > Skt. *pu⟨nā́⟩-ti* ‘purifies’
c.	*$\sqrt{preyh_x}$ ‘dear’ > Skt. *prīy-ás*, Av. *frii-ah* ‘dear; own’		**pri⟨né⟩hₓ-ti* ‘endears’ > Skt. *pri⟨ṇā́⟩-ti* ‘pleases’

- Nasal infix exhibits similar function in derivation from adjectival roots, which is attested both in (21a) Anatolian and (21b–c) elsewhere in IE.
  - Adjectival roots lack simplex verbal stems (viz., unattested in IE).
  - (Present) stems formed from these roots by infixation have **causative** meaning.

The nasal infix as a *v* head

(22) **Summary: nasal infix as transitivizer:**

a.	**pl̥h₁-tó* 'became full' > Gk. *plḗ-to* 'became full'	'became full'	**pl̥⟨né⟩h₁-ti* 'fills' > Skt. *pṛ⟨ná⟩-ti* 'fills'	'fills'	(= (20c))
b.	**√pewh$_x$* 'pure' > Lat. *pū-rus* 'pure', MIr. *ú-r* 'fresh'	'pure'	**pu⟨né⟩h$_x$-ti* 'purifies' > Skt. *pu⟨ná⟩-ti* 'purifies'	'purifies'	(= (21b))

- Neither behavior in (22) is accounted for if nasal ⟨infix⟩ is **just** a Present formant.
- Meiser (1993) therefore argues that the transitivizing function of nasal infix is "original" and that its use as a Present stem formant was a later innovation (cf. Zasada 2023).

The nasal infix as a *v* head

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- Meiser (1993) therefore argues that the transitivizing function of nasal infix is "original" and that its use as a Present stem formant was a later innovation (cf. Zasada 2023).

  ⇒ **Nasal infix was "originally" an exponent of *v*.**

Cooccurence with Aspect markers

(23) Cooccurence of *-*né*- and *-*ské* in Hittite verbal stems:

a.	*ḫar⟨ni⟩k-zi*	'destroy-3SG'	⇒	*ḫar⟨nin⟩ki-ške-zzi*	'destroy-IPFV-3SG'
b.	*šar⟨ni⟩k-zi*	'compensate-3SG'	⇒	*šar⟨nin⟩ki-ške-zzi*	'compensate-IPFV-3SG'

- If nasal infix expones *v*, it should be able to cooccur with Aspectual suffixes.
- In Hittite the nasal ⟨infix⟩ cooccurs with –*ške* (< PIE *-*ské*) in the formation of "imperfective" stems, e.g., (23) (cf. Hoffner & Melchert 2008).

Cooccurence with Aspect markers

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- In Hittite *–šk̂e* is not a Present stem formant, since no Present/Aorist aspectual stem contrast exists in Anatolian.
- *–šk̂e* is rather a modifier of lexical (/"situation") aspect in Hittite (pluractional marker per Inglese & Mattiola 2020; cf. Dressler 1968).

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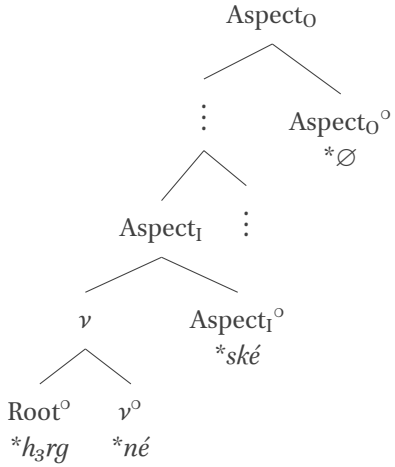
- *–ške* is rather a modifier of lexical (/"situation") aspect in Hittite (pluractional marker per Inglese & Mattiola 2020; cf. Dressler 1968).
  - ⇒ ***–ške* expones an inner Aspect head above ⟨infix⟩ in *v*** (cf. Yates & Gluckman 2020).
  - ⇒ **This may have been the "original" function of PIE *-*ské*-.**

Diachrony of the PIE nasal infix

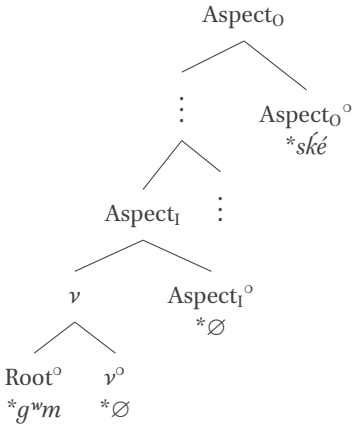
(24) Structure of PIE *$h_3r\langle né\rangle g$-$sk\acute{e}$-*ti* 'perish:TR-IPFV-3SG' (> Hitt. *ḫar⟨nin⟩ki-šḫe-zzi*):

- **Proposal:** Anatolian best reflects PIE verbal system.
  - No stem-based Present–Aorist aspectual contrast.
  - Nasal infix *-*né*- is a **transitivizer** that expones *v*.
  - *-$sk\acute{e}$ (and other eventual Present stem markers) is a **lexical aspect** marker that expones an 'inner' aspectual category Aspect_I above *v*, but within the verbal domain.
  - Morpheme ordering is correctly predicted by MAP: infixation of *-*né*-, suffixation of *-$sk\acute{e}$.



Diachrony of the PIE nasal infix

(25) Structure of PNIE *$g^{w}m$-ś*ké-ti* ‘come-PRS-3SG’ (> Skt. *gá-ccha-ti*):



- **Proposal:** Present–Aorist aspectual contrast emerges in PNIE (i.e., after the departure of Anatolian; cf. Strunk 1994).
  - *-ské (and *´-e, *-yé) reanalyzed as a **Present stem formant** that expones an ‘outer’ aspectual category Aspect$_O$ associated with grammatical (/“viewpoint”) aspect.
  - Nasal ⟨infix⟩ gets dragged into this system: reanalyzed as a Present stem formant, but continues to merge in v° as a morphological archaism, combining with *-∅ in Asp$_O$°.
  - MAP continues to predict infixation of *-né-.

Diachrony of the PIE nasal infix

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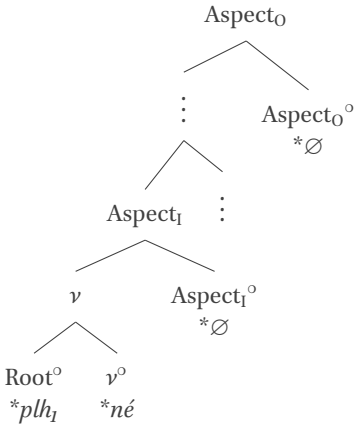

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  - Nasal ⟨infix⟩ gets dragged into this system: reanalyzed as a Present stem formant, but continues to merge in v^{o} as a morphological archaism, combining with *-∅ in Asp$_O$°.
  - MAP continues to predict infixation of *-né-.

Extending the analysis

(26) PNIE Present stems with suffix *-*éye*-:

a.	*$\sqrt{}$*wes* 'clothe'	⇒	***w⟨o⟩s-éye-ti***	> Hitt. *waššeezzi* 'clothes', Ved. *vās-áya-ti* 'clothes'
b.	*$\sqrt{}$*lewk* 'light'	⇒	***l⟨o⟩wk-éye-ti***	> Hitt. *lukkezzi* 'lights up', Ved. *roc-áya-ti* 'makes shine'
c.	*$\sqrt{}$*wyeh$_1$* 'wrap'	⇒	*wih$_1$-éye-ti	> Ved. *vy-áya-ti* 'wraps (around)', Lat. *vi-e-t* 'plaits'

The MAP also permits analysis of R(*o*)-*éye*-type causative(-iterative)s like (28a–b).

- *-*éye* expones Aspect$_O$, just like in non-causative zero-graded *-*éye*-Presents like (28c).
  ⇒ MAP predicts suffixation of *-*éye*.
- The *o*-grade expones *v*, the same transitivizing category as *-*ne*-.
  ⇒ MAP predicts **infixation** of *-*o*- into zero-grade root.

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Summary

- Previous scholars have suspected that the PIE nasal infix *-*né*- was “originally” transitivizing on the basis of **functional** evidence in Anatolian and NIE.

Summary

- Previous scholars have suspected that the PIE nasal infix *-*né*- was "originally" transitivizing on the basis of **functional** evidence in Anatolian and NIE.
- Our MAP-based analysis provides **phonological** evidence in support of this view, deriving its (almost) uniquely infixal position from its (almost) unique morphosyntactic properties.
  - The nasal infix was "originally" a transitivizing *v*, while *-*sḱé*- and other PNIE Present-forming affixes were Aspect markers.
  - This lower structural position was responsible for it surfacing as an infix rather than a prefix or suffix, like the true Aspect markers.
  - The same analysis can potentially be extended to R(*o*)-*éye*-type causatives, where *-*o*- is infixed because it expones *v*.

Summary

- Previous scholars have suspected that the PIE nasal infix *-*né*- was "originally" transitivizing on the basis of **functional** evidence in Anatolian and NIE.
- Our MAP-based analysis provides **phonological** evidence in support of this view, deriving its (almost) uniquely infixal position from its (almost) unique morphosyntactic properties.
- This analysis renews the question of the diachrony of the Present/Aorist stem-based aspectual contrast, whose emergence we situate in PNIE.
  - Straightforwardly accounts for behavior of *-*ne*- and *-*sḱé* in Anatolian as a PIE archaism.
  - Explains the dual functions of *-*ne*- (i.e., transitivizing + Present) as the result of PNIE reanalysis.

Conclusion

Thank you!

- Special thanks to the members of the:
  - UCLA Phonology Seminar
  - UCLA PIES Graduate Seminar
  - Indo-European & Modern Linguistic Theory research group
- As well as to:
  - Michelle Yuan
  - Ryan Sandell
  - John Clayton
  - and the audience of NELS 55

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Roadmap

- Appendix – Analyzing R(*o*)-*éye*- causatives

Deriving the causative(-iterative) *R(*o*)-*éye*

(27) Derivation of *o*-grade 'infixation': *w⟨o⟩s-éye-t-i

us, o, éye, t, i	ALIGN-*éye*-R	ALIGN-ROOT-R	ALIGN-*o*-R	CNTG-ROOT
a. *us-**o**-éye-t-i*	**	******!	*****	
b. ☞ *w⟨**o**⟩s-éye-t-i	**	*****	*******	*
c. *o*-ws-éye-t-i	**	*****	********!	

- Suffixation *us-**o**-éye-t-i is eliminated by ALIGN-ROOT-R ≫ ALIGN-*o*-R.
- Prefixation **o*-ws-éye-t-i is eliminated by ALIGN-*o*-R ≫ CNTG-ROOT.
  - **o*-prefixation may also be eliminated by *NOONSET.
- We need to work harder to derive a R(*o*)-*éye*-causative from a *√CeRC-shape root.
  - If we assume that the *e*-grade is underlying, such that *o*- and zero-grade forms incur a CNTG-ROOT violation, then CNTG-ROOT ≫ ALIGN-*o*-R correctly yields *o*-grade *√C⟨o⟩RC.

Cooccurence of PIE *-*éye*- and *-*ske*-

(28) PIE verbal stems with suffix *-*éye*-:

a.	*$\sqrt{}$*wes* 'clothe'	⇒	***w⟨o⟩s-éye-ti***	> Hitt. *wašš-e-zzi* 'clothes', Ved. *vās-áya-ti* 'clothes'
			⇒ ***w⟨o⟩s-éye-ské-si***	> Hitt. *wašš-i-ske-ši* 'clothe:IPFV'
b.	*$\sqrt{}$*lewk* 'light'	⇒	***l⟨o⟩wk-éye-ti***	> Hitt. *lukk-e-zzi* 'lights up', Ved. *roc-áya-ti* 'makes shine'
			⇒ ***l⟨o⟩wk-éye-ské-ti***	> Hitt. *lukk-i-ske*[- 'cause to light up:IPFV'

- Hittite reflexes *R(*o*)-*éye*-type causatives can be further suffixed with –*šk*e- (< *-*ské*).
- If this cooccurence is reconstructible for PIE, then *-*éye*- could expone a Voice or Caus head between v° and $\text{Aspect}_{\text{I}}{}^{\circ}$.
  - *R(*o*) would stay in v° in PNIE, but *-*éye*- would be reanalyzed into $\text{Asp}_{\text{O}}{}^{\circ}$.