

# On the (non-)transparency of infixes that surface at a morpheme juncture: *Bottoms up!*\*

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## 1 Introduction

Locality plays a fundamental role throughout the grammar, constraining e.g.:

- *Semantic relationships*: Compositionality, idioms
- *Syntactic relationships*: Selection, incorporation
- *Morphological relationships*: Allomorphy, feature interactions
- *Phonological interactions*: Assimilation, allophony, etc.

But sometimes, relationships and interactions that are otherwise **strictly local** survive in apparently **non-local** configurations.

- E.g., the persistence of an idiomatic interpretation in (1a) (cf. its failure in (1b)):

- (1) a. **The shit** continued to **hit the fan**.  
b. #**The shit** decided to **hit the fan**.

⇒ The survival of a local relationship is a useful diagnostic, showing that the relationship must hold locally at some relevant derivational point or level of representation.

– E.g., returning to (1), diagnosing a raising vs. control environment:<sup>1</sup>

- (2) a. [The shit]<sub>i</sub> continued [ *t*<sub>i</sub> to hit the fan ] (= raising)  
b. #[The shit]<sub>i</sub> decided [ **PRO**<sub>i</sub> to hit the fan ] (= control)

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<sup>1</sup>On locality and idioms, see, e.g., Chafe 1970, Bach 1974, Chomsky 1995, O'Grady 1998.

## The locality-(non-)disruptor of interest today: Infixes

- Infixes are affixes that appear *inside of* the stem they combine with.
- The location of an infix in a string can be described as preceding or following a particular phonological or prosodic pivot (Ultan 1975, Moravcsik 2000, Yu 2007, *i.a.*), e.g.:
  - Preceding the first vowel, as in Leti (Blevins 1999):  
(3)    **-ni-** (NOM) + kakri (cry) → k<**ni**>akri
  - Preceding the final syllable, as in KiChaga (Yu 2007, citing Inkelas p.c.):  
(4)    **-N-** (INTENS) + muili (white) → mui<**n**>li
- In canonical cases, infixes disrupt the linear integrity of a **root**, as in (3)-(4) above.
- But, when combining with a complex/multimorphemic stem, an infix can also appear incidentally inside an affix or **at a juncture between morphemes** in its stem, e.g., (5b).
  - Infixation of past in Palauan (Flora 1974:74):  
(5)    a.    **-il-** (PST) + dasa? (carve) → d<**il**>asa? ‘carved (past participle)’  
          b.    **-il-** (PST) + m-dasa? (VM-carve) → m-<**il**>dasa? ‘carved (past middle)’

## When an infix (incidentally) appears between two morphemes in its stem, does the infix disrupt relations at/across that morpheme juncture *that we otherwise expect to be strictly local*?

§2 The findings: Infixes disrupt limited types of phonological interactions, but never interrupt semantic, syntactic, or morphological interactions/relationships.

### §3 Theoretical implications:

- Novel evidence for...
  - (i) **the post-syntactic nature of morphology**
  - and (ii) **bottom-up exponence**
  - that is (iii) **interleaved with some (morpho)phonological processes**
  - but (iv) **not interleaved with surface phonology**
- This data poses a serious challenge for theories of the morphology-syntax interface where...
  - Words are built pre-/non-syntactically (e.g., lexicalist theories)
  - Words lack hierarchical structure (like in Paradigm Function Morphology)
  - Exponence is simultaneous across all morphemes/features in a domain

## 1.1 A primer on the terminology I'll be using

I am using the tools/terms of a piece-based theory of morphology, e.g., Distributed Morphology.

- **Morpheme**: an abstract morphosyntactic element corresponding to...
  - (i) a (set of) meaning(s)/function(s), and (= interpretation @ LF)
  - (ii) a (set of) phonological form(s) (= interpretation @ PF)
- I refer to the phonological realizations of a morpheme as **exponents** or **allomorphs**, and to the process of *choosing/inserting* the appropriate form for a morpheme as **exponence**.

How I will talk about infixation/infixes:

- (6) **Definition of Infixation** (Blevins 2014; emphasis added, modifications in brackets)

Under infixation a *bound [exponent]* whose phonological form **consists minimally of a single segment**, is **preceded and followed** *in at least some word-types* by **non-null segmental strings** which together **constitute a relevant form-meaning correspondence of their own**, despite their non-sequential phonological realization.

- (7) Nominalization in Hoava: **-in-** (Blevins 2014, citing Davis 2003)

- a. to (alive) → t<in>o ('life')
- b. hiva (want) → h<in>iva ('wishes')
- c. ta-poni (PASS-give) → t<in>a-poni ('gift')
- d. vari-razae (RECIP-fight) → v<in>ari-razae ('war')
- e. edo (happy) → <in>edo ('happiness')

- The morphological constituent that the infix combines with (and in the usual case linearly disrupts, cf. (7e)) is the **stem of infixation**.
  - The stem of infixation can be morphologically complex, as in (7c,d) and (5).
- Infixes are affixes with a **phonological or prosodic condition on their position** that may require them to **surface inside** their stem.
  - Most common pivots: C, V, syllable, foot; can include stress (Yu 2007)

## 2 When does(n't) an infix disrupt local relationships?

### The infixes

In the process of conducting a larger typological survey of infixes (Kalin To Appear), I have identified a total of 9 morphemes that each have at least one exponent that...

- (i) fits the definition of infixation in (6), and
- (ii) can surface incidentally at a morpheme juncture



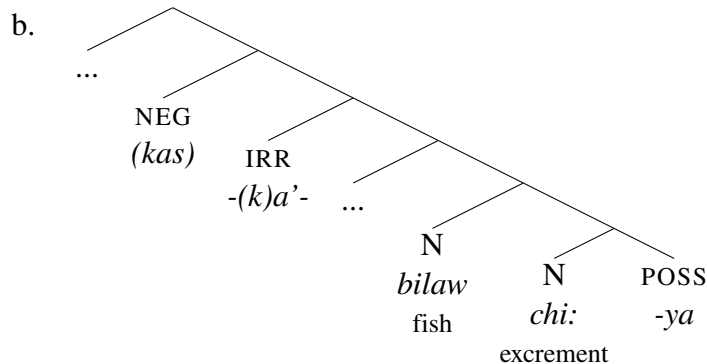
**Movima** (language isolate of Bolivia; Haude 2006)

- The infix: Irrealis mood in Movima is marked with the infix  $-(k)a'$ - (H:§3.6.2, §10.3).
    - Combines with a verb or a predicate nominal to express irrealis mood or existential negation
    - Infix placement: after the first iambic foot of the base (i.e., after initial H, LL, or LH)
- (12) a.  $-(k)a'$ - (IRR) + salmo (return) → sal<a'>mo ('I'll be back') (H:438)  
 b.  $-(k)a'$ - (IRR) + aroso (rice) → aro<ka'>so ('There is no rice') (H:80)
- nb. Initial  $k$  of  $-(k)a'$ - is absent after consonants, present after vowels (hiatus avoidance)

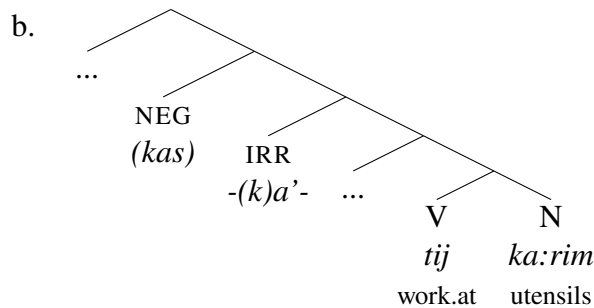
- The (non-)interrupted relationship: Interpretation of compounds

→ Interpretation of compounds **survives infixation**, both compositional interpretation, (13), and non-compositional interpretation, (14):

- (13) a.  $-(k)a'$ - (IRR) (H:81)  
 + bilaw-chi:-ya (fish-excrement-POSS, 'fish excrement')  
 → bilaw<a'>-chi:-ya ('there is no fish excrement')



- (14) a.  $-(k)a'$ - (IRR) (H:351,439)  
 + tij-ka:rim (work.at-utensils, 'work')  
 → tij<a'>-ka:rim ('nobody is at work')



⇒ *Infixes do not disrupt the semantic composition/interpretation of their stems.*

- Consistent throughout the sample, and evident in many further examples below.
- Core implication: Infixes, even when appearing intermorphemically, have a distinct syntactic location from where they are realized phonologically; in other words, infixation doesn't disrupt underlying constituency/compositionality.

## 2.2 Morphosyntactic relationships survive infixation

**Baseline** Morphosyntactic relationships are highly local.

- Productive selectional relationships are interrupted by an intervener, e.g.:
  - *-ly* in English selects adjectives and derives adverbs, (15a); requires adjacency, (15b)

- (15) a. happy-ly  
b. \*happy-**ness**-ly

- Non-productive selectional relationships are also interrupted by an intervener, e.g.:

- Comparative *-er* in English is lexically picky<sup>2</sup>; requires adjacency, (16b)/(17b)

- (16) a. simpl-er  
b. \*simpl-**ify-ed**-er (cf. more simplified)

- (17) a. green-er  
b. \*green-**ish**-er (cf. more greenish)

⇒ *What happens when the intervener is an infix?*

**Hunzib** (Northeast Caucasian; van den Berg 1995, Kalin 2021)

- The infix: Hunzib has a verbal plural infix *-á-* (B:81-83).
  - Combines with verbs to mark iterativity or plurality of internal argument
  - Infix placement: before the final consonant of a verb stem

- (18) a. áhu (take) + **-á-** (VPL) → a<**á**>hu (B:284)  
b. ék (fall) + **-á-** (VPL) → e<**yá**>k (B:295)  
c. čáx (write) + **-á-** (VPL) → ča<**á**>x (B:292)

- nb. Exhibits some surface allomorphy (phonologically-derived)

<sup>2</sup>Note that while it is true that *-er* generally combines with mono- or disyllabic adjectives, this is neither a necessary nor sufficient condition for predicting its compatibility with an adjective, cf. the ungrammatical \**iller* and the grammatical *unhappier*. See discussion in Bobaljik 2012:Ch. 5.5.

Charles Yang points out (p.c.) that *-er* sometimes seems to “select for” complex stems like *lucky*. A quick perusal of adjectives derived with *-y* suggests (by my intuition) that all are compatible with *-er*, even infrequent ones, e.g., *soapier*, *milkier*, and novel ones, e.g., *carrotier*. I would therefore suggest that the compatibility of these derived adjectives with *-er* stems from *-er*'s compatibility with *-y*, rather than the complex form as a whole.

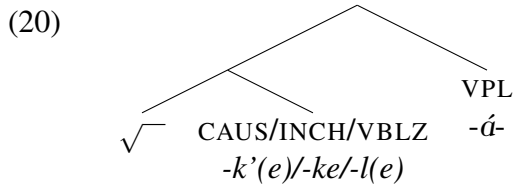
- The (non-)interrupted relationship: Category selection and lexically-specific selection

– Some relevant derivational suffixes (which we’ll return to later):

- ◊ causative *-k’(e)* (ADJ → trans V; V → V+causer); productive (B:107)
- ◊ verbalizer *-l(e)* (ADJ/V → V); not productive (B:108)

→ Selection (and meaning) **survives infixation** for all of these suffixes:

- (19) a. *háldu-k’* (white-CAUS) + **-á-** (VPL) → *hald<á>-k’* (B:301)  
 b. *gáme-l* (thin-VBZ) + **-á-** (VPL) → *gam<á>-l* (B:297)



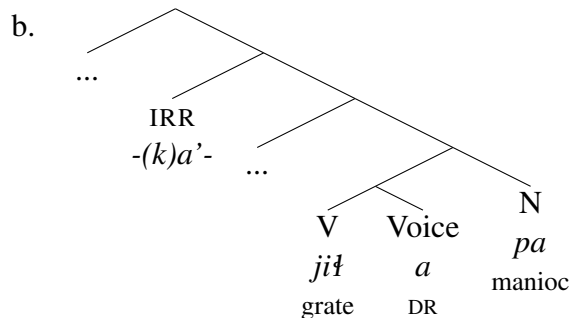
**Movima (again)** (language isolate of Bolivia; Haude 2006)

- The infix: Irrealis infix *-(k)a’-*; placement: after first iambic foot (see §2.1)
- The (non-)interrupted relationship: A productive process of object incorporation (H:§7.7)
  - An object that would otherwise be absolutive, (21a), is incorporated into the verb, (21b)
  - nb. the verb is marked with the “direct voice” active transitive suffix, DR (H:368, 374)

- (21) a. **wul-na=n**    *kis*    **saniya**                      b. *ij*    **wul-a-saniya**  
 sow-DR=2ERG ART.PL melon                                      2ABS sow-DR-melon  
 ‘You sow melon.’    ‘You sow melon.’

→ Object incorporation, (22a), **survives infixation**, (22b):

- (22) a. *ín*    *jił-a:-pa*                                      b. *ín*    *jił-a<ka’>-pa*  
 1ABS grate-DR-manioc                                      1ABS <IRR>grate-DR-manioc  
 ‘I grate manioc.’    ‘I’ll grate manioc.’ (H:79)



- Note that it *-(k)a’-*, when word-final, triggers infixing CV reduplication (H:82).
  - ◊ The *absence* of this shows incorporation happens before infixation.

⇒ *Infixes do not disrupt morphosyntactic relationships in their stems.*

- Consistent throughout the sample; many cases
- Core implications: Infixes, even when appearing intermorphemically, occupy a distinct (morpho)syntactic location from where they are realized phonologically. And, syntax can create the word constituent that feeds infixation.

### 2.3 Suppletive allomorphy survives infixation

**Baseline** The target and trigger of suppletive allomorphy must be local to each other.<sup>3</sup>

- Phonologically-conditioned allomorphy is local
  - E.g., English *a/an* allomorphy:  
(23) a. an apple  
b. a **giant** apple  
c. a **non**-apple
- Lexically-conditioned allomorphy is local
  - E.g., Kalin and Atlamaz 2018: A particular tense/aspect suffix in Kurmanji has a number of suppletive forms—*-or*, *-i*, *-t*, *-d*,  $\emptyset$ , etc.—all lexically conditioned.
  - Intervention of the causative morpheme always results in the choice of *-d*, (24b).  
(24) a. kel (boil) + T/Asp → kel-i (‘boiled’)  
b. kel (boil) + **-on** (CAUS) + T/Asp → kel-**on**-d (‘made boil’)
- Grammatically-conditioned allomorphy is local
  - See, e.g., Embick 2010, Paparounas 2021

⇒ *What happens when the intervener is an infix?*

**Palauan** (Austronesian; Flora 1974, Josephs 1975, Embick 2010)

- The infix: The past tense marker in Palauan is an infix, *-il-*
  - Infix placement: after the first segment of the stem.
  - Appears inside a root when combining with an un-prefixed stem:

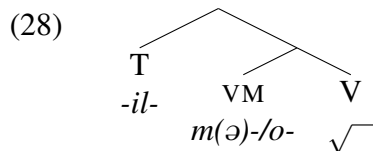
- (25) a. **-il-** (PST) + kie (live) → k<**il**>ie (‘lived’) (Embick 2010)  
b. **-il-** (PST) + dɔngʔokl (sit) → d<**il**>ɔngʔokl (‘sat’)

<sup>3</sup>For discussions of exactly what the relevant locality condition on suppletive allomorphy is, which may vary by type of allomorphy, see e.g. Embick 2010, Bobaljik 2012, Merchant 2015, Moskal 2015, Choi and Harley 2019.



- The (non-)interrupted relationship: Lexically- and phonologically-conditioned allomorphy
    - Note: Embick (2010:104-107) offers a case study of Palauan verb marker allomorphy and past tense infixation; the presentation here largely follows Embick’s.
    - Most verb stems bear a Verb Marker (VM), excluding some stative ones.
      - ◊ Josephs (1975:148): “It is very difficult to define or specify the meaning of the verb marker; rather, the best we can do is to say that the verb marker simply functions to mark or identify a particular word as a verb.”
    - Two suppletive allomorphs of the VM, *m(ə)-* and *o-* (see Josephs 1975:Ch. 6):
      - ◊ Majority of verbs: *m(ə)-* (26a)
      - ◊ All bilabial-initial verb stems: *o-* (26b)
      - ◊ A small list of non-bilabial-initial verb stems: *o-* (26c)
- (26) a. VM + *dasa?* (carve) → mə-*dasa?* (Flora 1974:99)  
 b. VM + *balo?* (shoot) → o-*balo?* (Flora 1974:100)  
 c. VM + *siik* (look\_for) → o-*siik* (Josephs 1975:133)
- Verb marker allomorphy, (26), **survives infixation** of the past tense marker, (27).

- (27) a. **-il-** (PST) + VM-*dasa?* (26a) → m-<**il**>*dasa?* (Flora 1974:100)  
 b. **-il-** (PST) + VM-*balo?* (26b) → o-<**il**>*balo?* (Flora 1974:101)  
 c. **-il-** (PST) + VM-*siik* (26c) → o-<**il**>*siik* (Josephs 1975:133)



**Nancowry** (Austroasiatic; Radhakrishnan 1981, Kalin In press)

- The infix: Nancowry has a number of left-edge prefixes/infixes, one of which is the instrumental nominalizer infix *-in-*
    - Derivational affix that combines with verbs and derives instrument nouns
    - Infix placement: after the first consonant of the stem (cf. (30))
- (29) a. **-in-** (INOM) + *caluak* (swallow) → **c<in>***luak* (‘a throat’) (R:146)  
 b. **-in-** (INOM) + *tiko?* (prod) → **t<in>***ko?* (‘a prod’) (R:97)
- Kalin (In press): *-in-*’s placement is actually after the first vowel<sup>4</sup>
    - ◊ The infix creates vowel hiatus, which is disallowed in unstressed syllables
- (30) **-in-** + *caluak* → **ca<in>***luak* → **c<in>***luak*

<sup>4</sup>Thanks to Nicholas Rolle who, in an early draft of Kalin and Rolle To appear, posited this post-vocalic placement.

- The (non-)interrupted relationship: Prosodically-conditioned allomorphy
  - The causative morpheme in Nancowry has two prosodically-conditioned suppletive forms (one of which is itself an infix):

(31) a. CAUS ↔ ha- / monosyllabic stems (32a)

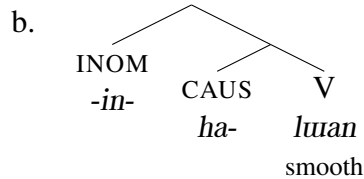
b. CAUS ↔ -um- / disyllabic stems (32b)

(32) a. CAUS + *luan* (smooth) → ha-*luan* (‘to smoothen’) (R:146)

b. CAUS + *palo?* (loose) → p<um>*lo?* (‘to loosen’) (R:150)

→ Allomorphy of the causative **survives infixation** of the nominalizer:<sup>5</sup>

(33) a. **-in-** (INOM) + CAUS-smooth (32a) → h-<in>*luan* (‘thing used to smoothen’)



⇒ *Infixes do not disrupt suppletive allomorphy in their stems.*

- Consistent throughout the sample; other cases:
  - Katu (Costello 1998): lexically-conditioned allomorphy of the causative morpheme survives infixation of a nominalizer
  - Turoyo (Kalin 2020): grammatically-conditioned allomorphy of the dative marker and phonologically-conditioned allomorphy of “B” agreement survive infixation of past
  - Nancowry (Kalin In press): prosodically-conditioned allomorphy of the causative morpheme survives infixation of a second causative (creating a double causative)
- Core implication: Exponent choice, for the morphemes that constitute the stem of infixation, happens *before* infixation.

## 2.4 Morphophonology survives infixation

**Baseline** Morphophonological interactions are highly local

- E.g., in English, some nouns ending in a voiceless fricative undergo voicing in the plural:

(34) a. *lea*[f] / *lea*[v]-es  
 b. *hou*[s]e / *hou*[z]-es  
 c. *mou*[θ] / *mou*[ð]-s

<sup>5</sup>I do not show the *-um-* allomorph surviving infixation of the nominalizer because infixation of *-um-* followed by infixation of *-in-* actually results in the surface-disappearance of *-um-*; this can be explained by completely predictable phonological/phonotactic repairs within the language, but would take us too far afield here. See Kalin In press:13-14.

– This voicing doesn't happen when there is an intervener, (35b):

- (35) a. leaf + PL → lea[v]-es  
 b. leaf + -let + PL → lea[f]-**let**-s (\*leav-let-s)

- (See Embick and Shwayder 2018 for a discussion of locality and how it might be somewhat different for different types of morphophonological processes.)

⇒ *What happens when the intervener is an infix?*

**Hunzib (again)** (Northeast Caucasian; van den Berg 1995, Kalin 2021)

- The infix: Verbal plural infix -á-; placement: before the final consonant (see §2.2)
- The (non-)interrupted relationship: Morphophonological conditioning of suffix vowel

– Some of the derivational suffixes of §2.2 have two distinct (non-suppletive) shapes:

◇ **causative**; highly productive/predictable (B:107)

- -k' / stem ending in vowel
- -k'e / stem ending in consonant

- (36) a. haldu (white) + CAUS → haldu-k' ('make white')  
 b. uλ' (end) + CAUS → uλ'-k'e ('make end')

◇ **verbalizer**; uproductive, unpredictable meaning (B:108)

- -l / stem ending in vowel
- -le / stem ending in consonant

- (37) a. haldu (white) + VBZ → haldu-l ('be white')  
 b. ek (fall) + VBZ → ek-le ('let fall, drop')

– This is morphophonology, not surface phonology:

- ◇ There are non-alternating CV suffixes.
- ◇ There are C suffixes that have the shape VC in certain phonotactic configurations.
- ◇ The quality of the epenthetic vowel varies by affix (though is most commonly *e*).
- ◇ The choice to add (or not add) *e* is made based on the nature of the preceding segment, oblivious to the shape of other (less embedded) affixes.

→ Morphophonologically-conditioned epenthesis **survives infixation**, (39):

- (38) a. haldu (white) + -k'(e) (CAUS) + **-á-** (VPL) → hald<**á**>-k'  
 b. haldu (white) + -l(e) (VBLZ) + **-á-** (VPL) → hald<**á**>-l
- (39) a. ix (warm) + -k'(e) (CAUS) + **-á-** (VPL) → ix<**á**>-k'e (\*ix<**á**>-k')  
 b. ix (warm) + -l(e) (VBLZ) + **-á-** (VPL) → ix<**á**>-le (\*ix<**á**>-l)

**Movima (again)** (language isolate of Bolivia; Haude 2006)

- The infix: Irrealis infix  $-(k)a'$ -; placement: after first iambic foot (see §2.1)
- The (non-)interrupted relationship: Morphophonological reduplication process
  - In nominal compounds derived from a verb root, the verb root is reduplicated (H:§5.2.2):

- (40) a. sam (twist) + di (long.thin) → sam-sam-di ('rope')
- b. dan (chew) + so (chicha) → dan-dan-so ('chicha made of chewed maize')

→ Reduplication **survives infixation**, (41):

- (41)  $-(k)a'$ - (IRR) + sam-sam-di ('rope') → sam-<**a'**>sam-di

⇒ ***Infixes do not disrupt morphophonology in their stems.***

- One other case in the sample: monosyllabic lengthening in Yurok (Algic) can survive the intrusion of an infix (Blevins 2014)
- Core implication: Morphophonology in the stem of infixation *precedes* infixation.

## 2.5 Surface phonology is lost under infixation

**Baseline** Surface phonology takes place under strictly local conditions

- E.g., in English, *l* and *n* assimilate to a following dental ( $\theta$ ,  $\delta$ ), (42a)/(43a)
- When something interferes between *l/n* and the dental, assimilation is blocked, (42b)/(43b)

- (42) a. u[n̩]-**thinkable**
- b. u[n]-re**thinkable**

- (43) a. mi[l̩] **theater**
- b. mi[l]er **theater**

⇒ ***What happens when the intervener is an infix?***

**Movima (again)** (language isolate of Bolivia; Haude 2006)

- The infix: Irrealis infix  $-(k)a'$ -; placement: after first iambic foot (see §2.1)
- The (non-)interrupted relationship: Allophonic nasal assimilation
  - The phoneme *n* always assimilates to a following consonant with respect to place (H:34)
  - An environment where we can see this assimilation:

- ◇ Nominal bases ending in a certain set of syllables (e.g., *wa, ra, di, ti*) take a “linking nasal” (underlyingly *n*) when followed by another morpheme (H:58-59):

- (44) a. maropa-[n]-di (papaya-LINK-grain) ‘papaya seed’  
 b. lora-[ŋ]-kwa (leaf-LINK-ABS) ‘leaf’  
 c. ariwa-[m]-mah (top-LINK-VLC) ‘to be on top’

→ When the irrealis infix intervenes between the nasal and a consonant it normally assimilates to, assimilation **is bled by infixation**, and underlying *n* surfaces instead.

- (45) **-(k)a’-** (IRR) (H:81)  
 + kweya-[m]-poy (woman-LINK-animal, ‘female animal’)  
 → kweya-[n]<a’>-poy ‘there is no female animal’

**Hunzib (again)** (Northeast Caucasian; van den Berg 1995)

- The infix: Verbal plural infix *-á-*; placement: before the final consonant (see §2.2)
- The (non-)interrupted relationship: Vowel harmony
  - Recall the causative and verbalizer suffixes from §2.2 and §2.4:
    - ◇ Causative *-k’(e)*
    - ◇ Verbalizer *-l(e)*
  - The quality of the final vowel (B:75):
    - ◇ Usually *e*, (46a)/(47a)
    - ◇ Harmonizes to *ə* when after a central non-low vowel (*i, ə*), (46b)/(47b)
    - ◇ Consistent with a language-wide generalization, that *e* never follows a central non-low vowel

- (46) a. uλ’ (end) + -k’(e) (CAUS) → uλ’-k’[e] (‘make end’)  
 b. ix (warm) + -k’(e) (CAUS) → ix-k’[ə] (‘warm up’)

- (47) a. ek (fall) + -l(e) (VBLZ) → ek-l[e] (‘let fall, drop’)  
 b. ix (warm) + -l(e) (VBLZ) → ix-l[ə] (‘warm oneself’)

→ When the irrealis infix intervenes between the harmonizing suffix and the root vowel, vowel harmony **is bled by infixation**, and underlying *e* surfaces instead, (48).

- (48) a. ix (warm) + -k’(e) (CAUS) + **-á-** (VPL) → ix<á>-k’[e] (\*ix<á>-k’[ə])  
 b. ix (warm) + -l(e) (VBLZ) + **-á-** (VPL) → ix<á>-l[e] (\*ix<á>-l[ə])

⇒ *Infixes always disrupt surface phonology in their stems.*

- One other case in the sample: in Turoyo, shortening, feature-spreading, and vowel-lowering are all bled by infixation (Kalin 2020)
- Many “regular” examples of infixation show that infixation feeds/bleeds surface phonology in its stem in general (Kalin To Appear)
- Core implication: Surface phonology applies only over a larger domain, and so does *not* take place in the stem of infixation, before infixation.

## 2.6 Interim summary

### Core findings:

- Morphophonological, allomorphic, morphosyntactic, and semantic relationships/interactions survive infixation. Phonological relationships/interactions do not survive infixation.

### Core implications:

- The relationships that feed or are a part of morphology, syntax, and semantics in the stem of infixation are established *prior to* infixation.
- Phonological relationships/interactions apply in the stem of infixation only *after* infixation.

## 3 Implications

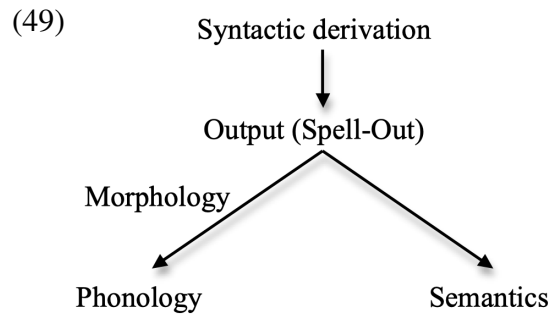
### 3.1 The broadest view

Given that...

- (i) Infixation is an exponent-level property (see Kalin To Appear)
- (ii) Infixes can surface inside of all kinds of constituents built by the (morpho)syntax, e.g.:
  - Compounds (Movima)
  - Stems derived with derivational morphology (many cases)
  - Stems derived with inflectional morphology (Turoyo, Yurok; not covered here)
  - Synthetic constructions that vary with periphrastic ones (Eton; not covered here)
  - Object incorporation structures (Movima)
- (iii) Infixation does not disrupt semantic composition or morphosyntactic relationships (§2.1-2)

Then...

⇒ **Inflection/exponence must be *post-syntactic*** (diagram from Bobaljik 2017):



→ Challenging for pre-syntactic models of morphology (e.g., Wunderlich 1996, Müller 2021) and non-syntactic models of morphology (e.g., Paradigm Function Morphology)

### 3.2 The nature of exponence

Where we are: Inflection is a part of exponence, and is on the branch to Phonology... (see (49))

⇒ *But how does exponence itself proceed?*

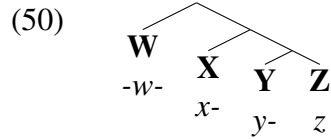
#### Theories of exponence:

- Bottom-up exponence: Exponence starts from the most embedded component of a morphosyntactic structure (usually the root) and proceeds upward
  - Some varieties of DM, e.g. Bobaljik 2000, Embick 2010, Myler 2017
  - Other realizational, syntax-first theories, like that of Starke 2009, Bruening 2017
  - (Note that while theories like Paradigm Function Morphology typically involve inside-out exponence, they deny that there is morphosyntactic structure inside words)
- Simultaneous exponence: Within a particular domain, exponence is simultaneous, realizing all morphemes/features in the domain at the same time
  - Popular within a number of OT-based models (e.g., Prince and Smolensky 1993, Mester 1994, Mascaró 1996) and other constraint-based models (e.g., Bonami and Crysman 2016, Crysman and Bonami 2016)
  - And argued for in some varieties/offshoots of DM: Svenonius 2012, Rolle 2018
- Hybrid model: Bottom-up insertion is possible (perhaps even default), but so is simultaneous or top-down/outside-in insertion
  - E.g., Carstairs 1990, Wolf 2008, and Deal and Wolf 2017

### Infixation in a bottom-up exponence model

Take a structure like that in (50), where W is a morpheme that will be expounded by an infix -w-.

- Let's assume that -w-, when it infixes, can incidentally surface between x- and y-.



- Order of exponence (see Bobaljik 2000, Myler 2017):

- |            |        |
|------------|--------|
| 1. Z ↔ z   | z      |
| 2. Y ↔ y-  | yz     |
| 3. X ↔ x-  | xyz    |
| 4. W ↔ -w- | x<w>yz |

⇒ Predictions:

- Infixation of -w- will not interfere with exponence of X, Y, or Z, because they are all expounded before W is.
- There is the possibility for z, y-, and x- to interact (morpho)phonologically, because they are adjacent at some derivational stage / level of representation.

→ Crucially, these are the right predictions, as shown in §2.3 and §2.4.

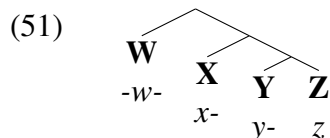
### Infixation in a simultaneous exponence model

Under a simultaneous model, there are two possible ways to incorporate infixation, in terms of timing with respect to exponent choice:

- Infixation of an infixal exponent could be *simultaneous with* exponence (model A below)
- Infixation of an infixal exponent could be *after* exponence (model B below)

#### A. Infixation could happen alongside simultaneous exponence.

- The schematic structure again (W expounded by -w-, which can surface between x- and y-):



- Simultaneous operations/processes (all happening at the same time):
  - W, X, Y, Z are expounded as -w-, x-, y-, z
  - -w- is infixal, deriving x<w>yz



- What this would mean: There is no point at which exponents are ordered in any other way than their surface order,  $x < w > yz$ .

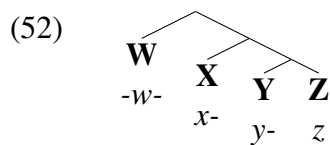
⇒ Predictions:

- $x$ - and  $y$ - should not interact (morpho)phonologically in any capacity
- Suppletive allomorphy arising between  $X/x$ - and  $Y/y$ - should be disrupted by the infix

→ Both predictions are falsified by the present data (§2.3, §2.4).

### B. Infixation could happen after simultaneous exponence.

- The schematic structure again (W expounded by  $-w-$ , which can surface between  $x$ - and  $y$ -):



- Sequence of operations:

1. W, X, Y, Z are expounded as  $-w-$ ,  $x$ -,  $y$ -,  $z$  all at the same time, deriving  $wxyz$
2.  $-w-$  is infixated, deriving  $x < w > yz$

- What this would mean: There is a point at which exponents are inserted and ordered in their *underlying order*,  $wxyz$ , prior to the intrusion of the infix.

⇒ Predictions:

- Some desirable payoff...
    - ◇ Infixation *won't* disrupt suppletive allomorphy (§2.3)
    - ◇  $x$ - and  $y$ - *can* interact (morpho)phonologically (§2.4)
  - BUT, to achieve the above payoff, it must be that at least some (morpho)phonology can apply to the  $wxyz$  sequence prior to infixation of  $-w-$ ...
    - ◇ So  $-w-$  should be able to undergo (morpho)phonological changes (or trigger them) from its pre-infixation position.
- **Not attested** (see, e.g., Yu 2007, Kalin To Appear)

The only model that accommodates findings about infixation is bottom-up exponence.

### 3.3 On the interaction of morphology and phonology

Where we've arrived:

- (i) Exponence/infixation are post-syntactic
- (ii) Exponence proceeds from the bottom up

- (iii) Some phonological interactions among morphemes (morphophonology) happen along the way, interspersed with exponence

The final piece:

- Surface phonology does *not* survive infixation (§2.5)
  - (iv) Some phonological interactions are late, applying only over larger domains (not interspersed with exponent choice)
- ⇒ In line with models that posit a distinction between the timing of types of phonological processes, with some applying cyclically/early and others not (e.g., Kiparsky 1982, Booij and Rubach 1987, Stump 2001, Bermudez-Otero 2012, Inkelas 2014)

### Putting it all together

**Case study:** Prosodically-conditioned exponent choice in Nancowry

- Recall the pattern (§2.3): There is prosodically-conditioned suppletive allomorphy of the causative, (53), that is not disrupted by the nominalizer infix, (54).

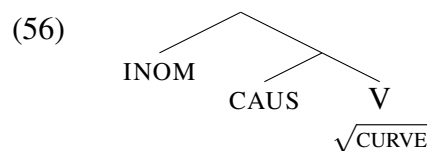
- (53) a. CAUS ↔ ha- / monosyllabic stems  
 b. CAUS ↔ -um- / disyllabic stems (elsewhere) (placement: after first V)

- (54) a. **-in-** (INOM) + ha-luan (CAUS-smooth) → h-<**in**>luan (‘thing used to smoothen’)

- Note that the nominalizer itself has two suppletive allomorphs (Kalin In press):

- (55) a. INOM ↔ -an- / monosyllabic stems (placement: after first C)  
 b. INOM ↔ **-in-** / disyllabic stems (elsewhere) (placement: after first V)

### Step 1: Building the morphosyntactic structure



### Step 2: Cyclic operations

#### (57) Cycle 1

- a. Exponence:  $\sqrt{\text{CURVE}} \leftrightarrow \text{kuāt}$  kuāt  
 b. Cyclic (morpho)phonology: prosodification<sup>6</sup> [<sub>σ</sub> kuāt ]

<sup>6</sup>Evidence for cyclic (re-)prosodification comes from prosodically-conditioned suppletive allomorphy (like that found in Nancowry), as well as prosodically-placed infixes (like in Movima), cyclic stress placement, etc. There is no other relevant cyclic (morpho)phonology in this example apart from prosodification.

(58) **Cycle 2**

- a. Exponence: CAUS ↔ *ha-* / \_\_ [ σ ] ha-[<sub>σ</sub> kuāt ]
- b. Cyclic (morpho)phonology: prosodification [<sub>σ</sub> ha ] [<sub>σ</sub> kuāt ]

(59) **Cycle 3**

- a. Exponence (incl. infixation<sup>7</sup>): INOM ↔ *-in-* / elsewhere [<sub>σ</sub> ha ]<in>[<sub>σ</sub> kuāt ]
- b. Cyclic (morpho)phonology: prosodification [<sub>σ</sub> ha<in> ] [<sub>σ</sub> kuāt ]

**Step 3: Surface phonology**

- (60) Vowel hiatus resolution: [<sub>σ</sub> hin ] [<sub>σ</sub> kuāt ]

⇒ *Suppletive allomorphy survives infixation. This is the desired result.*

## 4 Conclusion

In this talk, I have reported novel typological findings related to the transparency (or not) of infixes when they appear (incidentally) at a morpheme juncture in their stem.

- The relationships/interactions that *survive* infixation must be established prior to infixation (or stem from such relationships/interactions).
- The relationships/interactions that *do not survive* must be established after infixation.

I have argued that the findings provide evidence for the following:

- (i) **the post-syntactic nature of morphology** (à la Halle and Marantz 1993, 1994)
- and (ii) **bottom-up exponent choice** (Bobaljik 2000, Embick 2010, Myler 2017, *i.a.*)
- that is (iii) **interleaved with (morpho)phonological processes**, but (iv) **not interleaved with surface phonology** (Kiparsky 1982, Booij and Rubach 1987, Stump 2001, Bermudez-Otero 2012, Inkelas 2014, *i.a.*)

⇒ **Of these, I take bottom-up exponence to be the central, most robust finding**

- There is converging evidence for bottom-up exponence from a variety of domains:
  - Phonologically-conditioned suppletive allomorphy is inwardly-sensitive (Carstairs 1987, 1990, Dolbey 1997, Paster 2006, Embick 2010, though cf. Anderson 2008, Svenonius 2012, Deal and Wolf 2017,<sup>8</sup> Rolle and Bickmore 2020)
  - Infixation is only inward-looking/inward-displacing (Kalin To Appear)
  - Replacive grammatical tone can only be imposed inwardly (Rolle 2018)

<sup>7</sup>See Kalin To Appear, Kalin and Rolle To appear for evidence for teasing apart infixation and exponent choice, which is not shown here.

<sup>8</sup>But, see Kiparsky to appear for a reply.

- Non-local phonological interactions are possible among certain morphemes in Mirror-Principle violating structures (Myler 2017)
- For future research: Given this converging evidence, and so assuming exponence indeed proceeds from the bottom up... how do we account for apparent exceptions?
  - Can insertion sometimes be top-down or simultaneous? (see, e.g., Deal and Wolf 2017)
  - Or is something else going on in these cases?
    - ◇ See Kalin 2020 for a morphosyntactic solution to an apparent exception in Turoyo
    - ◇ See Kiparsky to appear for a phonological solution to an apparent exception in Nez Perce

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