Verb Root Shape in Yokuts: a Consequence of Morphological and Prosodic Structure

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Question

What are the consequences of **syntactic structure** in the word for **phonological processes** in the word?
Proposal

**Syntactic material** spelled out at the vP phase is sent to the phonology before other material $\rightarrow$ spelled-out material forms a **phonological constituent** (the stem)

**Novel Claim:** Prior spellout of vP material can result in **templatic** effects in the stem due to **minimality**

**General Implication:** possible cross-linguistic homology between boundaries in syntax (phases) and boundaries in phonology (stem and word edges)
I focus on a process of verbal morphophonology in a single language, **Chukchansi**, a member of the **Yokuts** language family.

- **Introduction**: the Phenomenon and the Proposal
- **Morphosyntactic Structure**: Phases
- **Phonological Effects**: Minimality

All data collected by the researcher and colleagues at California State University, Fresno
Root Shape Change in Chukchansi Yokuts

Phenomenon: **root shape change** in Chukchansi

Verb roots change shape when certain suffixes attach

<table>
<thead>
<tr>
<th>Root</th>
<th>No Shape Change</th>
<th>Shape Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ʃawg/ ‘buy’</td>
<td>[ʃaw.g-eʔ] ‘will buy’</td>
<td>[ʃa.wa:.g-ɪʔ] ‘buyer-NOM’</td>
</tr>
<tr>
<td>/k’a:mn/ ‘dry’</td>
<td>[k’a:.min.-hil] ‘dried’</td>
<td>[k’a.man.-ʔa-n’] ‘is drying’</td>
</tr>
<tr>
<td>/lihm/ ‘run’</td>
<td>[lih.m-im.x-it] ‘just ran with X’</td>
<td>[le.he:.m-e-t] ‘just made X run’</td>
</tr>
</tbody>
</table>
Main Questions

This phenomenon spurs two related questions:

1) What motivates these roots to change their shape?
2) What determines which suffixes correlate with root shape change?
I propose principled answers grounded in morphosyntactic and prosodic structure

Root shape change is triggered by suffixes that are vP-level phase heads

All root shape change is to the preferred LH iambic foot

- Minimality combined with iambic parsing give one-vowel inputs an LH iamb in the output
Previous Accounts

In previous accounts of similar phenomena in the Yokuts language Yowlumne (e.g., Kenstowicz + Kisseberth 1979, Archangeli 1983, 1991, Zoll 1993, inter alia):

◦ Verb roots choose from set of prosodic templates
◦ Some suffixes impose a template chosen from this set upon roots

No *principled* means to determine

1. the set of template-imposing suffixes, or
2. which template is chosen by which suffix
Theoretical Underpinnings

Syntax builds up structure and sends it to the interfaces (PF and LF) cyclically at phases (e.g., Uriagereka 1999, Chomsky 2001a,b)

Words are built in the syntax (morphemes = bundles of syntactic features); Lexical Insertion spells out phonological exponents of these morphemes (Distributed Morphology, e.g., Halle and Marantz 1993, Marantz 2001)

Prosodic structure demands that each phonological output is a Minimal Word, which must contain a stress Foot (Selkirk 1984, Nespor and Vogel 1986)
Verbal Morphology

Chukchansi verb morphology: root, obligatory final suffix, and optional non-final suffixes in between

Subset of non-final suffixes trigger root shape change
- Trigger suffixes are always closer to the root than non-triggers

Verb Structure: $\text{ROOT-}(\text{SFX}_{\text{Trigger}})-\text{(SFX}_{\text{Non-Trigger}})-\text{SFX}_{\text{Final}}$
- [lihm-it] [lehe:m-e-t] [lehe:m-e-wʃ-it]
- run-REC run-CAUS-REC run-CAUS-RFLX-REC
- ‘just ran’ ‘just made X run’ ‘just made oneself run’
Final and non-final suffixes encode different syntactic categories

- Final suffixes: tense, mood, non-finite subordination (gerunds)
- Non-final suffixes: voice, aspect, derivation

Final suffixes are **syntactically higher** (in Infl) than non-final suffixes (in vP domain between Infl and verb root)
Triggers vs. Non-Triggers

Trigger and non-trigger suffixes encode similar categories (voice, aspect, nominalization)

Proposal: these suffixes are in fact syntactically different

<table>
<thead>
<tr>
<th></th>
<th>Trigger Suffixes</th>
<th>Non-Trigger Suffixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice</td>
<td>Causative</td>
<td>Unaccusative, Passive, Reflexive, Benefactive, Comitative</td>
</tr>
<tr>
<td>Aspect</td>
<td>Inchoative, Durative, Distributive</td>
<td>Imperfective, Processive (‘go X-ing’)</td>
</tr>
<tr>
<td>Nominalization</td>
<td>Agent, Adjunct (Instrument or Location)</td>
<td>Object, Activity</td>
</tr>
</tbody>
</table>
**Generalization:** Voice and nominalization triggers have an active/causative element, which non-triggers lack

**Proposal:** This element is the phase head $v_{\text{CAUSE}}$ (= transitive $v^*$ in Chomsky 2001a,b)

- $v_{\text{CAUSE}}$ is only strong phase head in this position; other $v$ heads (unaccusative, passive, reflexive, applicatives) are not phase heads (Chomsky 2001a,b; cf. Legate 2003)

As phase head, $v_{\text{CAUSE}}$ sends complement (VP) to interfaces, PF and LF (Chomsky 2001a,b)
### Phase Head $v_{\text{CAUSE}}$

$v_{\text{CAUSE}}$ adds **external argument** and assigns **Accusative Case** to object

$v_{\text{CAUSE}}$ is present in unergatives (one argument), transitives (two arguments) and causatives (three arguments)

<table>
<thead>
<tr>
<th></th>
<th>bewn-e?</th>
<th>na?</th>
<th>“I will sew”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unergative:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sew-FUT</td>
<td></td>
<td>I.NOM</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>bewn-e?</th>
<th>na?</th>
<th>kami:sa-ʔan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitive:</td>
<td></td>
<td></td>
<td>“I will sew a shirt”</td>
</tr>
<tr>
<td>sew-FUT</td>
<td></td>
<td>I.NOM</td>
<td>shirt-ACC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>bewe:n-e-n’</th>
<th>ma?</th>
<th>nan</th>
<th>kami:sa-ʔan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causative:</td>
<td></td>
<td></td>
<td></td>
<td>“You will make me sew a shirt”</td>
</tr>
<tr>
<td>sew-CAUS-FUT</td>
<td>you.NOM</td>
<td>I.ACC</td>
<td>shirt-ACC</td>
<td></td>
</tr>
</tbody>
</table>

Causatives have **two** $v_{\text{CAUSE}}$s $\rightarrow$ **two external arguments, two Accusative Cases**
$v_{\text{CAUSE}}$ in Different Morphemes

Difference between unergatives/transitives and causatives: morphological spellout of $v_{\text{CAUSE}}$ heads

**Unergatives/transitives:** $v_{\text{CAUSE}}$ spelled out with root
  ○ Root head-moves from V to $v_{\text{CAUSE}}$ → not in complement of $v_{\text{CAUSE}}$
  ○ Phonological “root” is exponent of both lexical root and $v_{\text{CAUSE}}$

**Causatives:** additional, higher $v_{\text{CAUSE}}$ spelled out by separate causative morpheme
  ○ Lexical root moved to lower $v_{\text{CAUSE}}$ lies within higher $v_{\text{CAUSE}}$’s complement → root + lower $v_{\text{CAUSE}}$ sent to interfaces
Transitive: Root not Sent to PF

bewn-e? na? kami:sa-ʔan
sew-FUT I.NOM shirt-ACC
“I will sew a shirt”
Causative: Root Sent to PF

bewe:n-e-n’ ma?
sew-CAUS-FUT you.NOM
nan kami:sa-ʔan
I.ACC shirt-ACC

“You will make me sew a shirt”
Voices and Nominalizers

Other little v heads (unaccusative, passive, reflexive, applicatives) → not phase heads (no external argument added or Accusative Case assigned) → root not sent to PF

**Claim:** Nominalizers in Chukchansi spell out both little v and a category-changing n head

Agentive (actor) and adjunctive (instrument or location actor uses) nominalizers include $v_{\text{CAUSE}}$ → send root in complement to PF

Other nominalizers (activity or object nominals) → other little v heads (not phase heads) → root not sent to PF
Some aspect suffixes are triggers, some non-triggers

- Triggers: inchoative, durative, distributive
- Non-triggers: imperfective, processive ‘go X-ing’

**Claim:** trigger aspect suffixes $\rightarrow$ vP-internal Situation Aspect; non-trigger aspect suffixes $\rightarrow$ vP-external Viewpoint Aspect (see, e.g., Smith 1991, Travis 2000)

Situation Aspect remains visible to interact with higher Viewpoint and Tense heads $\rightarrow$ phase head (sends root to PF)

Viewpoint Aspect outside vP (in Infl domain) $\rightarrow$ not phase head
Consequences of Spellout

Syntactic material sent to PF $\rightarrow$ Lexical Insertion spells out **morphophonological exponents** (Distributed Morphology)

- These exponents are then manipulated by the phonology

**Proposal:** if some syntactic material (A) is sent to PF before other material (B), its morphophonological exponents (a) also enter the phonology before the latter’s (b)

- Syntax: $A \rightarrow B \rightarrow$ Phonology: $a \rightarrow b$
Roots spelled out at **vP phase** go through phonology first

Suffixes and roots spelled out at **CP phase** go through phonology afterwards

Verbs *cyclically spelled out*, e.g., Chomsky and Halle (1968), Kiparsky (1982), with cycles = **syntactic phases**

\[
[[\text{Cycle 1}]_{\text{vP}} \text{Cycle 2}]_{\text{CP}}
\]
Proposal: Root shape change is a phonological effect of cyclic spellout due to **prosodic parsing** and **minimality**

Chukchansi has **left-to-right iambic** parsing

- Shown by stress, vowel epenthesis, and root inventory

**Stress:** words ideally have initial H or LH Feet

- /aleːʤa-n/‘is crazy’→ [(ʔa.lectual).ʤan’]
- /adeʃt-eʔ/‘will bring for X’→ [(ʔa.dej).teʔ]
- /k’a:bo-taʔ/‘had caught’→ [(k’á:).bo.taʔ]
- /aleːʤa-la-wʃ-it/‘just made oneself crazy’→ [(ʔa.lectual).(ʤa.law).jit]
Vowel epenthesis: repair of consonant clusters results in initial LH foot (optimal iamb, e.g., Prince 1991, Kager 1993)

\[ /\text{lihm}-\text{taʔ/} \text{ ‘had run’ } \rightarrow [(\text{li.hím}).\text{taʔ}], *[\text{(líh)}.\text{mi.taʔ}] \]

Root shape inventory: Vast majority of verb roots either shapeless, or easily parsed into H or LH (iambic) sequences

\[ \text{Very few roots in lexicon that would be parsed into LL sequences} \text{ (bad iambs, e.g., Kager 1993, Hayes 1995)} \]
Root Shape Change: LH Iambs

Claim: all root shape change results in an LH iamb

- /tʃiʃ-la-taʔ/ ‘had made X cut’ → [(tʃi.ʃa:)la.taʔ]
- /ma:x-tʃ’-i/ ‘collector-ACC’ → [(ma.xa:)tʃ’i]
- /gays-a-n’/ ‘gets better’ → [(ga.ye:)san’]
- /be:wn-e-t/ ‘just made X sew’ → [(be.we:)net]

Other root shape changes are “rare,” “not productive” (Newman 1944), severely morphologically restricted, or due to independent phonotactic reasons
Phases and Minimality

All lexical words minimally contain one stress foot (Selkirk 1984, Nespor and Vogel 1986)

**Claim:** requirement enforced throughout derivation, resulting in a *minimality* effect for sufficiently small inputs

Root (bundle of syntactic features) sent to PF at vP phase → Root (phonological exponent) enters phonology first (see e.g., Marvin (2002), Newell (2008))

Output root by itself (Cycle 1) must contain a *stress foot*
Epenthesis and LH Iambs

Input has one vowel → second vowel epenthesized to form LH iamb

Claim: LH iamb more well-formed than H iamb → material added to create LH (see Prince 1991, Kager 1993 for LH as optimal iamb)

This is captured by the ranking FootForm >> Dep-V

Parse-σ requires the output to contain a foot

<table>
<thead>
<tr>
<th>/L/</th>
<th>Parse-σ</th>
<th>FootForm</th>
<th>Dep-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ (L'H)</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>('H), (L'L)</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
H Roots and LH Iambs

H inputs also receive an LH iamb:

◦ /ma:x-/ → [(ma.xa:)-]; /be:wn-/ → [(be.wen:).n-]

Claim: this derivation is only epenthesis of a mora, not alteration of input mora associations

Pressure to create an LH foot (FootForm) outweighs Dep-µ

<table>
<thead>
<tr>
<th>/H_\mu\mu/</th>
<th>FootForm</th>
<th>Dep-\mu</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ (L_\mu \ˈ H_\mu\mu)</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>(ˈH_\mu\mu) L_\mu</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>(ˈH_\mu\mu), (L_\mu ˈ L_\mu)</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
Larger Roots: No LH Iamb

Larger inputs do not disturb input mora association to please FootForm

- HL input (either root or word) \( \rightarrow \) HL output (not *LH)

High-ranked Max-\( \mu \) and Faith-\( \mu \)Link prevent mora deletion or rearrangement to derive an LH output

**Claim:** H and LH roots \( \rightarrow \) input morae need not associate to vowels; but HL roots \( \rightarrow \) input morae must associate

- Grammar parses roots with 2 or 3 input morae into H and LH outputs, but not into HL outputs
Larger Roots: No LH Iamb

- HL /be:le-/ → [(be:).le-], *[(be.le:)-]  

<table>
<thead>
<tr>
<th>/H_{\mu\mu}L_{\mu}/</th>
<th>Max-(\mu), Faith-(\mu)Link</th>
<th>FootForm</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\to (ˈH_{\mu\mu})L_{\mu})</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>((L_{\mu}ˈH_{\mu\mu}))</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

- HH /hayk’it-/ → [(hay).k’it-], *[(ha.ya:).k’it-]  

<table>
<thead>
<tr>
<th>/H_{\mu\mu}H_{\mu\mu}/</th>
<th>Max-(\mu), Faith-(\mu)Link</th>
<th>FootForm</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\to (ˈH_{\mu\mu})(H_{\mu\mu}))</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>((L_{\mu}ˈH_{\mu\mu}))</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
Non-Shape Changing Suffixes

Root not spelled out at vP phase → sent to PF with suffixes at **CP phase**
- These include both non-final (vP) and final (Infl) suffixes

Inputs with root and suffix(es) → always enough phonological material to form a Foot without epenthesis
- Roots spelled out at CP phase → **no shape change**
Non-Shape Changing Suffixes

Root + suffix inputs cannot delete, epenthesize, or rearrange material to form LH output

- \( /\text{ʧiʃ}-\text{ta}/\) ‘had cut’ \(\rightarrow [(\text{ʧiʃ}).\text{ta}]\), \*[(\text{ʧi}.\text{a:}).\text{ta}]\)
- \( /\text{maːx}-\text{e}/\) ‘will collect’ \(\rightarrow [(\text{maː}).\text{xe}]\), \*[(\text{ma}.\text{xa:}).\text{e}]\)

Vowel epenthesis to repair consonant clusters can result in an LH iamb, but cannot alter existing moraic structure

- \( /\text{lɪh}-\text{maː}/\) ‘had run’ \(\rightarrow [(\text{li}.\text{him}).\text{ta}]\), \*[(\text{lih}).\text{mi}.\text{ta}]\)
- But, \( /\text{beːw}-\text{n}−\text{hɪl}/\) ‘sewed’ \(\rightarrow [(\text{beː}).\text{win}.\text{hil}]\), \*[(\text{be}.\text{wen}).\text{hil}]\)
LH Iambs: the Complete Story

Preference for **LH iambs** \(\rightarrow\) epenthesis in roots with one input vowel; constraints against changing input structure \(\rightarrow\) no epenthesis in larger roots

This ranking only produces root shape change with sufficiently small inputs = when required by **minimality**
Correct Predictions: Reduplication

Phase-based spellout account of root shape change $\rightarrow$ correct predictions about reduplication and the intransitive suffix

Reduplicated roots $\rightarrow$ no shape change with LH-triggering suffixes

Reduplicated roots have more than one vowel $\rightarrow$ no epenthesis

- Base-Reduplicant faithfulness in fact prevents epenthesis
- $/\text{RED-tfij-}/ \rightarrow [\text{tfij}.\text{tfij-}], *[\text{tfij}.\text{a:.tfij-}], *[\text{tfij}.\text{tfj.}\text{a:-}]$

Expected if root shape change driven by minimality, but not if resulting from suffix template imposition or subcategorization
Correct Predictions: Unaccusative v

Also correctly predicts → any non-phase-head suffix merged below vP-phase head gets spelled out with the root

Unaccusative suffix /-n-/ becomes part of the shape-changed root:
  ◦ /t’ul-n-ʔa-n’/ burn-UNACC-DUR-FUT → [(t’o.lon).ʔan’] ‘is burning’
  ◦ Asp* suffix /-ʔa-/ sends its complement (= root plus unaccusative v) to be spelled out first → LH iamb
  ◦ Identical to “fake base” phenomenon in Newman (1944)

Not expected if trigger suffixes impose templates on adjacent roots
Other predictions need to be checked:

Shape change due to minimality, not template imposition →
multiple vP-phase head suffixes should only trigger one LH iamb

Specific structure of syntactic tree and relative height of suffixes
should reveal semantic or scopal differences

◦ E.g., I posit LH-triggering suffix /-ʔa-/ and non-triggering suffix /-xo-/ to
  be Situation Aspect and Viewpoint Aspect heads, respectively

◦ Should be semantically distinguishable, but currently seem very similar

◦ Distribution possibly due to presence of suffixes in lower head
Future Directions

Integrating account into bigger picture of Chukchansi **phrasal syntax** and **derivational phonology**

- Phrasal syntax is relatively free, but phase effects may be deducible
- Other aspects of phonology refer to similar morphological structure:
  - Long high vowel lowering (Guekguezian 2012)
  - Repairs of unsyllabifiable consonants (Hansson 2005)

Thorough comparison with other Yokuts languages

- Initial look at Newman (1944) $\rightarrow$ same generalizations hold, but more data needed
Conclusions

Principled analysis of root shape change in Chukchansi Yokuts

- Not arbitrarily selected by the morphology
- Result of syntactic structure of words (e.g., Halle and Marantz 1993) and general prosodic constraints (e.g., Prince 1991, Kager 1993)

Phase-based spellout inside the word (e.g., Marantz 2001, Martin 2002, Newell 2008) → one vowel roots surface with LH iamb as minimality effect triggered by vP-phase head suffix

- Prosodic Templates = Phase-Based Spellout + Minimality
Conclusions

Chukchansi Yokuts: example of word-internal **syntactic boundary** perfectly corresponding to **phonological boundary**

This and other work (e.g., Travis 2010) suggest certain syntactic and phonological boundaries coincide in general

**Tentative suggestion:** languages with morphologically complex verbs show homology between **vP phase** in (morpho-)syntax and **templatic verb stem** in (morpho-)phonology

Intriguing correlations between vP phase and templatic verb stem in varied language families (Muskogean, Bantu, Semitic)
Crucial Thanks

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