Verb Root Shape in Yokuts: Evidence for Homologous Cycles in Syntax and Phonology[*]

Peter Ara Guekguezian

University of Southern California

1. Root Shape Change in Chukchansi Yokuts

Root shape change in Yokuts languages (henceforth 'RSC'), first described in Newman (1944), is a process where the underlying shape of verb roots is altered next to certain suffixes in ways that are unpredictable phonologically. When a root attaches to a certain suffix, it surfaces with a shape determined by that suffix that is constant across roots. In this paper, I focus on RSC in the Yokuts language Chukchansi, using data elicited by the researcher and colleagues at California State University, Fresno; the analysis can likely be extended to other Yokuts languages (see Guekguezian in progress).

A brief illustration of RSC in Chukchansi is given in (1). Roots that determine their own distinct shape in general (shown with the non-past suffix /-eʔ/, /-nʼ/) all have the same shape [CVCV:(C)] in the RSC context (shown with the causative suffix /-la-/, /-e-/).

(1) RSC in Chukchansi

Root UR	NON-PAST /-eʔ/, /-nʼ/ (No RSC)	CAUSATIVE /-e-/, /-la-/ (RSC)
/ʧiʃ/	[(ˈʧi.ʃ-eʔ)]	[(ʧi.ˈʃa:)-.la-nʼ]
/ma:x/	[(ˈma:).x-eʔ]	[(ma.ˈxa:)-.la-nʼ]
/lihm/	[(ˈlih).m-eʔ]	[(le.'he:).m-e-nʼ]
/be:wn/[1]	[(ˈbew).n-eʔ]	[(be.'we:).n-e-nʼ]

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[1] Due to the rigid CVX syllable maximum of Yokuts (Newman 1944, Kuroda 1967, Kenstowicz and Kisseberth 1979), a /CV:CC/ root like /be:wn/ never surfaces faithfully. Either the vowel shortens (as in (1)) or an epenthetic vowel appears (if the root is followed by a consonant: /be:wn-hil/ → [(ˈbe:).(ˈw**i**n).hil].

Certain roots never undergo RSC; these roots have the same shape in the general context and attached to RSC-triggering suffixes (2).

(2) Non-RSC Roots

Root UR	NON-PAST /-eʔ/, /-n'/ (No RSC)	CAUSATIVE /-e-/, /-la-/ (No RSC)
/ʧ'edma/	[('ʧ'ed).ma-n']	[('ʧ'ed).('ma-.la-n')]
/hayk'it/	[('hay).('k'i.t-eʔ)]	[('hay).('k'it)-.la-n']

All productive forms of RSC begin in a light-heavy (Lˈ H) Foot (contra Newman (1944) and Collord (1968)); any apparent departures are either unproductive irregularities or due to active phonotactic constraints (Guekguezian to appear; also see Guekguezian 2011). Chukchansi has a left-to-right iambic stress system (Guekguezian to appear), in which (Lˈ H) is the optimal Foot (Hayes 1995), so that RSC results in optimal Chukchansi prosodic structure. RSC only occurs when roots with one underlying vowel attach to RSC-triggering suffixes. I claim that RSC is a phonological consequence of syntactic structure within the word. RSC occurs when the syntactic component sends the verb root to the phonological component in an earlier cycle due to a verb-internal phase head, which spells out its complement (Chomsky 2000, 2001, inter alia). Due to a disyllabic minimality requirement on phonological outputs, when roots with one input vowel go through a phonological cycle by themselves, they must be augmented. The material epenthesized to meet minimality is arranged to reduce prosodic markedness, creating a constant LH iamb. Inputs with more than one vowel, including multi-vowel roots and multi-morphemic inputs, already meet disyllabic minimality, and their underlying material cannot be rearranged to reduce markedness.

The paper is organized as follows. §2 analyzes the syntactic structure of RSC in detail, showing that RSC-triggers are strong phase heads. §3 demonstrates that the syntactic structure of RSC results in two phonological cycles and an inner Prosodic Word (PWd). §4 accounts for the appearance of the constant (Lˈ H) Foot in RSC as the emergence of unmarked prosodic structure driven by minimality. §5 concludes.

2. RSC in the Morphosyntax: Cyclic Spellout

This section examines the syntactic differences between RSC-triggers and non-triggers. I claim that RSC-triggers encode active verbal semantics and are strong phase heads; non-triggers encode other semantics and are not strong phase heads. The presence of a strong phase head in the syntax sends the material in its complement (the root) to the interfaces before higher material. This early spellout of the root results in an early phonological cycle (§3-4), in which RSC occurs.

2.1 Structure of the Yokuts Verb

Verbs in Chukchansi, as all words in every Yokuts language, are entirely suffixing; they show Tense-Aspect-Mood (TAM) marking as well as voice-changing operations. All verbs obligatorily have one word-final suffix, and optionally have other suffixes in-between the root and the word-final suffix. Word-final suffixes indicate tense or mood; there are different suffixes for verbs in matrix and embedded clauses. Only one suffix of this set,

either matrix or embedded tense or mood, can ever appear on a given verb, i.e., they are in complementary distribution. Non-final suffixes on verbs indicate voice, aspect, and mood; these suffixes can combine without limit, though generally verbs with multiple non-final suffixes are rare. Non-final suffixes occur in a relatively fixed order, though some suffixes can switch places to indicate different scopes (Adisasmito-Smith et al 2015). The unaccusative suffix /-n-/ always occurs closest to the root; voices tend to occur closer to the root than aspect or mood (3-4).

(3) /ale:ʤa-la-wʃ-it/ → [(a.'le:).(ʤa.'law).ʃit]
be.crazy-CAUSATIVE-REFLEXIVE-RECENT.PAST [ROOT-VOICE-VOICE-TENSE]
"just made oneself crazy"

(4) /xat-han-xo-n'/ → [('xat).('han).xon']
eat-PASSIVE-IMPERFECTIVE-NON.PAST [ROOT-VOICE-ASPECT-TENSE]
"is being eaten"

Final suffixes occur in Infl, while non-final suffixes occur between the Infl head and the lexical root, somewhere in the extended verbal domain. This falls in line with the generally accepted content of the two domains: Infl houses tense and mood content, while the extended verbal domain contains specification of argument and event structure, i.e., voice and aspect, respectively. Verbs in Chukchansi thus have the following structure (5), with optional non-final suffixes in the extended verbal domain and obligatory final suffixes in the Infl domain.

(5) $[[\sqrt{\text{ROOT}}\text{-}(\text{NON-FINAL})_{v/\text{Voice/Asp}}]_{v\text{P}}\text{-}\text{FINAL}_{\text{Infl}}]_{\text{InflP}}$

2.2 RSC-Triggers are Active Verbal Phase Heads

I now turn to suffixes that trigger RSC. The following non-final suffixes trigger RSC (6), while other non-final suffixes (as well as all final suffixes) do not trigger RSC (7).

(6) a. Voice: causative
b. Aspect: inchoative, durative, distributive ('X around, a lot')

(7) a. Voice: passive, reflexive, benefactive, comitative, unaccusative
b. Aspect: imperfective, processive ('go while X-ing')
c. Mood: exclusive ('just do X'), desiderative, hortatory ('let X')

At first glance, the property of RSC seems to be (syntactically) arbitrary. Some voice and aspect suffixes are RSC-triggers, while some are non-triggers. I claim that the syntactic commonality that all and only the RSC-triggers share is active verbal semantics; RSC-triggers encode the semantics of agentivity, initiation, or dynamicity. This includes the causative and inchoative suffixes, which add an initiation point, either externally or internally caused, and the durative and distributive suffixes, which modify the dynamic process of the active event. Heads expressing these semantics sit in the same position in the syntactic tree; I propose that these heads are all strong phase heads.

2.2.1 Phasehood in the *v*P

For the purposes of this analysis, I make the following assumptions about the syntactic structure of the extended verbal domain, or the *v*P. First, the *v*P has an articulated structure; while remaining agnostic about the finer details of this domain, I distinguish three types of syntactic heads: Voice, which introduces the external argument in the syntax (e.g., Kratzer 1996, Harley 2013), a higher v_1 head, which specifies properties associated with external arguments, i.e., the agency, initiation, and dynamicity of the event, and a lower v_2 head, which specifies properties associated with internal arguments, i.e., the result of the event or associated state (Ramchand 2008, Travis 2010, Harley 2013). The v_2 head merges with the lexical, category-free root to form the verb stem (e.g., Halle and Marantz 1993). The *v*P has the articulated structure in (8):

(8) $[_{\text{VoiceP}}$ ExtArg Voice $[_{v1\text{P}}\ v_1\ [_{v2\text{P}}$ (IntArg) $v_2\ \sqrt{}]]]$

Second, I claim that the highest active v_1 head has phasal status within the extended verbal domain. This proposal is novel in the sense that it integrates the theory of phase heads with the theory of the articulated *v*P. Nevertheless, it is in the spirit of Chomsky's (2000, 2001) intuition that transitive *v* (but not passive or unaccusative V) is a strong phase head (cf. Legate 2003), as well as Bošković's (to appear) proposal that higher heads in the extended domain of a lexical category (such as V) inherit phasehood. As a phase head, v_1 spells out its complement, v_2P, which is sent to the phonology. Crucial to the analysis below is the failure of a covert v_1 head to spell out its complement in Chukchansi and thereby trigger RSC. Several accounts of this failure are possible; herein, I adopt an approach where the lexical root moves to the v_1 head, while nothing vital rests on adopting this particular approach rather than another.

2.2.2 Phase Heads in Chukchansi Yokuts

This section illustrates the above proposal that all and only overt v_1 heads are strong phase heads in Chukchansi, not Voice or v_2 heads. The causative suffix is a v_1 head that selects for a v_1P complement (Harley 2013); aspectual suffixes (inchoative, distributive, and durative) and the verbal part of active nominalization suffixes (agentive, adjunctive) also occur in v_1, as they modify the causal or dynamic properties of the event (as opposed to the resultative or stative properties of v_2; see Travis 2010). Other verbal suffixes are not v_1 heads; either they occur in Voice, Appl, or v_2 positions, or they are merged above the verbal domain, in Mood or other Infl heads. Moreover, in the absence of an overt v_1 head, there is no early spellout of the v_2P. As shown in §4, early spellout of the v_2P (exponed by the phonological root morph) results in RSC; therefore, only the presence of an overt v_1 head triggers RSC.

I sketch the difference between an RSC derivation and a non-RSC derivation in the syntax using active verbs (non-RSC) and causative verbs (RSC). Most verbs in Chukchansi are active (i.e., unergative or transitive) in the absence of overt voice suffixes. Active verbs have an external argument in the Nominative Case and an internal argument in the Accusative Case, which can optionally be dropped. Following, e.g., Chomsky (1995) and

Kratzer (1996), the v_1 head assigns Accusative Case to the internal argument. (9) illustrates the structure of active verbs, such as [bewneʔ] 'will sew'.

(9) bewn-eʔ na-ʔ (gami:ʃa-ʔan)
sew-NON.PAST I-NOM (shirt-ACC)
"I will sew (a shirt)"

The active head in v_1, which encodes the semantics of a causal, dynamic event, merges with v_2P, the internal constituent of the event encoding the semantics of undergoing and result. The v_1 head then requires a Voice head to merge on top of it and introduce the external argument. This derivation is illustrated by (10).

(10) $[_{\text{VoiceP}}$ ExtArg Voice $[_{v1\text{P}}\ v_1\ [_{v2\text{P}}$ (IntArg$_{\text{ACC}}$) v_2 √]]]

The causative is essentially an additional v_1 head merged above this structure, requiring another Voice head on top of it to introduce the causer. While the active sentence (9) has one external argument [naʔ] and one Accusative Case (on [gami:ʃaʔan]), the causative sentence (11) adds an external argument [maʔ] and another Accusative Case (on [nan]). This suggests that the causative suffix essentially is another v_1 head, assigning Accusative Case to the argument below it (the causee), and requiring a Voice head to merge above it and introduce an external argument (the causer).

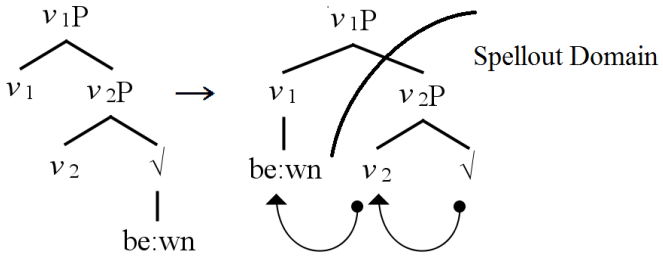
(11) bewe:n-e-n' maʔ na-n (gami:ʃa-ʔan)
sew.RSC-CAUSATIVE-NON.PAST you-NOM I-ACC (shirt-ACC)
"You will make me sew (a shirt)"

The causative has the structure in (12), with another pair of v_1 and Voice heads above the active structure in (10). This derivation follows, e.g., Harley (2013), in which the extra v_1 head (v_0 therein) encodes the causal semantics of the causative.

(12) $[_{\text{VoiceP}}$ Causer Voice $[_{v1\text{P}}\ v_1\ [_{\text{VoiceP}}$ Causee$_{\text{ACC}}$ Voice $[_{v1\text{P}}\ v_1\ [_{v2\text{P}}$ (IntArg$_{\text{ACC}}$) v_2 √]]]]]

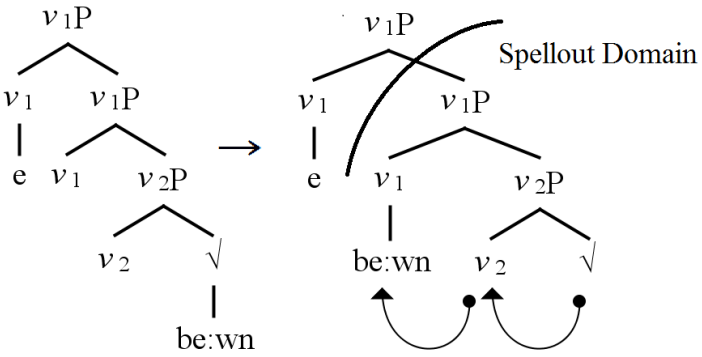
I now illustrate why the syntactic structure in (10) does not trigger early spellout of the verbal stem (so that RSC fails to appear), while the structure in (12) does. Assuming that the covert v_1 head is phasal in (10), it would spell out its complement, v_2P; the absence of any overtly spelled out material at this point would suggest that the material inside the complement has moved up. I suggest this is exactly the case: the root moves through v_2 to v_1, escaping the complement spellout domain. This derivation is illustrated in (13); after all the verbal heads are merged, the lower heads move up to v_1, avoiding early spellout (for ease of exposition, I omit the Voice head and the arguments).

(13) Non-RSC Derivation



When an overt, active v_1 head is merged, it assumes phasehood in the derivation. For example, the higher, overt v_1 head exponed by the causative suffix has phasal status in (12) (see Bošković (to appear) for the highest eligible head in the extended verbal domain inheriting phasehood). I posit that the root cannot move into the higher v_1 position, as it is occupied by the overt suffix. The root therefore stays within the complement of the overt v_1 head, and gets spelled out early. This derivation is illustrated in (14); after all the verbal heads are merged, the root (and lower heads) are spelled out in the phase domain of the higher v_1 head.

(14) RSC Derivation



The aspectual (overt) v_1 heads spell out the root in their complement in a similar fashion ((15); the spellout domain is highlighted).

(15) $[_{v1P}\ v_{1ASP}\ \mathbf{[_{VoiceP}\ Voice\ [_{v1P}\ v_1\ [_{v2P}\ v_2\ \sqrt{}]]]}]$

Any overt non-phase heads (e.g., Voice, Appl, Mood, v_2) merged do not alter the phasal structure in (13), and thus cannot cause the root morph to be inserted early; this is why non-phase heads, such as the passive or benefactive, do not trigger RSC.

3. Homology of Cyclicity and the Syntax-Phonology Interface

In this section, I propose that the difference in cyclic structure in the syntax is paralleled by a difference in cyclic structure in the phonology. Specifically, I assume the principle of Homology of Cyclicity in the syntax and the phonology (16-17):

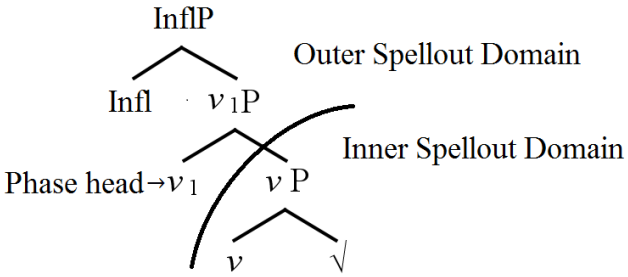
(16) **Homology of Cyclicity:** if some syntactic material (**A**) is spelled out before other syntactic material (**B**), its phonological exponents (**a**) also enter the phonology before the latter's (**b**)

(17) **Syntax: A >> B → Phonology: a >> b**

Phonology does not "wait" for the syntactic derivation to finish before inserting and manipulating phonological material exponing syntactic material (contra Cheng and Downing 2012). If the syntax sends material in separate cycles to the phonology, then the phonology operates on that material in separate cycles as well (see also, e.g., Marvin 2002, Newell 2008). It is important to note that the distinct cycles are not "built-into" the phonology, but are merely a consequence of phonology receiving and then operating on material in discrete chunks. I do not assume that there are different phonological cycles with different grammars; rather, there is just one grammar that applies to all inputs and produces all outputs in Chukchansi. In an OT grammar, therefore, every input, no matter when it runs through the phonology, is subject to the same constraints and constraint rankings. Cyclicity in the phonology is merely an open possibility resulting from cyclic spellout from syntax and Homology of Cyclicity.

A word spelled out in two syntactic cycles will thus be constructed in two phonological cycles. Moreover, the cyclic domains are isomorphic: if heads are in different phasal domains in the syntax, the morphemes exponing these heads will be in different cyclic domains in the phonology. Schematically, RSC verbs have the syntactic structure in, with an inner spellout domain (with the root) and an outer spellout domain (with the v_1 phase head and the Infl head). (18) corresponds to the morphological structure in (19a), with the root in the inner domain and the suffixes in the outer. The resulting phonological structure is in (19b), with the two morphological domains corresponding to a recursive PWd structure (see Selkirk 1995). I demonstrate in §4 that RSC can only result when the root goes through a phonological cycle by itself; the RSC derivation is schematized in (19c).

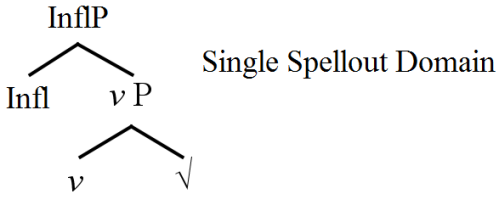
(18) RSC Syntax: Two Spellout Domains



(19) a. [[ROOT√]-TRIGGER$_{v1}$-NON.TRIGGER$_{Infl}$]
b. [[σ σ]$_{PWd}$ ...]$_{PWd}$
c. Cycle 1: /ROOT/ → [RSC]; Cycle 2: [RSC]-/SUFFIXES/ → [[RSC]-SUFFIXES]

A word that only comprises one spellout domain in the syntax (20) only has a single domain in the morphology and phonology (21a-b) and goes through a single phonological cycle (21c).

(20) Non-RSC Syntax: One Spellout Domain



(21) a. [ROOT√-NON.TRIGGER(S)$_{Infl}$]
b. [σ σ]$_{Pwd}$
c. Cycle 1: /ROOT-SUFFIX(ES)/ → [ROOT-SUFFIX(ES)]

A crucial assumption in (19c) is that the input to the second phonological cycle includes the output of the root from the first cycle, [RSC], not the underlying form /ROOT/. If the underlying form were reinserted, then there would be no phonological effects of cyclic syntax; only one phonological cycle would ever be apparent. This is similar but not identical to the principle of Phonological Persistence (Dobler et al. 2011).

4. RSC in the Phonology: Minimality Triggers Prosodic Well-formedness

This section demonstrates that the optimal prosodic structure of RSC is a consequence of phonological cyclicity. When a sufficiently small input goes through a phonological cycle, it gets augmented to meet disyllabic minimality; the added material is arranged to form an unmarked light-heavy (L'H) Foot, satisfying prosodic well-formedness constraints. Only a one-vowel root morph without any affixes attached constitutes a sufficiently small input and undergoes RSC; larger inputs to the phonology, including both multi-vowel roots by themselves and roots with affixal material, do not undergo RSC.

4.1 Cyclic Word Structure and Minimality

Since I have shown that phase-head suffixes send the root morph to go through an early phonological cycle by itself, I now show why this results in root shape change (RSC). I propose that RSC is a minimality effect: when a phonological input is sufficiently small in Chukchansi, it undergoes RSC. More precisely, I posit that Chukchansi enforces a disyllabic minimum on Prosodic Words (PWds), so that a phonological input with only one vowel requires a second, epenthetic vowel to comprise two syllables. Because this vowel is epenthetic, it can be "molded" by the phonology to reduce markedness, an effect of "The Emergence of The Unmarked" (= TETU; Prince and Smolensky 1993/2004, McCarthy and Prince 1994). In the case of RSC, prosodic markedness is reduced to form the optimal (L'H) Foot.

Many languages show evidence for a disyllabic minimality requirement on PWds distinct from merely the requirement that a PWd contain a Foot (cf. Selkirk 1984). Kager (1996) argues that the disyllabicity requirement in languages like Japanese, Turkish, Axininca Campa and Guugu Yimidhirr is distinct from the requirement that PWds contain a Foot, since the above languages allow heavy monosyllabic ('H) Feet. Garrett (1999) also cites several other languages of unrelated families that have disyllabic minimality requirements that are distinct from a requirement that a PWd contain a Foot. The proposal

that minimal Feet are distinct from minimal PWds characterizes Chukchansi, which, like the languages above, allows heavy monosyllabic ('H) Feet but, as I propose, requires disyllabicity on phonological outputs, resulting in (L'H) Feet.[2] I use a cover constraint DISYLL to enforce this requirement.

(22) DISYLL: assign a violation mark for any PWd with fewer than two syllables.

Every input, including roots by themselves, is subject to the same ranking of the same constraints, including DISYLL. Since every output of the phonology must compose a PWd (Selkirk 1984, 1996), an output built up over two separate cycles will comprise two, nested PWds (23). Therefore, DISYLL is active in every phonological cycle, no matter what the input is or what stage in the derivation of the word it takes place. In (23), therefore, both the inner PWd [ABC] and the outer PWd [ABCDEF] must be at least two syllables.

(23) Cycle 1: /ABC/ → $[ABC]_{PWd}$; Cycle 2: $[ABC]_{PWd}$-/DEF/ → $[[ABC]_{PWd}\ DEF]_{PWd}$

4.2 RSC with Short-Vowel Roots

I now show how DISYLL can capture the augmentation of one-vowel roots to the optimal (L'H) Foot in RSC when they go through an early phonological cycle. I start with roots with a short vowel, e.g., /ʧiʃ/ 'cut' and /lihm/ 'run'. When short-vowel roots attach to RSC-triggering suffixes, the result is an initial (L'H) iamb ((24), selected from (1)):

(24) /ʧiʃ-la-n'/ → [(ʧi.'ʃa:).lan']; /lihm-e-n'/ → [(le.'he:).men']

Because the causative suffixes /-la-/ and /-e-/ are phase heads that trigger early spellout of the roots in their complements (§2.2.2), these words are constructed in two parts: first the root, then the suffixes (25a-b).

(25) a. Cycle 1: /ʧiʃ/ → [(ʧi.'ʃa:)]; Cycle 2: [(ʧi.'ʃa:)]-/la-n'/ → [(ʧi.'ʃa:).lan']
b. Cycle 1: /lihm/ → [(le.'he:m)]; Cycle 2: [(le.'he:m)]-/e-n'/ → [(le.'he:).men']

In RSC forms, the epenthetic long vowel gets its quality from the input vowel, whose quality spreads to the second syllable (see Archangeli's (1983, 1991) analysis of similar facts in Yowlumne Yokuts).[3] The only departure from faithfulness when short-vowel roots

[2] In fact, two types of words in Chukchansi can escape the disyllabic minimum and surface as monosyllables: function words and nouns. Function words in Chukchansi do not necessarily form PWds: monosyllabic function words, in fact, do not form separate stress Feet, and seem to be parsed as clitics to surrounding function words (Selkirk 1995). Chukchansi has a handful of CVC nouns, which surface as monosyllabic in the Nominative case. I suggest these nouns escape the disyllabic minimum due to high-ranking constraints enforcing Noun Faithfulness (Smith 2001).

[3] Guekguezian (2012) accounts for the lowering of the input vowel in triconsonantal root RSC forms like [(le.'he:).m-e-t] from /lihm/ as an effect of sonority; stressed vowels prefer to be more sonorous, i.e., lower (de Lacy 2002). Stress-based sonority also accounts for the constant quality [a:] of the epenthetic second vowel in biconsonantal root RSC forms like [(ʧi.'ʃa:)-la-taʔ] from /ʧiʃ/ and [(si.'pa-ʔ).hiy'] from /se:p/: [a] is the most sonorous vowel. The difference between the biconsonantal and triconsonantal forms is in the output domain of root vowel harmony.

undergo RSC is the epenthesis of the long vowel to create the (L'H) Foot, violating DEP-μ twice. I can now demonstrate how the demand for two syllables in the output, driven by DISYLL, causes the epenthesis of these two morae to create the optimal (L'H) Foot. A disyllabic output can have one of four forms: light-light (LL), light-heavy (LH), HL, and HH. The iambic stress system of Chukchansi renders LH the best disyllable (see Guekguezian to appear). The relevant faithfulness constraint is DEP-μ, the only constraint violated by the RSC derivation of LH from short-vowel roots. The markedness constraint forcing violation of DEP-μ, i.e., mora epenthesis, is DISYLL; without epenthesis, a disyllabic output cannot be constructed from a one-vowel input (26).

(26) DISYLL >> DEP-μ: RSC with Short-Vowel Roots

/li$_{\mu}$hm/	DISYLL	DEP-μ
☞ (le$_{\mu}$.'he:$_{\mu\mu}$m)[4]		**
('li$_{\mu}$h$_{\mu}$m)	* W	* L

Epenthesis of only one mora to create an LL disyllable is penalized by FOOT-FORM (which (L'L) Feet violate, since they are inferior iambs (Hayes 1995)) and IAMB (which ('LL) Feet violate). FOOT-FORM and IAMB outrank DEP-μ, favoring the (L'H) Foot, which epenthesizes more morae ((27); see Guekguezian (to appear) for the ranking of FOOT-FORM over IAMB).

(27) FOOT-FORM, IAMB >> DEP-μ: RSC with Short-Vowel Roots

/li$_{\mu}$hm/	FOOT-FORM	IAMB	DEP-μ
☞ (le$_{\mu}$.'he:$_{\mu\mu}$m)			**
('le$_{\mu}$.he$_{\mu}$m)		* W	* L
(le$_{\mu}$.'he$_{\mu}$m)	* W		* L

Biconsonantal short-vowel roots like /ʧiʃ/ undergo the same augmentation to (L'H) under this ranking.

(28) RSC with Biconsonantal Short-Vowel Roots

/ʧi$_{\mu}$ʃ/	DISYLL	FOOT-FORM	IAMB	DEP-μ
☞ (ʧi$_{\mu}$.'ʃa:$_{\mu\mu}$)				**
('ʧi:$_{\mu\mu}$).('ʃa:$_{\mu\mu}$)				*** W
('ʧi$_{\mu}$.ʃa$_{\mu}$)			* W	* L
(ʧi$_{\mu}$.'ʃa$_{\mu}$)		* W		* L
('ʧi$_{\mu}$ʃ$_{\mu}$)	* W			* L

5.3 RSC with Long-Vowel Roots

One-vowel roots whose vowel is long, such as /ma:x/ and /be:wn/, also undergo augmentation to LH ((29), selected from (1)).

[4] Word-final codas are arguably not moraic in Chukchansi, while word-medial codas are.

(29) /ma:x-la-n'/ → [(ma.ˈxa:).lan']; /be:wn-e-n'/ → [(be.'we:).nen']

Again, the (L'H) Foot is constructed when the root morph enters the phonology by itself. However, since H roots can create licit Chukchansi Feet out of their underlying two morae, I also claim that the derivation of the (L'H) Foot is as faithful as possible, so as not to wrongly predict a wider scope of change from H to LH structure in non-RSC contexts. More precisely, only one mora or vowel root is epenthesized in the derivation /be:$_{\mu\mu}$wn/ → [(be$_{\mu}$.'we:$_{\mu\mu}$n)], which requires alteration of the underlying moraic associations, violating FAITH-μ-LINK (Morén 1999).

(30) FAITH-μ-LINK: assign a violation mark to any input/output association between a mora and a vowel with no correspondent in the output/input.

In order to eliminate the ('H)L challenger *[('be:$_{\mu\mu}$).we$_{\mu}$.n], which does not violate FAITH-μ-LINK, the constraint PARSE-σ must dominate FAITH-μ-LINK. To eliminate the ('H)('H) challenger *[('be:$_{\mu\mu}$).('we:$_{\mu\mu}$).n], DEP-μ must also dominate FAITH-μ-LINK. The above ranking of DISYLL, FOOT-FORM, and IAMB over DEP-μ requires in epenthesis of a mora to create an (L'H) Foot instead of an ('H), ('LL) or (L'L) Foot without epenthesis (again, see Guekguezian (to appear) for the ranking of IAMB over PARSE-σ).

(31) RSC with Long-Vowel Roots

/be:$_{\mu\mu}$wn/	DISYLL	FOOT-FORM	IAMB	PARSE-σ	DEP-μ	FAITH-μ-LINK
☞ (be$_{\mu}$.'we:$_{\mu\mu}$n)					*	*
('be:$_{\mu\mu}$).('we:$_{\mu\mu}$n)					** W	L
('be:$_{\mu\mu}$).we$_{\mu}$n				* W	*	L
('be$_{\mu}$.we$_{\mu}$n)			* W		L	*
(be$_{\mu}$.'we$_{\mu}$n)		* W			L	*
('be:$_{\mu\mu}$).wn	* W				L	L

5.4 Failure of RSC: Multi-Vowel and Multi-Morpheme Inputs

Having shown how inputs with one vowel undergo RSC when going through the phonology on their own, this section accounts for why inputs with more than one vowel resist RSC, both multi-vowel roots by themselves ((32) from (2)) and multi-morpheme inputs ((33) from (1)).

(32) /ɣ̃edma-la-n'/ → [('ɣ̃ed).('ma.lan')]; /hayk'it-la-n'/ → [('hay).('k'it).lan']
(33) /ɣ̃iʃ-eʔ/ → [(ˈɣ̃i.ʃeʔ)][5]; /lihm-eʔ/ → [(ˈlih).meʔ]

Multi-vowel roots do not undergo RSC when attached to suffixes that trigger RSC with one-vowel roots, such as the causative /-la-/, /-e-/. Because these roots have (at least) two underlying vowels, their faithful output candidates are disyllabic, and thus do not violate

[5] While Chukchansi prefers to parse words into iambic Feet, an (ˈLL) trochee emerges to avoid an ill-formed final (LˈL) iamb.

DISYLL. The choice been the faithful output and the (L'H) output is therefore left to lower-ranked DEP-μ, which eliminates an RSC candidate whose (L'H) Foot is formed by epenthesizing morae (34).

(34) RSC Challengers: *[(ʧ̚e.'de:).ma], *[('ha.ya:).k'it]

(35) DEP-μ: No RSC with Multi-Vowel Roots

/ʧ̚e_{μ}dma_{μ}/	DISYLL	DEP-μ
☞ ('ʧ̚$e_{\mu}d_{\mu}$).ma_{μ}		*
(ʧ̚e_{μ}.'$de:_{\mu\mu}$).ma_{μ}		** W

As demonstrated in §2 and §3, without an overt v_1 phase head suffix, root morphs are not inserted into the phonological cycle until the next highest phase in the syntactic computation, CP. At this point, all the morphs corresponding to the fully-inflected verb are inserted into the phonology, the suffixes along with the root. The input to this phonological cycle always has more than one vowel, including (at least) the vowel of the root and the vowel of the obligatory final suffix (the Infl head). Because this input contains more than one vowel, its output can meet the minimality requirement of two syllables without epenthesizing morae. In other words, the same ranking that prevents RSC with multi-vowel inputs consisting only of a root also prevent RSC with multi-vowel inputs consisting of more than one morph.

(36) No RSC with Multi-Morpheme Inputs

/li_{μ}hm-e_{μ}ʔ/	DISYLL	DEP-μ
☞ ('$li_{\mu}h_{\mu}$).me_{μ}ʔ		*
(le_{μ}.'$he:_{\mu\mu}$).me_{μ}ʔ		** W

/CVCV:C/ roots like /hewe:t/ appear with an (L'H) Foot in both RSC (37) and non-RSC (38) contexts in Chukchansi.

(37) /hewe:t-e-n'/ 'walk'-CAUS-RC.PT → [(he.'we:).ten']
(38) /hewe:t-eʔ/ 'walk'-N.PST → [(he.'we:).teʔ]

5. Conclusion

This paper has proposed an account of root shape change (RSC) in Chukchansi Yokuts based on the cyclic structure of words. This cyclic structure results from the presence of syntactic domain-delimiting elements, overt v_1 phase heads, in words that undergo RSC. These word-internal phase heads, which send roots to the phonology early, are absent in words that do not undergo RSC. Due to iambic parsing in Chukchansi, in which (L'H) is the optimal Foot (Guekguezian to appear), phonological root morphs that go through an earlier phonological cycle appear with an (L'H) Foot to satisfy disyllabic minimality.

The account outlined above captures the phenomenon of RSC in Chukchansi using both independently-needed linguistic structure (cyclic spellout domains in syntax and prosodic well-formedness and minimality in phonology) and elements active in other parts of

Chukchansi grammar (the morphosyntactic structure of the verb and the optimality of the (L'H) iambic foot). In this analysis of RSC, no special morphological or phonological mechanism is necessary; rather, RSC emerges from general, independently necessary properties of Chukchansi syntax and phonology. On the contrary, in previous analyses of RSC in Yokuts languages (e.g., Archangeli 1983, 1991, Zoll 1993), as well as those of Newman (1944) and Collord (1968), RSC is a separate and rather arbitrary morphological process; the set of suffixes that trigger RSC, as well as the particular shape change triggered by each suffix, is determined on an arbitrary basis. I argue instead that RSC does not form a separate sub-system within Chukchansi, but is tightly integrated into the general syntactic, morphological, and phonological structure of the language. RSC is a principled part of Chukchansi, and likely of all Yokuts languages, and arises rather naturally out of the structural "genius" (Sapir 1921) of the language.

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Peter Ara Guekguezian
guekguez@usc.edu