A RECONSIDERATION OF YOKUTS VOWELS[1]

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One aspect of the Yokuts vowel system which has played a prominent role in the development of phonological theory is the claimed disparity between underlying and surface vowels. A widely held view is that the quality contrast between two long vowels, *o:* and *u:*, is neutralized on the surface, due to a context-free rule of long vowel lowering. In this study, I return to primary data from Yokuts showing that paradigmatic relationships between verbs show maintenance of the *o:* vs. *u:* contrast and that there are instances of surface long high vowels in native and nonnative words. Some implications of these findings for phonological models are discussed. In a number of cases, these reiterate points made by Hockett (1967; 1973) which were largely ignored by early proponents of generative approaches.

[KEYWORDS: Yokuts, Yawelmani, phonology, vowels]

1. Introduction. At least three major publications in generative phonology describe the Yawelmani dialect of Yokuts as one in which an underlying contrast between /u:/ and /o:/ is neutralized on the surface as a consequence of a general phonological rule of long vowel lowering. The first analysis of this sort appears in Kuroda (1967), published a year before *The Sound Pattern of English* but strongly influenced by it. An updated version of the analysis, incorporating the syllable, appears in chapter 4 of Kenstowicz and Kisseberth's (1979) textbook *Generative Phonology.* Archangeli's (1988) *Underspecification in Yawelmani Phonology and Morphology* integrates autosegmental representations, templatic morphology, and underspecification into earlier generative accounts. The same neutralization is assumed in subsequent Optimality treatments (e.g., Archangeli and Suzuki 1997 and McCarthy 1999).

This study returns to primary data from Yokuts languages that show that paradigmatic relationships between verbs maintain the *o:* vs. *u:* contrast in most contexts, and that there are instances of surface long high vowels in native and nonnative words. These facts have implications, discussed below, for general issues concerning the abstractness of phonological representations (Kisseberth 1969) and the characterization of productive vs. nonproductive alternations. Hockett (1967; 1973) raises similar points. My purpose

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here is to update his general line of investigation and reasoning in response to subsequent work in generative phonology and Optimality Theory which has not appreciated the force of Hockett's remarks.

The Yokuts languages once covered the San Joaquin Valley and adjacent foothills in central California. A recent classification of these languages, from Whistler and Golla (1986), is given in (1), with subgrouping at the lowest levels for Valley Yokuts omitted.[2]

(1) The Yokuts languages (language name in italics)
- Poso Creek: *Palewyami*
- General Yokuts:
  - Buena Vista: *Tulamni, Hometwoli*
  - Nim-Yokuts:
    - Tule-Kaweah: *Wikchamni, Yawdanchi*
    - Northern Yokuts:
      - *Gashowu*
      - Kings River: *Chukaymina, Michahay, Ayticha, Choynimni*
      - Valley Yokuts:
        - Far Northern Valley: *Yachikumne (Chulamni), Lower San Joaquin, Lakisamni?, Tawalimni*
        - Northern Valley: *Nopt̲int̲e, Merced?, Chawchila, Chukchansi, Kechayi, Dumna*
        - Southern Valley: *Wechihit, Nutunutu, Tachi, Chunut, Wo'lasi, Choynok, Koyeti, Yawelmani*

This article focuses on data from General Yokuts, the term applied by Whistler and Golla (1986:321) to all Yokuts except the Poso Creek branch, since these languages share "the most characteristic rule of the phonology: lowering of long vowels in ablaut pairing of short and long vowels. Poso Creek is the only Yokutsan branch which does not share the rule of vowel lowering." Primary data in this study are taken from Newman (1944), Collord (1968), Beeler (1971), and Gamble (1978; 1989; 1994). Kroeber's (1963) dialect survey has been used to confirm patterns of surface vowel distribution in less well studied dialects.

All data in this study are from attested stem-lists, word-lists, or text examples in primary sources.[3] This contrasts with earlier phonological stud-

[2] The Southern Valley Yokuts dialect of Yawelmani is also known as Yowlumne.

[3] In data cited from Newman (1944), abbreviated N, vowel length is represented by a colon as opposed to a raised single dot and symbols with underdots are written as retroflex consonants. Following his example, surface forms of stems are sometimes cited with following hyphens. Abbreviations used are: N = Newman (1944); AOR aorist; CAUS causative; DESID desiderative; DUR durative; FUT future; GEN genitive case; HORT hortative; OBJ objective case; PASS passive; PRES present; REFL reflexive; REP repetitive.

ies, beginning with Kuroda (1967:2), where cited forms are not attested but "have been constructed from their stems according to the descriptive rules" given in Newman (1944), and continuing into modern Optimality theoretic treatments (e.g., McCarthy 1999:355, n. 30).[4]

2. Yokuts vowels. As noted above, a sound pattern shared among apparently all General Yokuts languages is one where short high vowels *i* and *u* alternate with long vowels *e:* and *ɔ:*. The question which arises is whether this pattern should be captured in terms of phonological rules or constraints, or whether it is best treated as a feature of morphological relationships between verb forms.

The consensus within the Americanist literature, beginning with Newman (1944), is that these alternations are part of a verbal ablaut system, best expressed in terms of relationships between different stem types. This is clear in Newman's phonological analysis, where high and nonhigh long vowels are posited as phonemes, and in his morphological analysis, where specific reference is made to the nonphonological status of these alternations.

Newman's (1944:19) analysis of the Yokuts vowel system posits ten vowel phonemes, as shown in (2). This vowel system is proposed for all of General Yokuts, except Wikchamni, which has additional front rounded vowels.

(2) Yokuts vowel phonemes (Newman 1944:19)

i	*e*	*a*	*ɔ*	*u*
i:	*e:*	*a:*	*ɔ:*	*u:*

Newman (1944:19) describes in some detail the quality of each vowel:

> The vowel quality of *i:* is close, as in English *reed*; the short *i* may also be close in quality, as in French *rit*. . . . Both *e* and *e:* are open vowels, with the quality of English *met*. The low vowels *a* and *a:* are like German *Mann* and English *father* . . . the back mid vowels *ɔ* and *ɔ:* are always open, as in German *voll* and English *law*. Like *i:*, the long *u:* is close in quality, as in English *boot*; and like *i*, the short *u* may have a close quality. . . .

These phonetic descriptions allow us to infer that Newman's phonological analysis is based on surface contrasts. Since all of the vowels in (2) contrast in open syllables, they are all posited as distinctive units within the phonological system.[5]

[4] For an in-depth study of the use of contrived Yokuts forms, see Weigel (2002). As he points out, the sheer number of contrived forms is sometimes alarming. In Kuroda (1967:20, table 2.5), only two of a total of forty-eight Yawelmani aorist active and aorist passive verb forms are actually attested in Newman (1944); the remaining forty-six are contrived.

[5] The majority of closed syllables in Yokuts contain short vowels. Newman (1944:25) attributes this to an automatic shortening process: "In all dialects the closing of a syllable automatically shortens the vowel of that syllable." However, he notes at least three regular exceptions

TABLE 1
DYNAMIC VOWEL PROCESSES (NEWMAN 1944:23–24)

Fundamental Vowels	***a***	***a:***	***ɔ***	***ɔ:***	***i***	***e:***	***u***	***o:***	***ɔ:*** vs. ***o:*** Contrast?
F (full)	*a*	*a:*	*ɔ*	*ɔ:*	*i*	*e:*	*u*	*o:*	No
B (broken)	—	*a'a*	—	*ɔ'ɔ*	—	*i'i*	—	*u'u*	Yes*
S (strong)	*a:*	*a:*	*ɔ:*	*ɔ:*	*e:*	*e:*	*o:*	*o:*	No
W (weak)	*a*	*a*	*ɔ*	*ɔ*	*i*	*i*	*u*	*u*	Yes
S' (strong-glottal)	*a'*	*a'*	*ɔ'*	*ɔ'*	*e:*	*e:*	*o:*	*o:*	No
W' (weak-glottal)	*a'*	*a'*	*ɔ'*	*ɔ'*	*i'*	*i'*	*u'*	*u'*	Yes
'W (glottal-weak)	—	*'a*	—	*'ɔ*	—	*'i*	—	*'u*	Yes
L (long)	*a:*	*a:*	*ɔ:*	*ɔ:*	*i:*	*i:*	*u:*	*u:*	Yes
Z (zero)	∅	∅	∅	∅	∅	∅	∅	∅	—
I (I-induced)	*i*	*i*	*i*	*i*	*i*	*i*	*u*	*u*	Yes
E: (E:-induced)	*e:*	*e:*	*e:*	*e:*	*e:*	*e:*	*o:*	*o:*	Yes
A (A-induced)	*a*	*a*	*ɔ*	*a*	*a*	*a*	*a*	*a*	Yes
'A ('A-induced)	*'a*	—	*'ɔ*	—	*'a*	—	*'a*	—	—
R (reduced)	∅	—	∅	—	∅	—	∅	—	—
TOTAL									8/11

*Broken Vs occur in Gashowu and Choynimi only.

At the same time, Newman (1944:20) recognizes that a subset of the phonemes in (2) underlie all vowel alternations within the verbal system: "Of the ten pure vowel phonemes, only seven (*i*, *e:*, *a*, *a:*, *ɔ*, *ɔ:*, and *u*) are found in bases," where bases are abstract roots underlying stems. In Newman's system, the *ɔ:* phoneme plays two distinct roles: it is the long (or strong) alternant of both *ɔ* and *u*. To clarify the dual role of this phoneme, Newman departs from a phonemic orthography, writing the strong member of the *ɔ* series as *ɔ* but the strong member of the *u* series as *o:*.

The processes which map roots to stems involve vocalic alternations which Newman (1944:23) refers to as "dynamic vowel processes." In table 1, Newman's view of dynamic vowel processes is reproduced, with a final column added. This last column indicates whether a surface contrast is found between his *o:* and *ɔ:* morphophonemes. In Newman's orthographic system, *ɔ* and *o* represent the same surface phone [ɔ]. For example, in his F (full) ablaut forms, the contrast between *o:* and *ɔ:* is neutralized: both are realized as [ɔ:]. Apart from this detail, the vowels in each row represent surface realizations of vowels within verb stems. There are severe restrictions on which vowel positions the dynamic processes in table 1 may effect. Only

to this in the native vocabulary: rhetorical lengthening gives rise to long vowels in closed syllables; in Yawelmani the causative-repetitive suffix /-(l)sa:/ fails to induce shortening of a preceding long vowel; and in Wikchamni the future suffix /-e:n/ surfaces without shortening (1944:25, n. 22).

TABLE 2
ILLUSTRATION OF NEWMAN'S W+S STRONG STEMS (NEWMAN 1944:49)

Bases	Prevocalic	Preconsonantal	Gloss
**giy'i*	*giy'e:(')-*	*giy'e:-*	'touch'
**me:k'i*	*mik'e:(')-*	*mik'e:-*	'swallow'
**'ile:*	*'ile:(')-*	*'ile:-*	'fan'
**'ilik*	*'ile:k-*	*'ile(:)k-*	'sing'
**ṣe:niɬ'*	*ṣine:ɬ'-*	*ṣine(:)ɬ'-*	'smell'
**hibe:y*	*hibe:y-*	*hibe:y-*	'bring water'

vowels of the root-initial syllable undergo the F and B processes; the W and S changes occur to root vowels in any position; and the remaining dynamic processes affect vowels which are not in the root-initial syllable.

Some notes are in order regarding the distribution of the different vowel grades listed in the first column of table 1: F (full) and B (broken) vowels occur only in the first syllable of roots; S (strong) and W (weak) vowels occur in any position of the root; and all other grades occur in NON-INITIAL syllables of roots. A dash in any column indicates that the dynamic vowel process does not apply to the fundamental vowel heading the column. The alternations attributed to long-vowel lowering in the generative literature are those under columns headed by the fundamental vowels *e:* and *o:*.

Newman's basic system represents occurring verb stems in terms of formulas combining different vowel types in the left-hand column of table 1. For example, W+S is the dynamic vowel formula of what Newman calls the "Strong Stem." In table 2, strong stems are shown for a variety of different base types (Newman 1944:49). The stems in table 2 have the pattern W+S. In W+S stems, the first vowel of the stem is drawn from the W (weak) row in table 1 (i.e., it is short), while the second vowel is drawn from the S (strong) row in table 1 (i.e., it is long and nonhigh). Parentheses in table 2 surround phonologically predictable glottal stop between adjacent vowels in the prevocalic column, and vowel length in the preconsonantal column which does not surface in closed syllables. In table 2, asterisked forms are unattested bases from which actual surface forms are derived. Under Newman's analysis, the relationship between long /e:/ in **me:k'i* and short *i* in *mik'e:-* is not a phonological relationship but a morphological one, mediated by the "S" category in table 1. In Archangeli (1988), Newman's different stem types are expressed in disyllabic and trisyllabic templates, with the different vowel grades in table 1 integrated into distinct syllable types. For example, the strong stem of table 2 is a CVCV:(C) template.

Table 2 illustrates strong stems, but Newman's analysis of Yawelmani verbs includes many more stem types. In table 3, for purposes of illustration, a range of different stem types is given for two verb roots, **hibe:y-* 'bring

TABLE 3
SOME OF NEWMAN'S DIFFERENT STEM TYPES

	**hibe:y-* 'bring water'	**me:k'i-* 'swallow'
Reduced stem (F+R)	*hibe:y-* [N:43]	*me:k'-* [N:42]
Weak stem (W+R)	*hibe:y-* [N:47]	*mik'-* [N:47]
Broken stem (B+R)		*mi'ik'-* [N:48]
Zero stem (W+Z)	*hiby-* [N:48]	*mik'-* [N:48]
Strong stem (W+S)	*hibe:y-* [N:49]	*mik'e:-* [N:49]
Strong zero stem (S+Z)	*heby-* [N:51]	*me:k'-* [N:50]
A-induced stem (W+A)	*hibay-* [N:51]	*mik'a-* [N:51]

water' and **me:k'i-* 'swallow', where once again asterisks mark Newman's roots. Stems with long vowels in the second syllable are given in their prevocalic forms, without closed-syllable shortening. Newman's formulas for these stem types in terms of the dynamic processes in table 1 are given in parentheses. Notice that the full range of stem types proposed by Newman involves not only syllable structure differences (e.g., long vs. short vowels) but also wholesale deletion of vowels in the zero (Z) and reduced (R) grades, as well as systematic replacement of certain root vowels in the "induced" grades.

It is clear from Newman's discussion that he conceives of the dynamic processes summarized in table 1, and illustrated in table 3, as morphologically conditioned alternations: "Each morphological process of Yokuts is accompanied by stem changes. . . . The extensive system of vocalic change can be conceived as operating on two planes: on the one hand, dynamic vowel processes effect ablaut changes which are not explained in terms of mechanical phonetic conditions; on the other hand, a number of phonetic processes introduce additional vowel changes of a purely mechanical nature . . ." (Newman 1944:22). Newman states explicitly that ablaut changes "are not explained in terms of mechanical phonetic conditions," and yet, traditional generative accounts regard some of the same alternations are purely phonological.

For example, in their study of Yawelmani, Kenstowicz and Kisseberth (1979) posit the underlying vowel system in (3) and the rule in (4), which yields surface neutralization of /o:/ and /u:/.[6]

(3) Yawelmani vowel system (Kenstowicz and Kisseberth 1979:91)

Underlying short vowels	*i*	*a*	*o*	*u*
Underlying long vowels	*i:*	*a:*	*o:*	*u:*
Surface long vowels	*e:*	*a:*	*o:*	*o:*

[6] For details of the traditional generative analysis and its motivation, see Kuroda (1967), Kentstowicz and Kisseberth (1979), and Archangeli (1988). The secondary literature on Yokuts phonology is wide-ranging, but most of it is based on combined features of these three works. For a partial bibliography up to 1972, see Pullum (1973).

(4) Yawelmani long-vowel lowering (Kenstowicz and Kissebeth 1979:91)

$$\begin{matrix} V \rightarrow [-\text{high}] \\ [+\text{long}] \end{matrix}$$

As mentioned earlier, the general account in (3) and (4) has been assumed in most Optimality treatments, with translation of rules into ranked, violable constraints. In the analysis proposed by Archangeli and Suzuki (1997), a constraint, LOWERING-IO, plays the same role as the rule in (4), stating that "Any output correspondent of an input long vowel must be [−high]."[7]

There are several important differences between Newman's system and the one sketched in (3) and (4). The most significant difference is the inventory of vowel phonemes. Where Newman posits ten phonemes, the more abstract analysis has only eight. In particular, Newman recognizes long high vowels as contrastive elements in surface forms. Another difference between the two accounts relates to potential neutralization of the generative /o:/ vs. /u:/ contrast. As already noted, the final column of table 1 shows that in eight of eleven ablaut contexts, there is a surface contrast between Newman's fundamental *o:* and *ɔ:*, corresponding to /o:/ and /u:/ of (3). The ablaut patterns which show maintenance of contrast are: broken, weak, weak-glottal, glottal-weak, long, I-induced, E:-induced, and A-induced. Some examples of these contrasting stem types from Newman (1944) are given in (5). Recall that in Newman's orthography, *ɔ* and *o* represent the same surface phone [ɔ].[8]

(5) Some Yawelmani surface contrasts between fundamental *o:* and *ɔ:* (Newman 1944)

Stem type	*ɔ:*-stem	*o:*-stem	
Broken (B+R)	*dɔ'ɔš-* 'report'	*yu'um-* 'dispossess'	[N:48]
Weak-glottal causative (W+W')	*mɔyɔ'n-* 'get tired'	*'ugu'n-* 'drink'	[N:53]
Glottal-weak (W+'W)	*hɔy'ɔ-* 'name'	*sud'uk'-* 'take off'	[N:48]
Long causative (W+L)	*mɔyɔ:n-* 'get tired'	*'ugu:n-* 'drink'	[N:53]
I-induced (W+S-I+Z)	*kɔyɔ:kiy-* 'butt, REP'	*'uɬ'o:'uɬ'-* 'steal, REP'	[N:64]
E:-induced (W+E:)	*'ɔpe:t-* 'arise from bed'	*hubo:ṣ-* 'choose'	[N:52]
'A-induced (W+'A)	*ṣɔw'ɔn-* 'swell up'	*buh'aɬ'-* 'mature'	[N:51]

[7] Kager (1999:379) notes conceptual problems with this sort of constraint. Sympathy theory, as proposed by McCarthy (1999), is an attempt to deal with some of the opacity problems posed by this analysis of the Yokuts vowel system within the general framework of Optimality Theory.

[8] The weak-glottal and long forms are given identical glosses and appear to be used with different combinations of suffixes. For example, compare *mɔyɔ'ne:nit na'* 'I'll be made tired', with the weak-glottal causative stem, and *mɔyɔ:ne:t na'* 'I was made tired', with the long causative stem (Newman 1944:93).

Within whole verb paradigms, then, there is no issue of absolute neutralization. The majority of surface stem patterns of vocalism allow one to distinguish Newman's fundamental *o:* from fundamental *ɔ:*.

The following section introduces data which support Newman's original position and greatly weaken phonological accounts that invoke long-vowel lowering. Surface forms with long high vowels from General Yokuts illustrate the nonautomatic nature of alternations between high and nonhigh long vowels, and the inaccuracy of general phonological statements like that given in (4).

3. Surface long high vowels in Yokuts. In table 1, long high vowels are limited to long ablaut in verb stems. However, there are at least four other contexts in which long high vowels occur in Yokuts. In the following subsections, each context is illustrated with examples from primary sources.

3.1. Surface long high vowels in long causative stems. Newman's long ablaut vowels in table 1 are found in what he terms the "long causative" stem. This stem type has weak ablaut in the first syllable and long ablaut in the second. A list of representative stems of this type from Yawelmani and Chukchansi is given in (6).

(6) Yokuts Long causative stems (W+L) (Newman 1944)

	Yawelmani base	Long causative stem	Gloss	
(6*a*)	**mɔ:yɔn*	*mɔyɔ:n-*	'get tired'	[N:53]
(6*b*)	**p'axa:t'*	*p'axa:t'-*	'mourn'	[N:53]
(6*c*)	**be:win*	*biwi:n-*	'sew'	[N:53]
(6*d*)	**di'iṣ*	*di'i:ṣ-*	'make, repair'	[N:53]
(6*e*)	**'ugun*	*'ugu:n-*	'drink'	[N:53]
(6*f*)	**hiwe:t*	*hiwi:t-*	'walk'	[N:53]
	Chukchansi base			
(6*g*)	**hužun*	*hužu:n-*	'become frightened'	[N:93]

The long causative stems in (6*a*) and (6*b*) show the general pattern of a weak vowel followed by a strong vowel. In (6*c*)–(6*g*), strong vowels in the long causative are long high vowels, as described in table 1.

In (7), Yawelmani and Chukchansi text examples drawn from Newman (1944) are given with long causative stems in boldface. It is clear from examples like these that Newman's description of surface long vowels is accurate, and that the statements in (3) and (4) are not. Long high vowels surface in (7*b*)–(7*f*) without lowering. Both [i:] and [u:] are attested in these stem types, and in this context there is a surface contrast between [u:] (7*d* and 7*e*) and [ɔ:] (7*g*).

(7) Long causative stems in attested words/phrases (Newman 1944)

Yawelmani

(7*a*) ***mɔyɔ:n****-e-t* *na'*
tired-CAUS-PASS.AOR I
'I was made tired' [N:93/14:18]

(7*b*) ***bini:t****-ihni'*
ask.CAUS-AGENTIVE
'One who makes (people) ask questions' [N:93/14:18]

(7*c*) ***hiṣi:n****-e:-haɬ'-xo-'* *na'* *mam*
hidden-CAUS-DESID.REFL-DUR.PRES-AOR I you.OBJ
'I want you to hide me' [N:90/14:12]

Chukchansi

(7*d*) ***hužu:n-****o-hulna'* *'amam*
become.frightened-CAUS-AORIhim
'I frightened him' [N:93/14:18]

(7*e*) *'ɔhɔm* *na'* *na'aṣ* ***hužu:n****-o-l*
probably I might frightened-CAUS-DUB
'I might not frighten him' [N:121/17:4]

(7*f*) ***lihi:m****-e-hil* *gawa:yu'-un*
run-CAUS-AOR horse-GEN
'(he) made the horse run' [N:122/18:3]

(7*g*) *na'* *'am* ***holo:s****-o-n'*
I him sit-CAUS-FUT
'I will have him sit down' [N:131/18:20]

Gamble (1978:77, n. 19) suggests that long causatives like those in (7) are the historical reflex of compensatory lengthening before glottal stop in Yawelmani, Chukchansi, and Wikchamni. The proposed sound change is given in (8).

(8) The origin of Long ablaut vowels in Yawelmani, Chukchansi, and Wikchamni
Sound change: *V'.CV > V:.CV

This sound change is supported by comparative evidence and language-internal variation. In Yawelmani, all class II bases show variation between weak glottal ablaut and long ablaut vowels. For example, *'ugu'n-e:-* varies with *'ugu:n-e:-* 'drink-CAUS' [N:53]. A similar situation holds in Wikchamni,

where compensatory lengthening in strong glottal stems in class II causatives gives rise to free variation: *hiwe'ti*, *hiwe:ti* 'walk-CAUS', *pana'sa*, *pana:sa* 'wipe-CAUS' (Gamble 1978:58). On the other hand, Gashowu and Choynimi have only weak glottal causatives for class II bases, maintaining the historic pattern [N:53].[9]

In diachronic terms, the sound change in (8) appears to postdate a historical long-vowel lowering rule which may be reconstructed for General Yokuts. As a consequence, long high surface vowels [u:] and [i:] surface without lowering. In synchronic terms, compensatory lengthening must be ordered after long-vowel lowering (4), or an equivalent constraint must distinguish between underlying and "derived" long high vowels. If these were the only instances of long high vowels in Yokuts, the basic structure of the analysis sketched in (3) and (4) might be salvageable, despite the common occurrence of these vowels in long causative stems. However, surface high vowels occur in other contexts and in other languages. These patterns are summarized below.

3.2. Surface long high vowel in Yawelmani *ekni:s. . . .* Newman (1944:112) describes the Yawelmani inchoative suffix *-a:* as one which takes a strong stem.[10] In the strong stem, long /i:/ surfaces as [e:] (or [e] in a closed syllable). However, in one attested text example in (9), there appears to be a surface [i:]. In this case, there is no apparent variation and no historical evidence of compensatory lengthening.

(9) Strong stem preceding inchoative *-a:* in Yawelmani

'ama'	*wakkiy*	*'e:man*	*ʈekni:s-a:-hin*
and	very.much	to.no.avail	excite-INCHOATIVE-AORIST

'(she) became very much excited, to no avail' [N:237/27:4]

However, this example may be misanalyzed. Elsewhere (Newman 1944:106), a homophonous lexeme *ʈekni:sa:hin* is glossed as '(he) avoided danger', with a stem /ʈekni:sa:-/ 'avoid danger', where /i:/ does not undergo lowering (cf. *ʈekni:sa:xɔ:* 'he is avoiding danger', *ʈekni:se:xɔ:* 'he has already avoided danger'). This nonalternating long high vowel could be a frozen instance of the long causatives in **3.1**.

3.3. Surface long high vowels in Gashowu and Chukchansi hortatory suffixes. At least two Yokuts languages, Chukchansi and Gashowu, show surface long high vowels in hortative suffixes (Newman 1944:115–17). Examples are given in (10).

[9] Chawchila has weak glottal causative stems for IIAi and IIB bases only (Newman 1944:53).

[10] Specific reference is made to "the strong stem of detached triliteral *-wiyi* proclitics" (Newman 1944:60, 12, 223, n. 126). For further discussion of *-wiyi* forms, see **3.4**.

(10) Gashowu hortatory *-i:wu-* and Chukchansi *-i:wi-*
Gashowu

(10*a*) *k'e:li:wu'a*
/k'e:li-i:wu-'a/
paint-HORT-IMPERATIVE
'go paint it!' [N:117/16:7]

(10*b*) *'ugnu:wuš na'*
/'ugun-i:wu-š na'/
drink-HORT-FUT I
'first I'll drink' [N:117/16:7]

Chukchansi (Collord 1968:48)

(10*c*) *xat^{h}i:wik*
/xat^{h}-i:wi-ka/
eat-HORT-IMPERATIVE
'go eat!'

(10*d*) *xat^{h}i:wix*
/xat^{h}-i:wi-xa/
eat-HORT-PERMISSIVE
'let's go eat!'

(10*e*) *t^{h}a'ši:wik*
/t^{h}a'iš-i:wi-ka/
see-HORT-IMPERATIVE
'go see!'

In (10*b*), the /i:/ of the hortative suffix undergoes rounding harmony, surfacing as [u:]. The surface long high vowels in these hortative forms, which appear to be relatively frequent, constitute counterevidence to the neutralization of /o:/ and /u:/ in (3), and an additional exception to the general rule of long-vowel lowering in (4).

3.4. Surface long high vowels in Yawelmani and Wikchamni extended aspect. Newman (1944:37–38, 55–61) describes Yawelmani verbs formed by prefixing a proclitic to the verb **wiyi* 'say, do'. In some cases proclitics are stems attested elsewhere in the language, while in other cases they are not, occurring only in these bound forms. Newman (1944:56) observes that "In feeling, the *-wiyi* verbs are highly idiomatic and informal. They are primarily the property of children in everyday speech. . . . Many of the proclitics are clearly onomatopoeic, and these combined with a form of **wiyi*, 'say, do', result in a 'do so-and-so' type of mimetic reference. . . ."

Within the class of *-wiyi* verbs, there are at least three distinct aspect classes: one of nonextended event, one of extended event, and a repetitive or distributive which involves reduplication of the proclitic. In (11), nonextended and extended stem types are illustrated. As should be clear from these examples, what distinguishes nonextended aspect from extended aspect is vowel length in the last syllable of the proclitic stem: where nonextended forms have a short vowel, extended forms have a long vowel. In (11*a*)–(11*c*), vowels alternating in length are nonhigh; in (11*d*)–(11*g*), they are high. In this second set, extended event morphology yields surface long high vowels.[11] In some cases, only an extended aspect exists without a nonextended counterpart. Verbs of this type are listed in (12) and include transitive verbs (12*a*) and intransitive verbs (12*b*–12*d*), as well as seemingly sound-symbolic forms (12*f*–12*g*). While it is tempting to exclude *-wiyi* verbs from the "core" phonology of the language, the fact that these verbs are common in children's everyday speech, though rare in adult language, suggests that they are, to some extent, a reflection of a child's knowledge of Yawelmani sound patterns.

(11) Yawelmani long vowels in *-wiyi* extended aspect [N:55–61]

	Nonextended event	Extended event
(11*a*)	*palwiyi* 'overspread quickly'	*pa:lwiyi-* 'overspread slowly'
(11*b*)	*ɬ'atatwiyi-* 'flutter'	*ɬ'ata:twiyi-* 'flutter slowly'
(11*c*)	*ɬ'ɔlwiyi* 'get peeled off quickly'	*ɬ'ɔ:lwiyi-* 'get peeled off slowly'
(11*d*)	*puɬ'wiyi-* 'whirl about'	*pu:ɬ'wiyi-* 'fill the air with whirling motion'
(11*e*)	*'alum'wiyi-* 'grasp with the mouth'	*'alu:m'wiyi-* 'put into the mouth slowly'
(11*f*)	*hik'wiyi-* 'make a hiccupping sound'	*hi:k'wiyi-* 'make a panting sound'
(11*g*)	*bidinwiyi-* 'tumble from a high place'	*bidi:nwiyi-* 'walk over a high place'

(12) More Yawelmani long high vowels in *-wiyi* extended aspect [N:55–61]

	Nonextended event	Extended event
(12*a*)		*ba:nwiyi-* 'run the hand over'
(12*b*)		*cɔyɔ:pwiyi-* 'slide'

[11] These forms are unusual not only because of the surface long high vowels but also because they have CV:C syllables. Surface CV:C syllables are highly limited in Yawelmani (see n. 5), leading Newman and others to propose an automatic rule of vowel shortening in closed syllables.

(12*c*) *ʂɔ:lwiyi-* ‘bloat up’
(12*d*) *wuʈu:kwiyi* ‘get smoky’
(12*e*) *yu:xwiyi-* ‘melt’
(12*f*) *hi:t’wiyi-* ‘inhale smoke’
(12*g*) *k’i:kwiyi-* ‘squeak’
(12*h*) *xi:swiyi-* ‘float downward’
(12*i*) *ti:p’wiyi-* ‘stretch out’

Newman (1944:56) found few examples of these verbs in texts: “A comparatively large body of text yielded only a few examples, and these were usually found in the comic portions of the text describing the antics of Coyote.” Text examples in (13) are taken from Newman (1944) and Gamble (1994).

(13) Text examples of Yawelmani long vowels in *-wiyi* extended aspect
(13*a*) *’ama’ woʈtin ’amin* ***ka:kwiyhin***

‘and being hit by him, (he) cackled’ [N:138/19:8]

(13*b*) *’ama’ ’amingin kay’iw dab* ***wa:swa:swiytaw*** *hatam’an*

‘and, at their (dual) honking, Coyote then dances’ [N:139/19:10]

(13*c*) ***yu:xwiyhin***

‘it melted away’ (Gamble 1994:64, 65, 66)

Though Newman was unable to find a productive construction of this type in other Yokuts languages, Gamble (1978:40–42, 54) describes a similar construction in Wikchamni:

> A fairly productive process of marking slow, extended activity is seen with the *-witi* verbs. This “retardative aspect”. . . is formed by lengthening of the first vowel in biliteral bases and the second vowel of triliteral bases. . . . The lengthened vowels of these *-witi* verb forms are exceptions to two general vocalic processes, lowering and shortening. These vowels are long although they are followed by a consonant cluster and the high vowels *i*, *ï*, *u* are not lowered. These exceptions point to vowel lengthening for retardative aspect as following the processes of lowering and shortening. (Gamble 1978:41)

(14) Wikchamni long vowels in *-wiyi* extended aspect (Gamble 1978)

	Nonextended event		Extended event	
(14*a*)	*t’uy’witi*	‘drip’	*t’u:yit*	‘a slow drip’
(14*b*)	*t^{h}uhwiti*	‘spit’	*t^{h}u:hwit*	‘spit slowly’
(14*c*)	*xïp’witi*	‘rub once’	*xï:p’wit*	‘rub slowly once’
(14*d*)	*t’ap^{h}witi*	‘slap’	*t’a:p^{h}wit*	
			muʈ^{h}u:k’witi	‘get smoky’

While Gamble's ordering solution may be workable within certain phonological frameworks, it is not compatible with many, since long vowel lowering and closed syllable shortening may be considered exceptionless lexical or postlexical rules, while lengthening under extended aspect requires reference to a specific morphological construction and appears to be a morphologically conditioned lexical process. But a more serious problem with Gamble's suggestion is the division it drives between stem types occurring in *-wiyi* constructions and those occurring in table 1. Within Newman's schema, extended event verbs have Long ablaut forms in their final syllables.

3.5. Surface long high vowels in loanwords. A final word-class with surface long high vowels are loanwords.[12] Examples are given in (15) from Gashowu, Chukchansi, and Wikchamni. Long high vowels are found in (15*a*)–(15*n*), constituting another class of exceptions to long-vowel lowering (4). In this case, a rule-ordering solution like that proposed by Gamble for Wikchamni will not work: long high vowels must be posited underlyingly for these words, and remain long and high on the surface.

(15) Loanwords with long vowels in Yokuts

	Gashowu		
(15*a*)	*buli:ga'*	'sheep' (< Sp. *borrega*)	[N:168]
(15*b*)	*mušgi:da'*	'mosquito'	[N:168]
(15*c*)	*'i:guš*	'fig' (< SP *higos*)	[N:168]
(15*d*)	*'u:baš*	'grape' (< Sp. *uvas*)	[N:168]
	Chukchansi (Collord 1968)		
(15*e*)	*hu:was*	'grape' (< Sp. *uvas*)	[p. 4]
(15*f*)	*kayi:na'*	'chickens' (< Sp. *gallina*)	[p. 45]
(15*g*)	*hu:ši-*, *hu:še-*	'to drive' (< Sp. *conducir*)	[pp. 17, 20, 24]
(15*h*)	*lu:ca:l-*	'to wrestle' (< Sp. *lucar*)	[p. 51]
	Wikchamni (Gamble 1989)		
(15*i*)	*ku:lika*	'sheep, lamb' (< Sp. *borrega*)	[p. 124]
(15*j*)	*puli:ka'*	'sheep, lamb' (< Sp. *borrega*)	[p. 124]
(15*k*)	*xap^{h}u:na*	'soap' (< Sp. *jabon*)	[p. 124]

[12] A phonetic contrast between tautosyllabic *i:/iy* or *u:/uw* is not suggested for any Yokuts language, and where templatic morphology is not available to determine the functional status of the syllable-final element, there is variation in how this element is transcribed. For example, the Yawelmani temporal particle meaning 'now, right now' is written *ƫiymi* in Newman (1944:236) but as *ƫi:mi* in his texts (e.g., Gamble 1993:64). J. P. Harrington consistently writes [i:] for tautosyllabic sequences which are written with *i:* or *iy* by Newman, again suggesting phonetic identity (e.g., Gamble 1993:74–79). In (15), I write all tautosyllabic homorganic sequences of this sort as long vowels *i:* and *u:*. Gamble (1994:4) also writes Newman's Vi as Vy and Vu as Vw, suggesting the same equivalencies.

(15*l*)	*hi:lu*, *'i:lu*	'thread, string' (< Sp. *hilo*)	[p. 124]
(15*m*)	*mu:la*	'mule' (< Sp. *mula*)	[p. 125]
(15*n*)	*musk^{h}i:ta'*	'mosquito'	[p. 125]
(15*o*)	*lamesa*	'table' (< Sp. *la mesa*)	[p. 125]
(15*p*)	*šumlela'*	'hat' (< Sp. *sombrero*)	[p. 125]
(15*q*)	*ka:let^{h}a*	'wagon' (< Sp. *galera*)	[p. 124]
(15*r*)	*kaye:t^{h}a*	'cracker' (< Sp. *galleta*)	[p. 124]

Loanwords in Yokuts violate other sound patterns that have been claimed to be regular within standard generative treatments (Kuroda 1967, Kenstowicz and Kisseberth 1979, and Archangeli 1988). These include: the limitation of short [e] to closed syllables, where it is the result of /i:/ lowering and closed syllable shortening (15*o*–15*q*); progressive rounding vowel harmony between adjacent vowels with the same height (15*a*, 15*b*, 15*g*, 15*i*, 15*j*, 15*n*); and closed syllable shortening (e.g., Gashowu *lame:š* 'table' (< Sp. *la mesa*) [N:168]). At the same time, loanwords are clearly nativized: they contain only the surface vowels and consonants of the Yokuts language in question and adhere to the basic CV, CVV, CVC, and CV:C syllable types seen in native words. Rather than exclude loanwords from our study of Yokuts phonology, we can use them to further inform our notions of what is productive and nonproductive within a phonological system, and what aspects of sound patterns loan phonology reflects. Recent studies suggest that loanword phonology reflects actual patterns of pronunciation and surface sound patterns, rather than more abstract levels of representation (Blevins [forthcoming] and Ussishkin and Wedel 2003*a*; 2003*b*). If this is the case, then the occurrence of long high vowels in loanwords suggests that these are categories Yokuts speakers could perceive and distinguish from long nonhigh vowels at the time of borrowing.

4. Discussion. Numerous phonological treatments of Yawelmani and other Yokuts languages assume the basic phonological system in (3) and (4), with underlying vowels /i a u o/ and /i: a: u: o:/ and a phonological rule of long vowel lowering which takes /i:/ to surface *e:* (= [ɛ:]) and /u:/ to surface *o:* = ([ɔ:]). However, there are clear counterexamples to the general rule of long-vowel lowering, and not all of them can be eliminated by rule ordering or constraint interaction. Newman's original and insightful analysis of the Yokuts system classified the dynamic vowel processes shown in table 1 as "changes which are not explained in terms of mechanical phonetic conditions . . ." (Newman 1944:22), and the data above provide a basis for his conclusions.

Before the numerous generative reanalyses of Yokuts appeared, Hockett (1967; 1973) argued forcefully for Newman's basic view of the vocalic

relationships in table 1 as one of fundamental relationships between words or forms, not sounds. Though the relationships between surface vowels in table 1 can sometimes be stated in terms of formulas like long-vowel lowering (3), they should not be equated with them, unless there is supporting evidence for the productivity of such phonological processes. Hockett went even further and suggested that by memorizing one model paradigm and selecting just one form from another paradigm, not only phonological rules but morphophonological rules could be eliminated as well:

> All the actual facts of morphophonemic alternation could be covered without any resort to morphophonemic notation. . . . In general . . . a single whole inflected form, properly chosen, is enough. The nonfuture does very well. This is a common form rather than a rare one; all basic verbs, transitive or intransitive, have it; it is indecisive only in a few cases, where the dubitative, also common, can serve to resolve the uncertainty. The nonfuture, plus the dubitative when necessary, plus the nonpast when irregular, could be designated the "principle parts" of a Yawelmani basic verb . . . with our principal parts as point of departure, we can altogether discard the machinery of morphophonemic notation and adjustment rules. In its stead, we can give a complete paradigm of one prototype verb of each set of basic verbs that manifest the same behavior in morphophonemic alternation. . . . To cover the complex alternations of Yawelmani by principal-parts-and-paradigms would take much more space than is occupied . . . by the morphophoneme-and-rewrite-rule presentation. But there would be a net gain in realism, for the student of the language would now be required to produce new forms in exactly the way the native user of the language produces or recognizes them—by analogy. . . .
>
> Is this net gain in realism, the principal-parts-and-paradigms approach enough to offset the loss in succinctness of statement? . . . I believe this depends on us rather than on the approaches. One of the most dangerous traps in any of the more complex branches of science . . . is that of confusing one's machinery of analysis with one's object of analysis. One version of this is pandemic in linguistic theory today: almost all theorists take morphophonemes (by one or another name) to be things IN a language rather than merely part of our equipment for the analysis and description OF the language. . . . A correct principal-parts-and-paradigms statement and a correct morphophoneme-and-rule statement subsume the same actual facts of alternation, the former more directly, the latter more succinctly. We ought therefore to be free to use the latter, provided we specify that it is to be understood only as a convenient shorthand for the former. (Hockett 1967:220–22)

The data above from long causatives, the hortatory suffix, extended/retarded aspect, and loanword phonology suggest that long high vowels *i:* and *u:* are common surface segments in Yokuts languages, and provide evidence against an automatic phonological rule of long-vowel lowering. It is likely that such a rule can be reconstructed for Proto-General-Yokuts and that it is

the fossilized reflex of this rule which permeates verb paradigms, but there is no evidence that speakers extract a phonological generalization from these alternations. We are left to conclude that the lowering rule in (4) is not an accurate statement of the knowledge a Yokuts speaker has about the Yokuts vowel system. It may be a convenient shorthand for paradigm-internal alternations involving verb stems, but it is unable to account for the range of surface long high vowels presented in the preceding sections and their extension to loanwords. This finding has important implications for general accounts of Yokuts phonology and morphology.

The generative and Optimality treatments already cited assume a regular rule of vowel harmony by which rounding spreads from one vowel to the next, provided the vowels agree in height. However, harmony can only be stated in purely phonological terms if certain surface nonhigh vowels are treated as lexically high, lowered by (4) or its constraint-based equivalent. Assuming imperative suffix /-k'a/ and aorist /-hin/, words like *yɔlɔ:winhin* 'assemble' [N:122], *yɔlɔwk'ɔ* 'assemble!' [N:118] are derived from /yɔlɔ:w-/ in these approaches via rounding harmony. Since the stem vowel in /yɔlɔ:w-/ is nonhigh, rounding harmony affects the nonhigh vowel of /-k'a/ but not the high vowels of /in-hin/. The same regular harmony is claimed to account for surface forms like *c'ɔmhun* 'devoured' [N:122], from /c'u:mu-/ 'devour, destroy', and the absence of harmony in *t'uyk'a* 'shoot!' [N:118], from /t'uyu-/ 'shoot'. However, harmony in forms like *c'ɔmhun* requires a phonological form /c'u:m-hin/ as input, since only vowels of like height harmonize. Under a morphological analysis, however, the aorist suffix /-hin/ selects a reduced stem whose sole vowel is Full (F) [N:24, 42, 121–22]. Looking at row 1 of table 1, we see that the aorist stem for Newman's **c'o:m-* is *c'ɔ:m-*, with /c'ɔ:m-hin/ as input to the phonology. The problem then with the morphological analysis is that input forms to vowel harmony do not provide the required strings for the proposed phonological harmony rule. This is consistent with the fact that harmony is not adhered to in loans. The stem ablaut patterns as well as stem-suffix harmony appear to be morphologically conditioned alternations in Yokuts.

Under the morphological analysis, stems *yɔlɔ:w-* and *c'ɔ:m-* are members of their respective paradigms, and it is only by comparing them with other surface stems within their respective paradigms that their position within table 1 can be established. For example, *c'ɔ:m-* is identified as a different stem type from *yɔlɔ:w-*, since the strong stem of this verb (W+S; see table 2) is *c'umɔ:-*, with a short high vowel in the first (W) syllable, as in *c'umohnɔ:l* < /c'umo:-hne:l/ 'devour, destroy (passive consequent adjunctive)' [N:166]. In contrast, the first vowel of *yɔlɔ:w-* never surfaces as high (the "induced" stem vowels in table 1 are found only for stem-final vowels). In sum, if vowel lowering (4) is not part of Yokuts phonology, but rather an

integrated component of the word- or stem-based relationships cataloged in table 1, then phonologically conditioned vowel harmony is not part of Yokuts phonology either. This, of course, is the original view of Newman (1944) and is Hockett's (1967) position too, but it bears repeating, since most phonological approaches take Yokuts as a prime example of phonologically conditioned vowel harmony.

A morphological account of vowel lowering also has implications for abstractness within phonological theory. Yawelmani can no longer be used as a prime example of abstract underlying phonemes which are never realized on the surface. Under Newman's account, both *u:* and *ɔ:* are phonemes, since they contrast in open syllables in surface forms. This analysis is further supported by the occurrence of this contrast in the *-wiyi* forms of children's speech and in loanwords.

The data in this paper highlight one of the most important questions for modern phonological theory. The question is not whether synchronic alternations are best captured in terms of rules or constraints but, rather, which synchronic alternations reflect pure knowledge of sound patterns and which are better expressed as learned relationships between stems or words. It is to be hoped that this study has brought us closer to appreciating the contributions of Newman (1944) and Hockett (1967; 1973) in answering this question, at least in the limited domain of the Yokuts vowel system.

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