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In conclusion, although there may well be empirical and conceptual reasons for rejecting a theory of binding based on SUBJECT accessibility, the purported empirical problems centered around example (1) do not arise given the formulation of Chomsky (1981).

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Yokuts and the Vowel Plane

Donca Steriade

I consider in this article the theory that predicts whether two segmental matrices may belong to distinct planes.[1] In doing so, I assume that McCarthy's (1979; 1981; 1982) original hypothesis on the separation of segmental planes must be maintained: segmental matrices belong to distinct planes if and only if they belong to distinct morphemes. What I focus on is a narrower aspect of this theory: Does the separation of segmental planes persist postlexically? I show that it does not and that analyses based on the contrary assumption are unmotivated and incompatible with other aspects of autosegmental theory. The conclusion that postlexical rules operate on representations that contain a single segmental plane may be construed as support for Younes's (1983) and McCarthy's (1985) proposals of "tier conflation":[2] distinct segmental planes conflate into one at essentially the same junctures in the derivation when internal brackets are erased, in particular

I am grateful to Diana Archangeli for discussing with me some of the material in this article and for making available a prepublication version of Archangeli (1985). Two anonymous LI reviewers and Bruce Hayes have made useful comments on a first version of this article.

[1] I adopt Archangeli's (1984) terminological distinction between tiers and planes.

[2] A similar proposal is attributed to Bruce Hayes in Tuller (1984).

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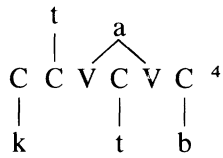
postlexically (on Bracket Erasure, see Pesetsky (1979), Kiparsky (1982)).[3] A different, more radical interpretation of McCarthy's (1985) data and of the suggestions made here could be that distinct segmental planes do not exist at any level of representation following the initial association of segments and skeletal slots. I am not, however, prepared to defend this interpretation now and merely point to its existence.

Representations like (1), in which three sets of segments are represented on distinct planes, have been introduced by McCarthy (1979), in a comprehensive study of Semitic morphology, and amplified in later work (1981; 1982; 1984).

(1)



The argument for the segmental planes in (1) is based on the following correlation between lexical entries and the application of morphophonological processes: (a) each plane in (1) corresponds to a distinct morpheme; (b) certain morphophonemic processes operate on elements of a single plane as if they were adjacent. Thus, a Bedouin Hijazi Arabic word game (McCarthy (1982)) transposes elements of the root plane and ignores vowel and consonant melodies belonging to other planes. When applied to a form like (1), this game would produce permutations of the segments *ktb* but would not affect either the position of the *t*-infix or that of the vowels. Similar word games, when operative in a language whose roots are composed of vocalic *and* consonantal melodies, can transpose vocalic and consonantal elements of the root plane: such is the case of the Hanunoo transposition game (Conklin (1959), McCarthy (1982)). In Hanunoo, as in Bedouin Hijazi Arabic, the transposition game respects morpheme boundaries and does not permute heteromorphemic elements. The only difference between the two games is that Hanunoo lacks the discontinuous morphemes of Semitic. It would be reasonable to hypothesize that this correlation between morpheme structure and the operation of word games indicates that such games always precede tier conflation. The upshot of these remarks is that, whether or not the representation in (1) must be present in the early stages of the phonological derivation in Arabic, such a representation may not be present at any stage in a language like Hanunoo.

In the course of the discussion I will address the following question: May languages whose roots contain both vocalic and consonantal melodies nonetheless, on a language-specific basis, segregate root vowels on a plane distinct from that of root consonants? More specifically, is the existence of template morphology automatically associated with the separation of vowel and consonant planes even in the absence of a morphological justification for this separation? I will show that at least one set of data that have been

[3] It is also conceivable that Bracket Erasure must be weakened to be just the conflation of segmental planes, without total obliteration of morphemic distinctions. See Sproat (1984) and Hargus (1985).

[4] Throughout this study Cs and Vs are used as skeletal units, for reasons of graphic expedience.

construed as supporting this hypothesis, the facts of Yokuts Lowering, do not in fact establish it.

Interest in the question of segmental plane separation has been stimulated by Archangeli's analysis of Yokuts morphology and phonology (1984; 1985). Archangeli argues that a root-internal vowel plane exists in Yokuts, even though the root melody must comprise consonants as well as vowels. On this she bases an analysis of certain Yokuts dialectal facts that appears to disconfirm recent proposals concerning the applicability of rules to geminate clusters (Steriade (1982), Hayes (1984), Steriade and Schein (1984; 1985)). In fact, if Archangeli's proposal is justified, the Yokuts data will not only invalidate these particular proposals; they will render the whole known paradigm of geminate behavior quite mysterious, if not incomprehensible. I will show here (a) that the Yokuts root-internal vowel plane cannot be motivated; (b) that the rule on which Archangeli's argument for the vowel plane is based is postlexical; this rule must therefore apply at a stage in the derivation where the separation of segmental planes, if ever present, has been removed; and (c) that an alternative analysis of the Yokuts facts is available, which is not only compatible with the known behavior of geminates but also preferable to Archangeli's in terms of factual coverage.

1. The Yokuts Vowel Plane

Archangeli (1984; 1985) presents an autosegmental analysis of Yokuts morphology based on the distinction among three planes: the skeleton, the consonantism, and the vocalism. The morphological separation of at least two planes, skeletal and segmental, appears incontrovertible: Yokuts root morphemes assume different syllabic shapes depending on the suffixes added to them. Thus, the roots /caw/ 'to shout' and /hoyoo/ 'to name' assume their neutral (underlying) templates when followed by the aorist suffix /-hin/: *cawhin, hoyoohin*. They take on a CVVC template when followed by the continuative suffix /ʔaa/: *hooy-ʔaa-, caaw-ʔaa-* (eventually *hoy̆aa-, caw̆aa-*). And they assume a CVCVV(C) template when followed by the reflexive-reciprocal /-wšiil/: *hoyoo-wšiil, cawaa-wšiil* (eventually *hoyowšol, cawawšel*).[5]

Archangeli notes that when the underlying or suffix-supplied template is bisyllabic, the vast majority of verbal roots will surface with uniform vocalism in both syllables: a bisyllabic template such as CVCVVC is associated with roots like *ʔagaay-* 'pull', *biniit-* 'ask', *lowoon-* 'attend a feast', *hudook-* 'straighten' and only exceptionally with bivocalic roots like *wastuu-* 'hurt', *tiixal-* 'talk'. Significantly, this minority of the bivocalic roots frequently deviates from the principles of Yawelmani morphology in other ways as well, for example by assuming otherwise unattested templates (*tiixal-*). This configuration of facts deserves explanation. Archangeli's suggestion is (a) that all regular roots are mono-

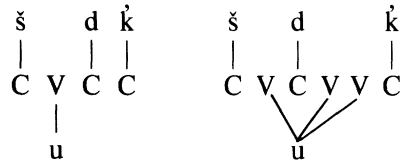
[5] Many of the Yokuts forms discussed here, in particular *hoyowšol, cawawšel*, evidence the operation of a rule of Closed Syllable Shortening, whereby long vowels become short in closed syllables. The evidence for this rule is discussed in Kuroda (1967) and Archangeli (1985).

vocalic and (b) that vowels occupy a different plane from consonants in Yawelmani. We note that the facts presented so far justify (a) but not necessarily (b).

1.1. Against the Standard Argument for the Vowel Plane

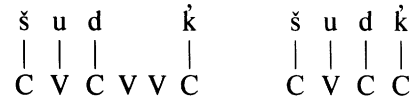
A fact that could be construed as support for the root-internal vowel plane in Yokuts is the variable position of root consonants and vowels. Thus, *šudḵ* 'remove, take off' takes on a CVCVVC template in (intermediate) *šuduuḵ-un-šuʔ* '(it) came off' but a CVCC template in *šudḵ-uʔ* '(he) will take (it) off' (Newman (1944, 45, 85)). The vowel *u* precedes *d* in one case but precedes and follows it in the other. The formal account of this general property of Yokuts root morphemes is straightforward if vowels and consonants occupy distinct planes;

(2)



On the other hand, an analysis of Yokuts based on a strict enforcement of the principle *separate planes iff separate morphemes* faces a momentary difficulty: whether the root melody is *šudḵ* or *šduḵ*, some process other than simple association of segments to CV slots must be assumed in order to derive the two stems *šuduuḵ-* and *šudḵ-*. The representations in (3) show that association will not be sufficient to derive both stem forms:

(3) a. Assuming /šudḵ/



b. Assuming /šduḵ/

As shown below, the single-plane analysis is not beyond rescue. But the technical solution to the difficulty shown in (3) is not the important issue here. The important questions are these: What types of units may be assumed to define distinct segmental planes? What may count as a distinct morpheme from the point of view of the phonology?

It seems that a minimal condition for morpheme status must be the following:

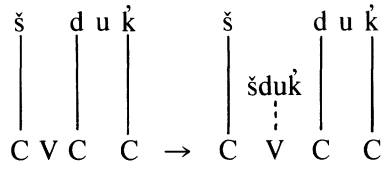
(4) In a concatenation *X Y*, X and Y are separate morphemes only if X or Y occurs independently.

Condition (4) is weak enough to accord morpheme status to *boysen* and to *berry* in *bóysenbèrry*—thus accounting for the compound stress pattern in this word—on the basis of the independent occurrence of *berry* elsewhere.[6] Condition (4) is nonetheless strong enough to make it impossible to analyze *cátamaràn* as bimorphemic **cátamaràn*. One of the reasons for adopting (4) as an analytic guideline is that universal conditions of morpheme structure such as the Obligatory Contour Principle (OCP) (McCarthy (1985)) could be made vacuous unless (4) is enforced. Thus, consider a hypothetical counterexample to the OCP, the pseudo-Semitic triliteral root *smm*, modeled on the (real) biliteral Arabic root *sm* 'poison' (see McCarthy (1981; 1982)). The presence of the two adjacent and identical autosegments *mm* on the root plane in *smm* seems to contradict the OCP, yet it could be made compatible with it if one were allowed to assume that *smm* is a "cranberry" composite of two morphemes *sm* and *m*. Thus, the status of the OCP as an empirical generalization depends to some extent on whether such arbitrary bimorphemic analyses are legitimate. By ruling out such options, condition (4) allows universals like the OCP to keep their empirical content.[7]

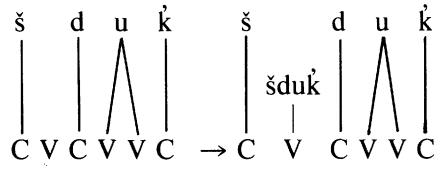
Note now that (4), the weakest possible restriction on what may count as a morpheme, tells us that a root like *šudk̀* should not be split into two "morphemes" *šdk̀* and *u* unless at least one of them occurs independently—that is, unless either *šdk̀* or *u* is identifiable in both form and meaning in some other morpheme combination. Since this is not the case, (4) rules against the morphemic separation of *šdk̀* and *u*.

I return now to the technical question we started from: How can a single-plane analysis of Yokuts roots account for the variable order of vowels and consonants in forms like *šudk̀-* vs. *šuduuk̀-*? The answer is: by a rule of Melody Copy. The derivation in (5) is formally equivalent to a case of reduplicative infixation, as analyzed in Broselow and McCarthy (1983):

(5) a.



b.



[6] Note that the *berry* of *bóysenbèrry* is not accorded morpheme status simply because a homophonous string *berry* occurs elsewhere in English, but because both the string [bɛri] and the meaning 'small globular juicy fruit not having a stone' are associated with its other occurrences.

[7] The discussion here owes much to McCarthy (1984), who seems to argue against a condition like (4). (See footnote 9.) The rejection of (4) is implicit also in some of the analyses presented in McCarthy (1985).

(5) illustrates how a single-plane analysis of the stems *šudḱ-* and *šuduuḱ-* can proceed if we assume that the underlying order of root segments is *šduḱ*. The initial association process links phonemes left to right to eligible skeletal slots.[8] Its immediate output consists of the (linearized) representations *šVdḱ, šVdu:ḱ,* each of which contains a segmentally empty V slot. The vowel *u* is inaccessible for association to this V in both cases. Failing association, which I assume to be the unmarked means of segmentally specifying a skeletal slot, the option of copying the root melody is taken. Since the Yokuts verbal root is monovocalic, only one segment, *u* in this case, can associate to the empty V: for this reason, we need not specify here, as in other cases of reduplicative infixation, the directionality of association.

The illustrative derivations in (5) assume that the root melody is *šduḱ*. But it is easy to verify that, if we rely on Melody Copy to derive the Yokuts stem alternants, the underlying order of consonants and vowels becomes indeterminate: the underlying melodies *šduḱ, šudḱ, ušdḱ, šdḱu* will produce the same results when mapped, via association and Melody Copy, onto CVCC and CVCVC templates. In this respect the single-plane analysis based on Melody Copy is quite similar to the two-plane analysis in (2). To clarify the derivation of individual cases, I will assume that the neutral templates of Yokuts—those not supplied by an affix—reflect the underlying order of root segments. In the case of the verb 'take off' the neutral template is—as we see below—CCVVC (surface CVCVVC, as before the neutral affix *in* 'medio-passive': *šuduuḱ-un-šuʔ* 'it came off'); the root is therefore *šduḱ*.

The single-plane analysis of Yokuts differs from Broselow and McCarthy's reduplicative infixation cases in one respect: the empty V slot that triggers copying is not infixed by an affixation rule independent of the one supplying the basic template. However, this aspect of the analysis finds support and a significant precedent in Bat-El's (1984) demonstration that melodic reduplication in Modern Hebrew is triggered by empty skeleton sequences belonging to the underlying root template.[9] Though Bat-El's examples do not involve *infixing* reduplication, there is every reason to expect that such cases will also exist. Thus, the single-plane analysis of Yokuts based on reduplicative infixation turns out to fit without difficulty into a rather well understood class of phenomena.

In the next section I consider the data presented by Archangeli (1985) as support for the vowel plane in Yokuts. Although Archangeli's analysis of these facts is also open to the objection that it violates (4), this constraint on morphological analysis will not be assumed in the argument.

[8] Like Marantz (1982), Broselow and McCarthy (1984), and others, I assume that syllabic (vowel) and nonsyllabic (consonant) melodies are distinguishable as such even when floating. I also make the standard assumption that vowel melodies map only onto V slots and consonant melodies map only onto C slots. Some discussion of this issue and of the role of syllabicity in reduplication can be found in Clements (1985) and Steriade (1985).

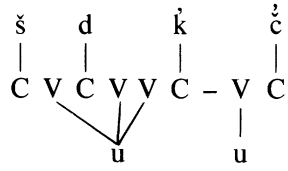
[9] The case of Warlpiri reduplication, taken by McCarthy (1984) to argue against a constraint on morphological analyses like (4), can be accounted for along the same lines as Bat-El's analysis of Modern Hebrew reduplication.

1.2. Yokuts Lowering: The Other Argument for the Vowel Plane

All Yokuts dialects lower their high long vowels to mid: underlying or intermediate *ii*, *uu* surface everywhere as *ee*, *oo*. But Yokuts is split into two dialectal groups by an isogloss that concerns the lowering of high vowels in root-internal sequences CVCVV(C)-. In the Gashowu, Choynimni, and Chukchansi dialects lowering appears to affect not only the long high vowel in the second (CVV(C)) syllable but also the high vowel in the first: thus, intermediate /šuduuk̓-uč̓/ 'one who is removing it' becomes *šodook̓-uč̓* in Gashowu. In Yawelmani, Chawchila, and Wikchamni lowering affects only the syllable containing the long vowel: /šuduuk̓-uč̓/ becomes *šudook̓uč̓*. I will refer to the characteristic Gashowu lowering in the first syllable of forms like *šodook̓* as *Secondary Lowering*.

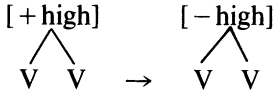
The assumption that the Yokuts root vocalism occupies a different plane from its consonantism is exploited by Archangeli to derive the facts of Gashowu Secondary Lowering: if the representation of the root /šuduuk̓-/ in Gashowu is as shown in (6), the lowering of the first vowel could be seen as an unavoidable consequence of the application of Lowering to the second, long vowel:

(6)

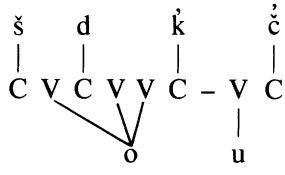


The rule of Lowering applies to the second syllable of this root and, in so doing, cannot avoid affecting the first syllable as well:

(7) a. *Lowering*



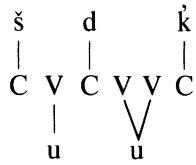
b. *Effect of Lowering in Gashowu*



A prediction of this analysis that cannot be fully verified for the verbal system is that forms whose intermediate representation contains a *CiiCiC, CuuCuC* sequence will be subject to Secondary Lowering and surface as *CeeCeC, CooCoC* in the Gashowu group. I return to this prediction below.

Archangeli suggests that the absence of Secondary Lowering from the Yawelmani group is due to the fact that bisyllabic templates are bivocalic there:[10]

(8)



Returning now to the facts of Gashowu, the application of Lowering to an input like (6) has taken place, according to Archangeli, despite the fact that the first V linked to *u* does not meet the structural description of the rule: Lowering requires that the two Vs in (7) be adjacent to one another, yet the first V linked to *u* in (6) is not adjacent to the other two.

The application of Lowering to (6) raises serious questions: when a similar conflict in applicability arises with other monosegmental geminates, the rule is blocked. As this type of rule blockage has been discussed extensively elsewhere (Steriade (1982), Hayes (1984), Steriade and Schein (1984; 1985)), one example will suffice. In Tigrinya a velar or uvular stop spirantizes after a syllabic nucleus. When the stop is geminate, however, the rule fails to apply. Steriade and Schein's interpretation is, roughly, that only one of the two Cs in the geminate cluster is adjacent to the context Nucleus: Spirantization cannot apply to the contents of the first C without also affecting the second one. Under such circumstances any feature-changing rule, like Tigrinya Spirantization or Yokuts Lowering, is blocked. A detailed justification of this interpretation of rule blockage by monosegmental geminates is presented in Steriade and Schein (1984; 1985). A different interpretation of this widespread phenomenon is presented by Hayes (1984). Hayes refers to this paradigm of rule blockage as *inalterability,* and I will adopt his term here. According to Hayes, the association lines represented in the structural description of phonological rules are always interpreted as exhaustive. This means that a rule whose structural description mentions an autosegment linked to an element of another plane cann apply to a string containing a multiply attached instance of that autosegment unless an association lines present in that string are explicitly mentioned in the structural description of the rule. Hayes's proposal would also predict that Yokuts Lowering will fail to apply to the structure in (6), since the rule itself mentions a doubly—not a triply—attached vowel.

We need not discuss here the differences between these two hypotheses on inalterability or the means to test them. What needs to be stressed is that one must explain why every rule so far examined in the literature that shares with Yokuts Lowering the

[10] This is actually a simplification of her position: the representation of Yawelmani *šudook̓uč̓* in (8) is not underlying, according to Archangeli (1985), but results from the operation of redundancy rules that fill in an underlying segmentally empty head of a syllable. I consider here the stages in the derivation that follow the operation of these redundancy rules. I also simplify the discussion by ignoring the way Archangeli represents the specifications for [round] in the Yokuts vowels.

property of mentioning in its description both the segmental and the skeletal planes will fail to affect monosegmental geminates, unless all skeletal slots of the geminate meet the conditions of applicability of the rule. Thus, if the hypotheses on rule application formulated to explain inalterability are disconfirmed by the Yokuts data, one must seek an alternative explanation of the paradigm. But, as long as no alternative explanation for inalterability presents itself, one must reanalyze the facts of Yokuts.

Archangeli's hypothesis that Lowering applies to representations like (6) also raises problems for a different hypothesis: that of tier (or, in Archangeli's terms, plane) conflation. Younes (1983) and McCarthy (1984) present a number of arguments to the effect that distinct segmental planes do not survive postlexically.[11] Lowering is, as shown in the next section, postcyclic and postlexical. If it applies to (6) as claimed, one must explain why tier conflation has not taken place. Again, we are faced with the choice of rejecting tier conflation, even though no alternative explanation of Younes's and McCarthy's facts is available, or of reanalyzing the Yokuts data. As it will turn out, the internal logic of Archangeli's proposal requires that tier conflation be maintained for languages other than Yokuts.

1.3. Postcyclic Lowering and Tier Conflation

As Kuroda (1967) and Archangeli (1984) show, Lowering must follow Vowel Harmony: the latter applies only to sequences of vowels of identical height and is blocked in forms such as Gashowu *mooṣ-ini* 'will gather nuts' or intermediate *huud-ʔas* 'know', where the target vowel differs in height from the trigger. In forms such as Gashowu *dogoog-uṭ* 'was pointed at' from intermediate *duguug-Iṭ* (*I*, a high vowel unspecified for [back] and [round]), the epenthetic final high vowel must undergo Vowel Harmony before Lowering applies. Otherwise, the output of Lowering, **dogoog-Iṭ*, will be identical to the sequence of vowels in *mooṣ-ini*, where Vowel Harmony does not apply. Thus, Lowering, which could bleed Vowel Harmony, does not, because it is ordered after it.

I show now that Lowering is postcyclic and postlexical. First, Lowering has the standard postcyclic property (Kiparsky (1982; 1983)) of applying in feature-changing fashion to derived as well as underived environments.[12] It has the standard postlexical property of violating Structure Preservation (Kiparsky (1982; 1983)): it creates a segment, *e:*, which does not occur in the underlying segmental inventory of Yokuts.

Second, if Lowering were cyclic, then in some derivations its application on an internal cycle would be able to bleed Vowel Harmony. Consider the underlying repre-

[11] McCarthy's position is in fact that segmental planes are conflated after every level of affixation. A fortiori, they will have been conflated by the onset of the postlexical component.

[12] In assuming that Lowering changes features, I follow Archangeli's (1984) arguments to that effect. But one can point to Levergood's (1984) work as an indication that all segmental rules, whether feature-changing or feature-filling, are constrained in identical ways by the Strict Cycle. When applied to Yokuts, Levergood's results entail that Lowering must be postcyclic since, whether feature-changing or not, it is a segmental rule applying in nonderived environments.

sentation of Chukchansi *wo?ooy-oo-wuš-ḳa*[13] 'make yourself to fall asleep' ('sleep-caus-refl-imp'): /wu?IIy-II-wIš-ḳA/. The capital letters I and A stand for high and low vowels unspecified for roundness. If Lowering had applied on the second cycle, before the suffix /-wIš/ has been affixed, Vowel Harmony on the third cycle would be bled and the derivation would result in **wo?ooy-oo-wiš-ḳa*. Below I compare derivations of this form based on cyclic and postcyclic Lowering. I assume, with Archangeli, that the cyclic rules start operating on the second cycle, although the precise delimitation of cyclic domains in Yokuts is irrelevant to the argument:

(9)

	Postcyclic Lowering	*Cyclic Lowering*
Underlying Representation	wu?IIy-II-wIš-ḳA	wu?IIy-II-wIš-ḳA
	Postcyclic	*Cycle 2*
Vowel Harmony	wu?uuy-uu-wuš-ḳa	wu?uuy-uu
Lowering	wu?ooy-oo-wuš-ḳa	wu?ooy-oo
		Cycle 3
Vowel Harmony		not applicable
Lowering		not applicable
Surface	wo?ooyoowuška	*wo?ooyoowišḳa[14]

Since Lowering is postcyclic, we may compare its application in Yokuts to the application of postcyclic rules in Semitic, another language family for which one can posit monosegmental "long-distance" geminates as in (1) and (6). If the mode of application of Lowering in Yokuts violates inalterability, as Archangeli argues, we could construe this fact broadly and hypothesize that *all* long-distance geminates will have the same property. The Semitic languages allow a first test of this hypothesis.

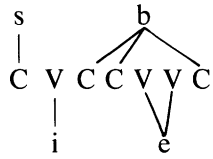
Semitic Spirantization is the postcyclic rule that invites comparison with Yokuts Lowering. I consider two versions of this rule: that of Biblical Hebrew (Leben (1980), McCarthy (1981)), which applies to all postvocalic stops, and that of Tigrinya (Schein (1981), Kenstowicz (1982)), which applies to velars and uvulars only. Both Hebrew and Tigrinya arguably have, at some level of the derivation, structures similar to (1) and (6), containing a segmentally linked configuration of three C slots, of which two Cs form an adjacent geminate cluster. In fact, the arguments for such structures are much more compelling in Semitic than in Yokuts, since the separation of segmental tiers can be justified on morphological grounds. Consider now the derivation of Hebrew *sibbeeβ* 'to

[13] Newman (1944, 88). The actual surface form is *wo?ooy-o-wuš-ḳa* and results from shortening the second instance of *oo*. The causative suffix shortens regularly in Chukchansi, even in (apparently) open syllables. One may attribute this to the fact that the causative suffix is *-IIC-* underlyingly: two unspecified high vowels and an empty C. The intermediate string would then be *wo?ooyooCwušḳa* and the causative *oo* would regularly undergo Closed Syllable Shortening, a general rule in Yokuts.

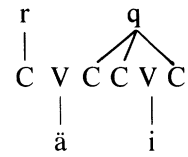
[14] The lowering in the initial syllable of forms like *wo?ooy-* is explained in Newman (1944) as a pandialectal phenomenon in Yokuts whereby any sequence V?VV in which the vowels are both nonlow assimilate in height. This rule has no connection to Secondary Lowering.

turn' and that of Tigrinya *räqqiχ* 'thin', forms whose morphology requires the representations in (10):[15]

(10) a.

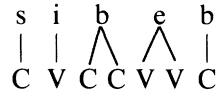


b.

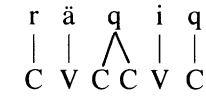


The surface representations *sibbeeβ, räqqiχ* indicate that Spirantization applies to the last instance of *b* and *q* without affecting the segmental content of the first two Cs in the linked configuration. If Spirantization had applied to (10) as Lowering is claimed to apply in (6), it would have produced **siββeeβ* and **räχχiχ*. The actual surface forms, *sibbeeβ* and *räqqiχ*, do appear to involve a violation of inalterability, if we assume that they apply to (10), but a radically different type of violation from the one posited by Archangeli for Yokuts. In fact, the difficulty raised by *sibbeeβ* and *räqqiχ* for inalterability is removed once we adopt Younes's and McCarthy's mechanism of tier conflation: the conflation of segmental planes will produce the representations in (11), to which Spirantization, a postcyclic rule that must follow tier conflation, can apply in regular fashion to derive the surface forms:

(11) a.



b.



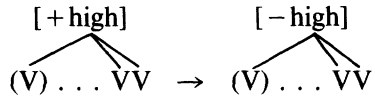
Note that we must assume tier conflation not just to save some account of inalterability effects but also in order to explain how a single underlying segment, *b* or *q*, splits into two distinct surface segments *b* and β, *q* and χ. To see this, assume that tier conflation does not take place and that Spirantization applies to every postvocalic X slot occupied by an obstruent (in Hebrew) or a [+back] obstruent (in Tigrinya). In order to allow Spirantization to apply to the last C in the geminate configuration, we must assume that no inalterability constraints obtain. If so, Spirantization will apply not only to the last C linked to the obstruent but also to the first: we will then obtain not the expected *sibbeeβ, räqqiχ* but **siβbeeβ, *räχqiχ*.

Spirantization is not the only postcyclic rule whose interaction with inalterability requires tier conflation. Two Tigrinya rules that affect the vocalism provide identical arguments for tier conflation; these are discussed in Steriade and Schein (1985). Thus, the application of Semitic postcyclic rules to forms that contain underlying long-distance geminates establishes the need for tier conflation and is compatible, modulo tier conflation, with known accounts of inalterability. In contrast, the application of postcyclic Lowering to the long-distance geminate in (6) is incompatible both with the hypothesis of tier conflation and with inalterability.

[15] On *sibbeeβ*, see McCarthy (1979, 269); *räqqiχ* belongs to a class of adjectives that denote physical properties and have the uniform CVCCVC template and the uniform *ä . . . i* vocalism. See Leslau (1941).

1.4. A Rejected Alternative

Could we solve half of the problem by reformulating the rule of Yokuts Lowering so as to make its application to (6) compatible with the typology of inalterability? The only obvious alternative to (7), (12), is easily dismissed as a solution to the problem at hand:

(12) 

Although the parenthesis notation in (12) cannot itself be rejected, rules like (12) must be: allowing such rules will make it possible as well to expect rules like Tigrinya Spirantization to use the same mechanism and thus escape inalterability. Since Yokuts Lowering appears to be the only rule of its type that violates inalterability, we must question not the obviously accurate statement in (7) but the representations to which it applies.[16] We should ask whether an explanation of Gashowu Secondary Lowering must in fact rely on representations like (6).

1.5. Secondary Lowering as Melody Copy

I begin by showing that Archangeli's explanation for Secondary Lowering, which is the sole remaining argument for (6), must be abandoned in any case, for reasons internal to Yokuts. The structure of the argument is the following. An analysis that explains Secondary Lowering by assuming that (6) is the input to Lowering predicts that Secondary Lowering will occur in all and only the forms for which long-distance vocalic geminates can be posited. I show first that Secondary Lowering occurs in forms for which representations like (6) cannot be justified. I show then that Secondary Lowering always fails to occur word-internally, regardless of whether or not the individual form where it fails to occur might, by Archangeli's criteria, contain a long-distance vocalic geminate.

Although some template morphology is observable in the Yokuts nominal system, noun roots tend to differ systematically from verbs in having largely unpredictable skeleta and in admitting more than one vowel quality per morpheme. Newman (1944, 169) states this clearly:

> In contrast to the base [verbal root—D.S.], which is invariably bivocalic and bisyllabic, the theme [nominal root—D.S.] may contain any number of vowels and syllables; in further contrast to the base, whose two vowels belong to the same vowel series [have the same vowel quality—D.S.], the theme may be composed of heterogeneous vowels, members of any vowel series.

Typical of the nominal roots are items like *ṗiṣloo* 'mouse', *baʔoonaay* 'wasp', *koʔteeyaa* 'buzzard', *gawaayuʔ* 'horse', *ʔuplalli* 'wild dove', *antuw* 'shaman', *baluw* 'west', *ʔitwooṗ* 'woman's brother's wife', *beemamguċ* 'hummingbird'. Recall now that Archangeli's

[16] On the exact nature of the principle that rules out (12), see Steriade and Schein (1985).

original argument for separating a root-internal vowel tier in Yokuts is that verb roots are monovocalic. Since noun roots do not have this property, it would appear that there is no justification for assuming structures like (6) for the nouns. If so, an explanation of Secondary Lowering that depends on (6) will predict that this phenomenon will not have a nominal counterpart. This prediction is incorrect: Newman cites items like Choynimni *nepeey* 'wife's brother', *lemeeda* 'bottle', *hogooyus* 'sibling of opposite sex', *bočoon* 'man', Chukchansi and Gashowu *ṣeleela-w* 'stone-loc', *nebeeč́* 'older brother', Gashowu *goyoolum* 'young woman', *ḳeteeč́* 'short', and many others. Especially significant are stems like *lemeeda*, *ṣeleela-*, whose skeleton and vocalism are clearly unpredictable: such forms do not share with the verbs a predictable skeleton and vocalism but do exhibit Secondary Lowering.

Alternatively, let us assume that, even without justification, the vowel and consonant planes are distinct in the nominal roots and that representations like (6) may be appropriate for all tautomorphemic sequences of identical vowels in Yokuts. We might hypothesize that nonconcatenative morphology is always automatically associated with the existence of a vowel plane.[17] However, this hypothesis is also untenable. Nonverbal roots of the Gashowu group are significant also because they occasionally attest CVVCVC sequences. Recall that an analysis that attributes the phenomenon of Secondary Lowering to the fact that representations like (6) are the input to Lowering in Gashowu will also predict that Secondary Lowering takes place from left to right in CVVCVC morphemes. This prediction is also disconfirmed. The Gashowu group contains items like Choynimni *hoo?su?-u* 'coyote' (surface *ho?su?u*), Chukchansi *ḳeenič́-in* 'red ant-poss', *weewila-w* 'tree limb-loc'. Verbal forms of the same type are also occasionally found: Choynimni *?ooššut-uč́* (surface *?oššutuč́*) 'steal-agent'. The list of such items is necessarily small: the short high vowel we are interested in must be found in an open syllable, so as not to be analyzable as epenthetic. As Archangeli (1984) shows, many high vowels in open syllables are subject to a somewhat irregular process of Syncope; hence the relative rarity of forms like *ḳeeničin*. But the significant fact is that the instances of left-to-right Secondary Lowering predicted by Archangeli's analysis never occur.

Moreover, Secondary Lowering does not take place in disyllabic suffixes. An example of a relevant suffix is Chukchansi /-iwii/ 'immediately' (Newman (1944, 117)): *tux-uwoo-ḳ* 'tie-immediately-imp', *beleen-iwee-ḳ* 'wrap up-immediately-imp'. Note again that the suffix-initial vowel cannot be epenthetic.

To sum up the discussion so far: contrary to the predictions of Archangeli's analysis, Secondary Lowering is attested in Gashowu only in the word-initial syllable, regardless of whether the word-initial morpheme is a verb, for which representations like (6) might be justified, or a noun, for which they are not. Word-internally, Secondary Lowering never takes place.

[17] I am indebted to D. Archangeli for this suggestion.

My analysis of Secondary Lowering is based on the idea that related dialects might differ from each other in the relative ordering of identical rules. I suggest, following Kuroda (1967), that all verbal roots and many nominal roots whose surface skeleton is CVCVVC are underlyingly CCVVC. The first consonant in a word-initial CC cluster can be assumed to be extrasyllabic throughout the lexical component and triggers a version of Kuroda's vowel-copy rule postlexically.[18] It is the relative order between this vowel-copy rule and the rule of Lowering that brings about the difference between Yawelmani and Gashowu. Vowel Copy precedes Lowering in Yawelmani but follows it in Gashowu:

(13)	*Yawelmani* /šduuḵ-/		*Gashowu* /šduuḵ-/
Vowel Copy	šuduuḵ	Lowering	šdooḵ
Lowering	šudooḵ	Vowel Copy	šodooḵ

Secondary Lowering is then just the effect of the Gashowu order between Vowel Copy and Lowering. The reason why it never occurs word-internally is that Vowel Copy is preempted there by the earlier rule of Epenthesis. The absence of Secondary Lowering in forms like Chukchansi *tux-uwoo-k* or *keenič-in* is now fully explained: the short high vowels in these morphemes are underlying, not the result of Vowel Copy. This analysis has the further benefit that it reveals a deep symmetry in the verbal template pool of Yokuts: there exist only three closely related templates, CVCC, CCVVC, and CVVCC (the last two essentially being CVVC preceded or followed by a C). The analysis also predicts the possible existence of *CuCooC-*, *CiCeeC-* nominal forms in Gashowu: nouns whose underlying structure is CVCVVC and whose first two vowels happen to be both [+high]. Since the first is not a copy of the second, Lowering ought not to affect it. I have found so far one relevant form in Newman's data (1944, 200–201): Chukchansi *ṭuyoṣ* 'bow' (from underlying *ṭuyuuṣ*), contrasting with the related form *ṭoyooṣu-* 'arrow' (from intermediate *ṭyuuṣu*).

The formal relation between Epenthesis proper and Vowel Copy must now be clarified. Both rules insert a vowel next to a stray consonant (C′), but the locus of Epenthesis is to the left of the stray C (VC_C′#, VC_C′C), whereas Vowel Copy takes place to its right (#C′_CV). The second source of difference is the segmental specification of the inserted vowel. The result of Epenthesis proper is a high vowel unspecified for [back, round], whereas Vowel Copy creates an exact replica of the first vowel of the word.

Recall now that we have justified a process of Melody Copy for Yokuts. The change in assumptions about Yokuts templates—replacing CVCVVC by CCVVC—does not affect the conclusions of section 1.1. Melody Copy is still necessary to maintain a single-plane analysis of alternations illustrated by *šudḵ-*/ (intermediate *šduuḵ*). I suggest then

[18] There exist numerous precedents for the hypothesis that a consonant at either edge of the word may remain unsyllabified throughout most of the derivation. A discussion of such cases in Latin, Sanskrit, and some dialects of Ancient Greek is presented in Steriade (1982).

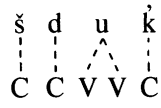
that Vowel Copy is the joint effect of the postlexical Epenthesis rule in (14) (distinct from Epenthesis proper, a lexical rule) and of the postlexical application of Melody Copy.

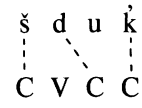
(14) $\emptyset \rightarrow$ V / C′ ___

The derivation of the *šudǩ/šudook* alternation in Yawelmani is shown below. The Gashowu derivation is identical save for the order between Lowering and Melody Copy.

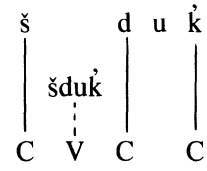
(15) *Lexical*

Association



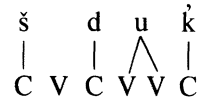


Melody Copy not applicable



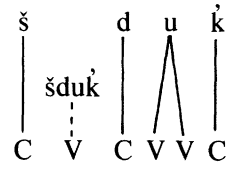
Postlexical

(14)

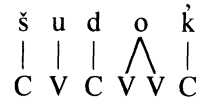


not applicable

Melody Copy



Lowering



The logical consequence of this analysis is that Epenthesis proper, in contrast to (14), must introduce a vowel prespecified as [+high]:[19]

(16) *Epenthesis proper*

$\emptyset \rightarrow$ V / ___ C′

[+high]

[19] As far as I can tell, no independent argument establishes Archangeli's (1984) contention that the feature value [+high] is supplied only by redundancy rules in Yokuts. As for the hypothesis that epenthesis rules never insert more than just a nuclear slot, it is clearly disconfirmed by languages like Hungarian (Vago (1974)), which, like Yokuts, have more than one type of epenthetic vowel.

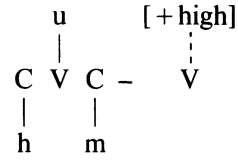
2. Conclusions

We have seen that an explanation of Secondary Lowering does not have to rely on representations like (6) or, more generally, on the existence of a root-internal vowel plane in Yokuts. The analysis proposed here for Secondary Lowering accounts for the fact that this phenomenon never occurs anywhere except word-initially, regardless of morpheme structure or lexical category. This analysis is also compatible with any account of inalterability and does not raise difficulties for the hypothesis of tier conflation: the Yokuts data do not bear on either.

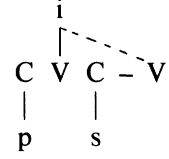
Secondary Lowering would have established the existence of the vowel plane in Yokuts, if the explanation for it had to rely on (6). We have seen that it does not: the facts of Secondary Lowering do not then bear on the issue of the vowel plane either. In the absence of any remaining argument for the vowel plane, I conclude that the Yokuts material does not require a weakening of McCarthy's original position or of the constraint in (4): distinct segmental planes must correspond to distinct morphemes, and in a concatenation of two distinct morphemes at least one must be able to occur independently.

This conclusion is perhaps more far-reaching than it seems. There appear to be no more than four well-documented cases in the literature whose analysis relies on a morpheme-internal vowel plane: Yokuts, Sierra Miwok (Smith (1984)), Ainu (Itô (1984)), and Rotuman (Saito (1981), McCarthy (1985)). I have not attempted a reanalysis of the rather complex data of Rotuman. The facts of Sierra Miwok appear compatible with the same type of reduplicative infixation as that sketched for Yokuts in section 1.1. Finally, the Ainu data, for whose analysis I rely on Itô's study, do not appear to provide a compelling argument for the vowel plane either. Itô notes a contrast between two types of root morphemes ending in a floating vowel: morphemes like *humi* 'to chop up', *poki* 'to lower', *piru* 'to wipe', *ketu* 'to rub', whose last segment is a high vowel with the opposite specification for backness from the root-internal vowel; and monovocalic morphemes like *maka* 'to open', *kere* 'to touch', *pisi* 'to ask', *popo* 'to boil', *tusu* 'to shake'. As the last segment of such roots is either high and [−αback] with respect to the root-internal vowel (as in *humi*) or else an exact copy of that vowel (as in *pisi*), Itô suggests that the *humi*-type roots have the structure in (17) and that the *pisi*-type roots are represented as in (18):

(17)



(18)



The surface form *humi* is derived by a rule of Melodic Dissimilation that specifies a high vowel with the opposite value for backness from the preceding vowel. Since forms like *pisi* do not undergo Melodic Dissimilation, Itô hypothesizes that they are monovocalic, as shown in (18): no vowel precedes *i* in (18), and therefore Melodic Dissimilation cannot be triggered. It is suggested that surface *pisi* results from multiple association of the root vowel, *across an intervening tautomorphemic consonant:* this last aspect of Itô's analysis is meant to establish the vowel plane for Ainu. But alternative interpretations exist. The least interesting option is that the *pisi* class contains bivocalic roots, like the *humi* class, but is exceptional with respect to Melodic Dissimilation. Alternatively, we could admit that *pisi* is underlyingly monovocalic /pis/ and hypothesize that a melody-copy rule fills the suffixal V slot shown in (18) *after Melodic Dissimilation applies*. We would then be able to maintain Itô's explanation for undissimilated *pisi* without being committed to the vowel plane. The point of interest is simply that the contrast between the two Ainu root classes discussed by Itô is not sufficient to establish a separation of segmental planes.

It is to be anticipated, then, that all other evidence that appears to support morpheme-internal vowel planes will yield to reanalysis.

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