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SELECTED STUDIES IN UTO-AZTECAN PHONOLOGY[1]

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0. Introduction. I present in this article three separate studies of synchronic and historical Uto-Aztecan phonology. In the first, I examine the distribution of *s* and *š* in the Northern Uto-Aztecan language (itself a subfamily) Tübatulabal and consider its consequences both for the synchronic analysis of that language and for typological and historical studies in general. I then compare the resulting description of the historical development of the Tübatulabal fricatives with some features of the evolution of certain labials in the Southern Uto-Aztecan subfamily Pimic.

Next, I discuss a number of synchronic and historical rules involving the loss of or changes in proto- or underlying glides, with examples drawn from the southern branch of the Northern Uto-Aztecan subfamily Numic, from Cahuilla (a language of the Cupan branch of the Northern subfamily Takic), and from the little-known Takic language Gabrielino.

Finally, I give a brief introduction to the morphophonology of noun plurals, especially reduplicated ones, in Gabrielino, and suggest how some of the emerging Gabrielino evidence may be related to my own claims (Munro 1977; 1981) regarding the reconstruction of stress in Takic and Uto-Aztecan generally.

1. *s* and *š* in Tübatulabal, and *v* and *w* in Pimic. Typical listings of Tübatulabal phonemes (e.g., Voegelin, Voegelin, and Hale 1962:18) note only one fricative, other than *h* and its variants, and that fricative is

invariably specified as *š*, which is identified as a reflex of Proto-Uto-Aztecan **s* (Voegelin, Voegelin, and Hale 1962:43,[2] 64; Miller 1967:8–9). No mention is made in surveys like these, or in Voegelin's Tübatulabal dictionary (1958), of a Tübatulabal *s*. Voegelin does identify a secondary development of phonemic *š* to *s* in his Tübatulabal grammar (1935:83; I have updated the transcriptions to follow the "Working Dictionary" [1958] orthography):

> It is curious that while affricates occur in both alveolar (*ts*) [*c*] and palato-alveolar (*tc*) [*č*] series as primary consonants, the homorganic fricative (*c*) [*š*] occurs only in palato-alveolar position as a primary consonant. -*c*- [-*š*-] becomes alveolarized when juxtaposed to the alveolar affricate, -*ts*- [-*c*-]:

> cïnï?ác   [šɨnɨ?áš]   the soldier
> cïnï?ásts   [šɨnɨ?ásc]   the soldiers

Those of us who have been privileged to hear Tübatulabal spoken by William Mace, who lives in the Los Angeles area, do not recognize this description of the Tübatulabal fricatives. Lisabeth Ryder (1976) first observed that *s*'s greatly predominate over *š*'s in Mr. Mace's speech, and she suggested that, in fact, the two phones appeared to be in nearly complementary distribution (cf. Bright 1978). My subsequent study with Mr. Mace has confirmed this impression.

Let me begin by comparing some words from Mr. Mace's speech with their equivalents from Voegelin's dictionary. (In general, Mr. Mace follows the dictionary very well, with only minor divergences; for ease in comparison, I present mostly words in which the only difference is in the choice of *s* or *š*.)[3]

(1)		Bill Mace's Form	Working Dictionary Form
	'manure'	*sa:l*	*ša:l*
	'bathe'	*?a:sɨt / ?a?as*	*?a:šɨt / ?a?aš*
	'barn owl'	*se?egapišt*	*še?egapišt*
	'snake'	*sɨmɨnt*	*šɨmɨnt*
	'sit cross-legged'	*mɨ:sɨt / ?ɨ:mɨs*	*mɨ:šɨt / ?ɨ:mɨš*
	'make a hole'	*so?lot / ?o:so:lo*	*šo:lo- / ?o:šo:lo*
	'jackrabbit'	*su:?it*	*šu:?it*
	'copulate eagerly'	*su:bu?su:bat*	*šu:bu?šu:ba-*

These examples demonstrate that Mr. Mace's *s* can correspond to *š* initially, medially, in clusters, and finally. However, as 'barn owl' shows,

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[2] On page 43 there is, I believe, a misprint of *s* for *š*. Voegelin, Voegelin, and Hale nowhere else mention a Tübatulabal *s*.

[3] For consistency I cite all atelic forms from Mr. Mace's speech with the suffix -*t*. I have adjusted some glosses (making them more general) so as to include the words' meanings in both dialects.

sometimes Mr. Mace has *š* corresponding to Voegelin's *š*. This is true also in examples like:

(2)		Bill Mace's Form	Working Dictionary Form
	'urinate'	*ši?ɨt / ?i:ši?*	*ši?ɨt / ?i:ši?*
	'navel'	*ši:dulust*	*ši:dulušt*
	'weed sp.'	*ši:gišt*	*ši:gišt*

Inspection reveals that Mr. Mace's *š* occurs only in the environment of *i*. This is confirmed by the fact that all the words in Voegelin's dictionary beginning with *ši* which Mr. Mace recognizes are pronounced by him with initial *š*, while other *š*-initial words in the dictionary are pronounced with initial *s*. One exception to this generalization, however, is:

(3)		Bill Mace's Form	Working Dictionary Form
	'ice'	*sɨpt*	*šipt*

Here one would expect Mr. Mace's form to agree with the Voegelin form, but note that the vowel of his form is *ɨ*, which one would not expect to occur with a preceding *š* after all. In fact, this word reflects a fairly well known set of correspondences (Miller 1967:#94) in which *ɨ* is a more usual vowel than *i*; Mr. Mace's form may well be conservative. In other such cases, for instance:

(4)		Bill Mace's Form	Working Dictionary Form
	'back (adverbial)'	*sɨuba/sɨ:ba*	*šiuba*

I cannot provide a Uto-Aztecan etymology, but one may at least hypothesize some alternation in vowel quality between Mr. Mace's dialect and that of Voegelin's consultants.

The examples already presented show that *š* does not occur merely in front of *i*— consider words like 'barn owl' and 'weed sp.', in which the *-išt* ending occurs. There are more forms in which *š* occurs following *i*:

(5)		Bill Mace's Form	Working Dictionary Form
	'red racer'	*pišu:gant*	*pišu:gat*
	'pole/post'	*yigišanil*	*yɨ:gišanil*

These same generalizations concerning the distribution of *š* and *s* apply to the treatment of Spanish [s] in loanwords:[4]

(6)		Bill Mace's Form	Working Dictionary Form
	'week'	*šima:na*	*šima:na*
	'onions'	*šivo:ya*	(not in Voegelin 1958)
	'sugar'	*?asu:ga*	(not in Voegelin 1958)
	'Monday'	*lu:nas*	*lu:naš*

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4 A *?* is often heard at the end of vowel-final nouns.

'Saturday'	*sa:varu*	*ša:varu*
'corn'	*maišt*	(not in Voegelin 1958)

The alternation is also revealed morphophonemically, for instance when the causative/transitive suffix -*in* is added to a stem. Compare the following:

(7)   Bill Mace: *wimsɨt* 'moving over'/*wimšinat* 'making room for'
        Voegelin: *wimšɨt* 'to give room'/ *wimšin* 'to give him roadway'

A few words that I have recorded from Mr. Mace originally looked like exceptions to me because of the presence of *š*'s with no adjacent *i*. In general, these fall into two groups. Some are nouns ending in *št*, like:

(8)   Bill Mace's Form   Working Dictionary Form
        'belly'   *sapušt*   *šapušt*

If the *št* in words like this can be identified with Voegelin's instrumental nominalizer -*š-t* (1935:157), there is no problem, since Voegelin associates this nominalizer with an incremental *i* vowel which is sometimes deleted. (Note, however, that 'navel' in 2 above suggests that not all of Voegelin's final -*št*'s will be treated this way in Mr. Mace's speech.) Another possibility is suggested by:

(9)   Bill Mace's Form   Working Dictionary Form
        'body filth'   *tugu:bišt* (abs.)   (not in Voegelin 1958)
        'his body filth' *tugu:bišin*   *tugu:bišn*

Voegelin's presentation of words like *tugu:bišn* (i.e., stem-instrumental-possessive) in the Working Dictionary strongly suggests that the -*n* adds no mora value to the word, a conclusion which is supported by the Grammar (1935:195, e.g.), in which possessed instrumental forms are cited with stress on the *i* before the *š* and a final voiceless nasal (i.e., with -'*cn* [modern -'*šn*]). This is different from Bill Mace's form, in which the *n* is not devoiced, but is part of a separate syllable with an *i* vowel which receives the main word stress (thus, *tugu:bišín*). I am not prepared to argue whether Mr. Mace's treatment or that of Voegelin's consultants is the more conservative, but (9) does suggest the possibility that the instrumental suffix might also include an *i* following the *š* at some level—which, again, would lead to its retention as *š* in Bill Mace's speech.[5]

The other morphemes in which Bill Mace consistently shows an unexpected *š* are the future suffix, which for him is always -*ša*, and other related verbal suffixes. Once again, Voegelin's Grammar shows that these are no problem for the analysis presented above, since these suffixes also include a possible incremental *i* (Voegelin 1935:97).

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[5] Another possibility, of course, is that the *i* in question is part of the possessive suffix.

Now that I have described the way *s* and *š* pattern in Bill Mace's speech, and contrasted this with the near-universal use of *š* described by Voegelin, let us consider which of the two represents the more conservative style of the language.

At first glance one might expect the *š* dialect of Voegelin's consultants to be the older, since they were all born before Bill Mace. Against this, however, is the fact that Mr. Mace learned the language from his grandparents, who must have been generationally equivalent to Voegelin's oldest consultant. A second possibility is that Bill Mace's speech represents an idiosyncratic personal development, not unexpected, perhaps, in one who has used the language relatively little in recent decades.

However, as Voegelin, Voegelin, and Hale (1962) suggest in their discussion of Uto-Aztecan phonological typology, an across-the-board switch of *s* to *š* or *ş* is uncharacteristic of Uto-Aztecan—no other language shows only *š* or *ş* as its reflex of *s* (cf. Miller 1967:8–9). (Luiseño, in which almost all *s*'s have become *ş* and *s* is retained for the most part only in marked forms such as those derived by sound symbolism, is perhaps the closest case.) Further, as Voegelin, Voegelin, and Hale point out (and as Voegelin suggests in the quotation cited above), the distribution of alveolar and alveopalatal consonants in Tübatulabal is somewhat skewed:

Alveolar	*t, d*	*c, ẕ*	*n*	l
Alveopalatal[6]	*š*	*č, ẓ*		

The alveolars predominate, and so one might expect that if there is just one fricative, it will be *s*, not *š*. Taken together, these considerations suggest that a stage of Tübatulabal in which the reflex of *s* was *s* with allophonic alternants *s* and *š* might be expected to precede a stage in which all *s*'s were reflected as *š*.[7]

[6] Voegelin, Voegelin, and Hale use the terms "apico-alveolar" and "lamino-alveolar." I am retaining the terminology Voegelin used in 1935 (cf. the quotation cited above).

[7] There is another piece of evidence referring to "typology" and pattern congruity. The "nasalized" reflex of Proto-Uto-Aztecan *s* in Tübatulabal is *nẕ*, a prenasalized alveolar affricate (I use the orthography of Voegelin's "Working Dictionary" rather than the perhaps more usual *nj*—likewise, *ẕ* replaces *j*, and *ẓ*, *ǰ*). The fact that this reflex is alveolar (even in the dialect described by Voegelin—cf. *punẕil* 'eye') supports the general preference for alveolars over alveo-palatals in the Tübatulabal system. However, the retention of an alveolar form *s* in the word for 'eye' cannot be used to argue for the archaism of Bill Mace's system, since one would expect palatalization for him in this environment too—note the following *i* (reconstructible for the protolanguage, according to all sources). What this example may show is the divergence of the nasalized consonants from the other series in the mind of the Tübatulabal speaker at the time of palatalization, since the *s* in 'eye' was not treated like other *s*'s.

A related point is the complexity of the rules needed to derive the two forms of Tübatulabal from each other. Suppose one assumes that the variety of the language described by Voegelin is older and that Bill Mace's dialect derives from it. To describe the development of the Voegelin dialect from Proto-Uto-Aztecan one would need a statement like:

(10) $*s > š$

Then, to describe the development of Bill Mace's dialect one would propose:

(11) $š \rightarrow s \ / \ \begin{Bmatrix} C \\ \# \end{Bmatrix} \underline{\qquad} \begin{bmatrix} V \\ [+X] \end{bmatrix}$

$\begin{bmatrix} V \\ [+X] \end{bmatrix} \underline{\qquad} \begin{Bmatrix} C \\ \# \end{Bmatrix}$

$\begin{bmatrix} V \\ [+X] \end{bmatrix} \underline{\qquad} \begin{bmatrix} V \\ [+X] \end{bmatrix}$

where I am using the expression $\begin{bmatrix} V \\ [+X] \end{bmatrix}$ to represent a vowel specified as $\begin{Bmatrix} [-high] \\ [+back] \end{Bmatrix}$ —that is, as either nonhigh or back. Such a disjunctive specification of the quality of the conditioning vowels is necessary because other [+high] vowels ($ɨ$ and u, which are both [+back]) and another [-back] vowel (e, which is [-high]) may condition the suggested change. (11) is a suspicious rule, since it must include two disjunctively specified environments. That is, (11) seems unduly complicated to say something as simple as "change $š$ to s when it's not next to an i," but "except for" environments are typically difficult to specify in rules.

On the other hand, if one assumes that Bill Mace's way of speaking is the conservative one, one can easily get from there to the dialect of Voegelin's consultants:

(12a) $*s > s$

(12b) $s \rightarrow š/i$ (allophonically, in Mace's speech)

(12c) $s > š$ (in the other dialects)

The difference between (12b) and (11) is not just one of relative rule complexity, it is also one of naturalness. Palatalization of $š$ in the environment of i is a routine process; loss of palatalization in the environment of non-i is much less usual. So naturalness and formal criteria both would support the hypothesis that Bill Mace's speech is conservative in relationship to that of Voegelin's consultants.[8]

[8] I have not considered here the question of whether both Bill Mace's dialect and that of Voegelin's consultants might have developed in parallel, without one being the source of the other. Given such a small speech community as that of the Tübatulabals, this does not seem a reasonable suggestion, but it cannot be ruled out altogether.

The Tübatulabal data examined above, and the conclusions drawn from them, are parallel to the facts concerning the distribution of *v* and *w* in Pimic. Saxton and Saxton (1969) and other standard sources for Papago do not describe any allophonic variation in phonemic *w*, which has long been recognized to derive from Proto-Uto-Aztecan *p* (e.g., Voegelin, Voegelin, and Hale 1962). However, earlier sources on Papago do reveal variation: Sapir (1915:109) interprets Dolores's description (1913) as grouping together [v] and [w] as one phoneme reflecting *p*, with *v* occurring before *a* and *i*, and *w* before *u*, *o*, and *i̶*. The varieties of present-day Pima with which I am familiar are even more restrictive— [w] is pronounced only before the vowel *u*. Thus, there are three different sets of Pimic data to account for:

I (Standard Modern Papago)	II (Dolores's Papago)	III (Modern Pima)
PUA *p* > *w*	PUA *p* > *w* / ____ *u, o, i̶* > *v* / ____ *a, i*	PUA *p* > *w* / ____ *u* > *w* / ____ *a, i,* *o, i̶*

Once again, the case in which one rule may be viewed as an extremely natural assimilation (like the restricted palatalization of *s* to *š* in Tübatulabal) is most believable as the first historical change, and other developments should be viewed as the spreading of this assimilatory rule to less clear conditioning environments.

The key to understanding the Pimic data is to postulate a stage of pre-Pimic in which PUA *p* had become *v*—a generalization of a spirantization process observed in many branches of Uto-Aztecan. If one then reconsiders I, II, and III above, the most natural-looking rule is the Pima one by which *v* > *w* before *u*; this is much better motivated than the others listed, because of the similarity in articulation and sound (and thus in features) between *w* and *u*.

Let me outline the development of the reflexes of PUA *p*, in a series of separate stages:

Stage I (pre-Pimic): PUA *p* > *v* (unconditioned?).

Stage II (immediately before the separation of the ancestors of modern Pima and modern Papago): *v* > *w* / ____ *u*. (Pima shows no further changes after this stage; as noted above, this change is a simple assimilation.)

Stage III (pre-Papago, before the split of the ancestor of the dialect described by Dolores and the ancestor of standard modern Papago): *v* > *w* / ____ *i̶, o* (as well as *u*). (This is an extension of the Stage II rule to vowels which like *u* are [+back] and which, in addition, share one of *u*'s other features, [+round] (*o*) or [+high] (*i̶*).)

Stage IV (premodern Papago): *v* > *w*. (This represents a generalization

of the Stage II and III rules to all environments, including precon-
sonantal ones—the least natural change.)

Without more knowledge of Pimic dialectology, it is not clear whether
the situation I have described above should best be viewed as sketched
in (13) (as implied in the characterization of Stage III above) or as in
(14):

(13)

Stage I
|
Stage II

Stage III

Stage IV

Pima   Dolores's Papago   Standard Papago

(14)

Stage I
|
Stage II

Stage III (Dolores's Papago)
|
Stage IV
|
Pima   Standard Papago
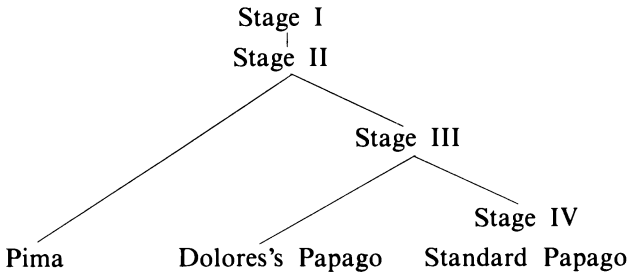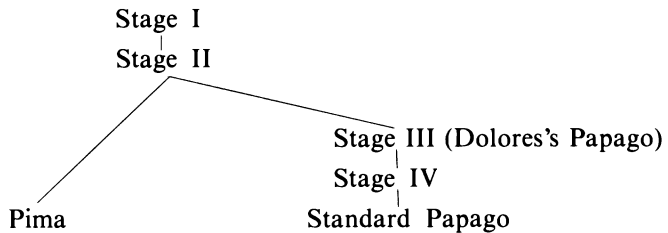
In other words, I am not sure whether all speakers of the Stage III
dialect described by Dolores have been replaced by speakers of Stage IV
Papago (as in 14), or whether only some of the Stage III speakers'
descendants became Stage IV speakers (as in 13). Since the dialect
described by Dolores was spoken relatively recently, however, (13) seems
more plausible.

This is clearly a more complicated situation than that described for
Tübatulabal, both because there are three attested variants and because
an initial change (Stage I) must be postulated to have occurred before
the first assimilatory change. Still, the parallel seems worth noting, and
the two cases may be taken together as a model of one way to think
about changes in phonemic systems.[9]

2. Glides. It has often been observed that Proto-Uto-Aztecan *h and
*? are the reconstructed phonemes most subject to loss. For instance,

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[9] One place that *p is retained as p (at least in Pima and standard Papago) is as the
second element in reduplicated forms of words with original initial *p or of loanwords
with initial v/w. A Pima example of the latter case (from Etheleen Rosero) is *vakial*
'cowboy' (from Spanish *vaquero*) / *vapkial* 'cowboys'.

virtually all the $\emptyset$'s in Miller's tables of consonant correspondences (Miller 1967:8–9) occur in the columns for *h and *$?$; most of the others, in fact, are in the *s column, where one may reasonably hypothesize an intermediate h stage. While Uto-Aztecan w's and y's do not usually vanish without trace, they may change quite a bit. *c can sometimes lenite to y, as is well known (cf. Sapir 1913:417; Campbell and Langacker 1978:273, 275), while a lenited *c > y may itself develop to n. As Langacker (1975) has shown (cf. also Munro 1973), a similar line of development gives *m > w > η (or more likely **m > *w > η). In this section I present a number of language-specific cases of synchronic and historical changes affecting glides, in the hope that these will contribute to our total knowledge of the behavior of Uto-Aztecan glides and perhaps deepen our understanding of the morphophonemics of the protolanguage.

2.1. The fate of *h in Southern Numic. The only available Southern Numic language for which extensive lexical data have long been available is Southern Paiute (Sapir 1930–31). Based on that data, comparativists such as Voegelin, Voegelin, and Hale (1962) and Miller (1967) postulate that *h is lost in Southern Paiute, generally without trace. This conclusion was anticipated by Sapir (1915:322), who noted, however, that "some Southern Paiute forms beginning with pure vowels, that is, not precede [sic] by ', have at times been heard pronounced with weak breath-attack; e.g. *aya-* was sometimes heard as *'aya-*." In Chemehuevi, which is closely related to Southern Paiute, *h is retained in such words. Some examples are:

(15)   Chemehuevi[10]   Southern Paiute
    'three'   *pahíy, pahé*   /pai-/
    'two'   *waháy*   /wa:/
    'arrow'   *hú:*   *o:?* /u:/
    'owl'   *muhúmpɨc*   *moóp.ɨc:* /muupɨci/~*mu:p:*
                                     (or /mu:pɨci/?)

The best reconstruction available for the numerals are from Campbell and Langacker (1978), who give *$pahayu$ for 'three' and *woo for 'two', although Miller (1967) lists many 'two' forms which include h. Miller and Voegelin, Voegelin, and Hale (1962) agree on *hu for 'arrow', and Miller gives *$muhu$ for 'owl', all with numerous cognates, so that the presence of *h in at least three of these words seems assured.

Within Southern Numic, Kawaiisu (spoken in California, west of the Chemehuevi/Southern Paiute area) agrees with Chemehuevi in retaining

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[10] Chemehuevi words here are from Pearl Eddy. They are phonetic recordings: word-final vowels are deleted in most styles of speech.

h, while Southern Ute (cf. Givón et al. 1980), which is spoken in Colorado, seems to agree with Southern Paiute in having eliminated *h*'s. Since Chemehuevi is spoken to the west of Southern Paiute, there appears to be a clear east–west split within Southern Numic, with the *h*/∅ isogloss running roughly along the Colorado River or slightly east of it. Further dialectal work is needed to determine the source and extent of this phenomenon.

2.2. The insertion and loss of *h* and *ʔ* in Cahuilla. As Seiler has noted (1977:54–58), most Cahuilla rules which mention *ʔ* are insertion (or "glottalization") rules. For instance, *ʔ* is regularly inserted before the absolute ending[12] (-*š*, -*l*, -*t*, or -*lʸ*) in the object form of singular nouns:

(16)

	Subject Form	Object Form
'house'	*kíš*	*kíʔči*
'water'	*pál*	*páʔli*
'bear'	*húnwet*	*húnweʔti*
'woman'	*níčilʸ*	*níčiʔlʸi*

Sometimes, "glottalization" is conditioned: for instance, a *ʔ* appears before the inceptive suffix -*ka* after stems ending in any vowel other than *i*.

(17) *čéŋen* + *ka* > *čeŋenka* 'going to dance' (consonant-final stem)
      híči + *ka* > *híčika* 'going to go' (*i*-final stem)
      ʔúʔuxu + *ka* > *ʔúʔuxuʔka* 'going to cough' (*u*-final stem)
      pey + *kíya* + *ka* > *peykíyaʔka* 'going to keep it' (*a*-final stem)
      pey + *téʔe* + *ka* > *peytéʔeʔka* 'going to borrow it from him' (*e*-final
         stem)

One might think of this either as uniform glottalization followed by deletion of the inserted *ʔ* following *i*, or as insertion of the *ʔ* only after vowels other than *i*—consider, though, the problem of specifying non-*i* (**1** above). Note that there is no general prohibition against sequences of (stressed or unstressed) *i* followed by *ʔ*, as shown by:

(18) *híči-ʔi* 'he went' (past nondurative)

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[11] I owe most of my practical familiarity with Cahuilla to Katherine Siva Sauvel (cf. Sauvel and Munro 1982), but have learned a great deal, particularly about more abstract approaches to the language, from the writings of Hansjakob Seiler, especially his *Grammar* (1977) and *Dictionary* (Seiler and Hioki 1979). The inflected Cahuilla forms I cite are from Katherine Sauvel, who speaks the Mountain dialect; since most of Seiler's examples come from the Desert dialect, mine will look somewhat unexpected to those who know Cahuilla through his work. Seiler (1977) and Seiler and Hioki (1979) give a general account of how the dialects differ; see also Sauvel and Munro (1982). I would like to thank Bill Bright for helpful advice and discussion about Cahuilla structure.

[12] I use the term "absolutive" as a structural label; Seiler, on the other hand, reserves its use only for those suffixes which alternate with possessive and postpositional affixes.

(19) *ʔiʔik-qa* 'he plays'

While the inceptive glottalization shown in (17) fails to occur after *i*, there is no such restriction on the objective glottalization shown in (16) (cf. 'house', 'woman'). Failure of glottalization near *i* is seen, however, in another Cahuilla process, the regular derivation of possessed forms of noun ending in VCV + absolutive, which is schematized in:

(20) For nouns ending . . . $V_1C_1V_2$- ABS, possessed form is . . . $V_1C_1ʔV_2$

Some examples are:

(21)

	Absolute Form	Possessed Form ('his')
'head hair'	*yúluka-l*	*yúlukʔa*
'dress'	*ʔéla-t*	*ʔélʔa*
'fingernail'	*sálu-l*	*sálʔu*

(I have no examples of nouns of this type whose last vowel is *e*.)

Once again, there is a restriction involving *i*. If *i* is the last vowel of such forms, no *ʔ* appears in the possessed form:

(22)

	Absolute Form	Possessed Form
'feather'	*wíkilʸ*	*wíki*
'knee'	*támilʸ*	*támi*
'tailbone'	*húsilʸ*	*húsi*

The rules just described interact with a rule which regularly deletes intervocalic *h* in certain environments, such as the singulars of certain nouns (cf. Seiler 1977:53):

(23)

	Singular		Plural	
'basket'	*néat*	/nehat/	*néhtam*	/nehatam/
'owl'	*múut*	/muhut/	*múhtam*	/muhutam/
'gopher'	*méet*	/mehet/	*méhtam*	/mehetam/

and, in verbs, before a vowel-initial suffix such as *-ik* (an allomorph of the inceptive *-ka* discussed above):

(24) *pey-mú-ik* 'going to shoot him' < /peymuhik/

This deletion of *h* is the major source of vowel length contrasts in present-day Cahuilla, which has leveled the length contrasts of Proto-Cupan (cf. de Chene 1979:10 and Munro 1981). Note that the environment for *h* deletion must be more finely specified than simply "intervocalic," since *h*'s which are immediately prestress do not delete, as shown by:

(25a) *ne-hátis-qa* 'I sneeze'

(25b) *ʔe-háñʔa* 'your saliva'[13]

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[13] Seiler records the object–subject pronominal prefixes with third-person plural subjects with long vowels; thus, for him, the *pem-* of (28) would be *peem-*, from *pe-* (third-person

Another environment in which these underlying *h*'s show up is in possessed forms comparable to those in (21), for instance:

(26)	Absolute Form	Possessed Form
'basket'	*néat*	*néh²a*

(26) suggests that the process of glottalization, which I have treated above as relatively low level and inconsequential, has the effect of protecting the underlying *h* from intervocalic deletion: we may think of glottalization as ordered before *h* deletion.

The interesting case is that of a possessed noun whose absolute form underlyingly ends in V*hi*-ABS:

(27)	Absolute Form	Possessed Form
'body hair'	*piilʸ*	*pih²i*

This example shows that when *h* is the underlying medial consonant in the absolute form, *²* will be inserted even when the final vowel is *i* (cf. 22). Since we know that glottalization is ordered before *h* deletion, this suggests that we should view glottalization as a uniform process, with a later rule deleting *²* between any consonant but *h* and *i*. But that cannot be the case, without some kind of morphological conditioning—recall the past nonduratives formed by suffixation of -²*i*, as in (18). Such words contain *²*'s which would be subject to deletion by such a rule. Thus, we should probably assume that the rule specifying glottalization in possessed forms is highly specified. *²* is inserted in words of the proper type, except if the vowel that would precede it is *i*. *²* is not inserted if the last vowel of such forms is *i*, unless the consonant preceding the *i* is *h*.

Another potential case of "glottalization" is illustrated in:

(28a) [peké²qa] 'he bites it' / [pemkéwe] 'they bite it'

     [sé²qa] 'it blooms' / [hemséwe] 'they bloom'

It can be shown, however, that the *²*'s in these words are deleted before plural -*we* (and other suffixal *w*'s), rather than being inserted before singular -*qa* and in other environments. The rule involved affects only poststress *²* before *w*, as can be seen from the acceptable prestress *²*-*w* sequences in forms like:

(29) *pe-²-wax-ni-qa* [pe²wáxniqa] 'you dry it'

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singular object) + *hem*- (intransitive third-person plural subject). This would be another case of *h* deletion in which the *h* is, strictly speaking, prestress. However, the rule can easily be structured to allow deletion in this position if we require only that the vowel following the *h* be unstressed:

$$h \rightarrow \emptyset \ / \ V \ \underline{\hspace{2em}} \ \underset{[-str]}{V}$$

Historical correspondences suggest that many of the ʔ's in question are archaic, but there is proof of their underlying status within synchronic Cahuilla. One indication that the final ʔ's in verb stems like *-keʔ*-'bite', *-seʔ*- 'bloom', *-kʷaʔ*- 'eat [tr.]', *-paʔ*- 'drink', and *-čaʔ*- 'choke [tr.]' are indeed underlying rather than inserted involves canonical form: no other Cahuilla verb stems (even the highly irregular "stressless" root *-yax-/-ya*- 'say') can be analyzed as underlyingly shorter than CVC. Additional evidence is provided by vowel-initial suffixes. The final ʔ of the stems in question always surfaces before vowel-initial suffixes like the past subject relativizer *-iš*:

(30*a*) *paʔ-iš* 'the one who drank'

(30*b*) *pey-kʷaʔ-iš* 'the one who ate it'

While vowel-initial suffixes are generally rare in Cahuilla (Seiler 1977: 44–46), a subset of the consonant-final verbs in the language regularly takes vowel-initial variants of certain consonant-initial suffixes. The *-ik* variant of the inceptive suffix *-ka* exemplified above (17, 24) is one example; others include modal *-aluʔ* (instead of *-puʔ*) and subordinators *-ive* and *-ap* (for realized *-ve* and unrealized *-pi*). Of the *-CVʔ*-roots named above, all except *-kʷaʔ*- 'eat' take the standard consonant-initial suffixes, but *-kʷaʔ*- belongs to the vowel-initial suffix group:

(31*a*) *pey-kʷaʔ-ik* 'going to eat it'; *pe-kʷaʔ-aluʔ* 'might eat it', etc.

(31*b*) *pey-čaʔ-ka* 'going to choke him'; *pe-čaʔ-puʔ* 'might choke him', etc.

Clearly, the fact that *-kʷaʔ*- belongs to a group of verbs which are otherwise exclusively consonant-final supports the postulation of a ʔ in its stem—and the notion that other verbs may be ʔ-final as well.

2.3. Gabrielino glides. I have recently begun to study John P. Harrington's extensive field notes on the little-known Takic language Gabrielino, continuing the filing and analysis of these materials done by William Bright and Geraldine Anderson (who reported her preliminary findings to the Friends of Uto-Aztecan in 1974).[14]

As Anderson (1974) notes, Gabrielino has "a rule which turns a nonlow vowel into a glide (i/e) → y, (u/o) → w, in the neighborhood of another vowel. If two non-low vowels occur in sequence, often either may glide." She exemplifies this last observation with:

(32*a*) *ʔahúuyŋa* / *ʔahwíiŋa* 'La Puente'

(32*b*) *ʔahúuyt* / *ʔahwíit* 'its price'

(Kenneth Hill, who has also studied the Gabrielino notes, has suggested to me that only in sequences of two high vowels may either vowel glide.)

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[14] I am most grateful to Bill Bright for making these materials available to me, and to Geri Anderson for sharing her previous work.

This rule is interesting enough, but even more fascinating is its inter-
action with another Gabrielino process involving glides.

Intervocalic Proto-Takic *w, *y, *ʔ, and *h were usually deleted
during the development of Gabrielino. In the following examples, the
Gabrielino form is compared with my reconstructed Proto-Cupan form
(Munro 1981). Note that deletion of the intervocalic glide produces in
every case a vowel cluster, which is subject either to Anderson's gliding
rule or to simplification to a single (long?) vowel:[15]

(33) *w deletes

(33a) 'mountain' Proto-Cupan (PC) qawí:-ča—Gabrielino (Gab.) qawi-
ABS > qai-š > xai-y̥ > xáy-y̥ / xáay-y̥
(The normal reflex of Proto-Takic *q is Gabrielino x; the Cupan
absolutive endings -š and -ča often correspond to -y̥ [voiceless y,
apparently] or simply -y in Gabrielino.)

(33b) 'rat' PC qá:wa-la (?)—Gab. qawa-ABS > qaa-r > xá-r / xáa-r
(The most common Gabrielino absolutive is -r, corresponding to
the lenited Cupan absolutives -l/-la/-lʸ.)

(33c) 'name' PC -tɨ:wa- —Gab. -tɨwa-n- > -tɨan- > -twánʸ- / -twáanʸ-
(n is probably the Gabrielino possessed suffix.)

(34) *y deletes

(34a) 'moon' PC mɨ:ya-la—Gab. mɨya-ABS > mɨa-r > mwár / mwáa-r

(34b) 'rush sp.' PC sɨ:ya-la—Gab. sɨya-ABS > sɨa-r > swá-r / swáa-r

(34c) 'fish'[16]   (i) PC kiyú:-l—Gab. kiyu-ABS > kiu-r > kyú-r / kyúu-r
              (ii) PC kuyú:-l—Gab. kuyu-ABS > kuu-r > kwú-r / kwúu-r

(35) *ʔ deletes

(35a) 'star' PC šú:ʔu-la—Gab. šuʔu-ABS > šuu-r > šú-r / šúu-r

(35b) 'worm' PC kuʔá:-l/kuʔá-l—Gab. kuʔa-ABS > kua-r > kwá-r /
kwáa-r

(36) *h deletes

(36a) 'gopher' PC mɨ:ha-ta(?)—Gab. mɨha-ABS > mɨa-t > mwá-t /
mwáa-t

There are several points to be noted here. First, Proto-Takic *ɨ glides
to w (the reflex of *ɨ usually seems to be o in Gabrielino).

Second, if one vowel in a cluster is nonlow and the other is a, the
nonlow vowel will glide, but if both vowels are nonlow, the first will

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[15] I write the stressed vowels in the Gabrielino words long, as Harrington does, but do
not commit myself to the length of any of the vowels in the earlier stages of these
derivations. I return to the question of synchronic vowel length in Gabrielino in 3 below.

[16] These two words for 'fish' appear to be in synchronic variation in Gabrielino, just as
two such words are in Luiseño (kiyúu-l ~ kuyúul; cf. Bright 1968).

glide, with few exceptions.This observation is confirmed by some syn-chronic paradigmatic alternations which illustrate the same rules:

(37) Possessed forms with stem-initial *y

(37a) 'mother' -(y)ok (from * -yɨ-k): 'my mother' ne-yok > neok >
nyók/nyóok

'his mother' ʔa-yok > ʔaok >
ʔáwk/ʔáawk

(37b) 'older sister' -(y)óxoʔ: 'my older sister' ne-yoxoʔ > neoxoʔ > nyóxoʔ
'his older sister' ʔa-yoxoʔ > ʔaoxoʔ > ʔáwxoʔ

3. Gabrielino reduplication. In this section I present a preliminary survey of reduplication in Gabrielino noun plurals, based on a study of the same manuscripts I referred to in **2.3.** Gabrielino reduplication is similar to reduplication in many other Uto-Aztecan languages, but it has a few unusual features. Final specification of this reduplication process will require a more sophisticated understanding of the interaction of stress and length in Gabrielino than we now have, but nonetheless it seems that Gabrielino reduplicated plurals lend support to my hypothesis that Proto-Cupan and probably also Proto-Takic had a rule of second-mora stress (Munro 1977; 1981).

3.1. Gabrielino noun plurals. Reduplication, usually in the presence of the plural suffix -am/-om, is extremely common in Gabrielino noun plurals, but some nouns form their plurals by suffixation alone. These generalizations apply both to nouns ending in the regular absolutes -t, -r, and (often voiceless) -y, and to other nouns, such as loanwords, which end in -ʔ. There are, then, a number of possible pluralization patterns. A few nouns are recorded with more than one plural form.

Perhaps the simplest type of pluralization is indicated by redupli-cation alone, as in:[17]

(38)	Singular	Plural
'house'	kii-y	ke-kii-y
'tuna cactus'	naavo-t	na-naavo-t
'willow'	šaxaa-t	ša-šaaxa-t

Alternatively, plurality may be signaled only by a suffix. -am is the most common form of this suffix and is the only plural suffix used with ʔ-final nouns:

(39)	Singular	Plural
'salt person'	ʔoŋoovepe-t	ʔoŋoovepe-t-am

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[17] Another such example would be kotaa/ko-koota-r 'wood'. In words of this rare group, the -r absolute drops in the singular, but reappears in some other forms, including the reduplicated plural.

| | 'flea' | *motuuče-y* | *motuuče-y-am* |
| | 'quail' | *kakaa-r* | *kakaa-r-am* |

(40) | | Singular | Plural |
| | 'young man' | *kovaače?* | *kovaače?-am* |
| | 'sheep' | *boreewo?* | *boreewo?-am* |

The suffix *-om* is far less commonly used alone:

(41) | | Singular | Plural |
| | 'mouse' | *pa?ii-t* | *pa?ii-t-om* |
| | 'Luiseño' | *kekiitamka-r* | *kekiitamka-r-om* |

Of these simple possibilities, reduplication is the most common. In fact, many nouns which do not reduplicate in the plural look as though they might be inherently reduplicated, such as 'quail' and 'Luiseño'.

As all the previous examples show, it is usual for the absolutive to be retained in the plural of a Gabrielino noun. However, in a few cases the absolutive drops before the plural suffix, which then has the shape *-m*. This can happen either without reduplication, as in:

(42) | | Singular | Plural |
| | 'mountain sheep' | *paa'a-t* | *paa'a-m* |

or with reduplication, as in:

(43) | | Singular | Plural |
| | 'woman' | *tokoo-r* | *to-tooko-m* |
| | 'lazy' | *čwii-t* | *čo-čwii-m* |

(Many Gabrielino "adjectives" are nominal in form.)

The most common type of pluralization involves reduplication combined with suffixation and, in words which do not end in ?, the retention of the absolutive. Reduplicated nouns with absolutives may take either *-am* or *-om*, as illustrated by (44) and (45) respectively. (46) contains ?-final nouns which, in the plural, reduplicate and take the suffix *-am*.

(44) | | Singular | Plural |
	'hummingbird'	*piino-r*	*pe-piino-r-am*
	'toloache'	*maane-t*	*ma-maane-t-am*
	'jackrabbit'	*šo?ii-t*	*šo-šoo?e-t-am*

(45) | | Singular | Plural |
	'coyote'	*?iita-r*	*?e-?iita-r-om*
	'rattlesnake'	*šoo-t*	*šo-šoo-t-om*
	'yellow jacket'	*šaŋaa-r*	*ša-šaana-r-om*

(46) | | Singular | Plural |
	'dog'	*wooše?*	*wo-wooše?-am*
	'horse'	*kavaayo?*	*ka-kaavayo?-am*
	'spotted'	*čeveeve?*	*če-čeeveve?-am*

3.2. The Gabrielino reduplication pattern. Vowels written above as double are indicated in Harrington's transcriptions as both long and stressed.[18] The reduplicated noun plurals cited so far thus reflect a pattern for which the following preliminary schema may be given:

(47) REDUP. I: $\#\ C_1\ V_1\ (C_2\ V_2)\ >\ \#\ C_1\ \overset{V_1}{\underset{[-str]}{}}\ C_1\ \overset{V_1}{\underset{[+str]}{}}\ (C_2\ \overset{V_2}{\underset{[-str]}{}})$
$$\begin{matrix} & [-str] & [+str] & [-str] \\ & [-lng] & [+lng] & [-lng] \end{matrix}$$

This formulation ignores several problems concerning vowel quality which are evident from the forms already cited. I have assumed for some time, following the analysis of Bright and Anderson (cf. **2.3** above), that Gabrielino, like Luiseño, makes only a three-way quality distinction among short unstressed vowels, with height distinctions neutralized for nonlow vowels. Where Luiseño's unstressed nonlow vowels are normally written as either *i* or *u*, following Bright (1968), I write the equivalent Gabrielino vowels as *e* and *o*.[19] The plurals of nouns with an initial stressed (long) high vowel, such as 'house', 'hummingbird', and 'coyote' above, support the need for a rule by which vowel height is neutralized.

(48) HEIGHT NEUTRALIZATION: $\quad V \rightarrow [-high]$
$$[-str]$$

When stress shifts off a high vowel, its quality is realized as mid.

But it is not always possible to predict the quality of the stressed vowel of a reduplicated plural from the singular form to which this rule has applied. The problematic cases are those in which the second vowel of the singular is long and stressed. If the first vowel of such words is *a*, as in 'willow', 'horse', and 'yellowjacket' above, and such additional words as:

(49)   Singular   Plural
    'owl'   *čamee-r*   *ča-čaame-r-am*

there is no problem, of course, since rule (48) does not affect low vowels. The interesting cases are those in which the second syllable is stressed in the singular and whose first (surface) vowel is *e* or *o*. In some of these, such as 'woman', 'jackrabbit', and:

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[18] Since there seems to be almost no Gabrielino words which are invariably written with short stressed vowels, length appears to be merely a redundant feature of stress.

[19] Harrington usually writes the mid vowels, but occasionally gives two pronunciations for the same word, one with unstressed mid and one with unstressed high. No contrasts have been discovered.

(50)   Singular   Plural
       'squirrel'   *hoŋii-t*[20]   *ho-hooŋe-t-am*
       'tray basket'   *novoo-r*   *no-noovo-r*

the newly stressed vowel in the reduplicated plural is also mid, as might have been predicted from the singular. However, in other words the stressed long vowel in the reduplicated form is *i* or *u*:

(51)   Singular   Plural
       'deer'   *šokaa-t*   *šo-šuuka-t*
       'blackberry'   *pekʷaa-r*   *pe-piikʷa-r*
       'greedy eater,   *ʔesaaw-t*   *ʔe-ʔiisaw-t-om*
         wolf'

Thus, in a synchronic description of Gabrielino reduplication, it seems that nonlow vowels in the first syllables of words with second-syllable stress which have reduplicated plurals must be specified as [$\pm$ high], even though such specification is otherwise redundant in the language. There is no other nonhistorical way to predict the quality of plural vowels from those of the singular. (Inspection of the forms already presented shows, of course, that an attempt to predict the quality of vowels in the singular from those of the plural would be equally doomed. In addition, however, the reduplicated plurals give no information about which syllable is stressed [long] in the singular, since all of them have second-syllable stress and length.)

As in Luiseño, the medial occurrence of C_1 in a reduplicated noun plural sometimes appears in a lenited version, with *r* substituting for an initial *t* and *v* for an initial *p*, as in:

(52)   Singular   Plural
       'person'   *taxaa-t*   *ta-raaxa-t-am*
       'good'   *tehoove-t*   *te-riihve-m*
       'girl'   *taxaa-y*   *ta-raax-e-m*
       'thief'   *pokii-y*   *po-vuuk-y-am*

This is rare, and clearly must be lexically marked, since most such *t*'s and *p*'s are unchanged in the plural.

The last three words in (52) show an additional rare change—deletion of the penultimate vowel of the reduplicated form. The plural of 'girl' shows another change as well—reduction of the expected final *-yam* (from *ta-raaxay-am* > *ta-raax-y-am*) to *em*.

3.3. Gabrielino reduplication and the problem of Takic stress. Despite the fact that Gabrielino nouns must be marked, in general, for their method of plural formation—whether or not they reduplicate, whether

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[20] The existing Cupan cognates with initial *q* (e.g., Luiseño *qéeniš*) suggest that this word actually has initial *x*, not *h*.

the absolute is lost, which ending (if any) is used—Gabrielino redupli-
cation seems much simpler than that of Cupan. In particular, it is the
second occurrence of the reduplicated vowel which is always stressed
(long) in Gabrielino, never the first, and so Gabrielino has no instances
of the problematic syncope rule so common in Cupan by which the
second occurrence of the reduplicated V_1 is often deleted.

Gabrielino reduplication, in fact, looks more like the archaic Uto-
Aztecan reduplication seen in Numic, while Cupan reduplication-plus-
syncope is innovative. Gabrielino has virtually no traces of the pervasive
Cupan syncope rule, so Gabrielino-Cupan cognates are often quite
different from each other. Take, for example, the word for 'wolf', for
which I propose a Proto-Takic reconstruction *ʔisa-wɨ-t, formed from a
root *ʔisa- 'coyote' plus the augmentative element *-wɨ-t (I ignore length
for the present). The different developments of the modern Gabrielino
and Luiseño words from this source are compared below:

(53) Gabrielino   Luiseño
      *ʔisa-wɨ-t   *ʔisa-wɨ-t
      ʔisa ɨ t (glide deletion;   ʔisa wɨ t (stress)[21]
         cf. **2.3** above)
      ʔisa w t (nonlow vowel glid-   ʔís wɨ t (syncope)
         ing; cf. **2.3**)
      ʔisá(a)wt (stress—and stressed   ʔiswot (Proto-Cupan *ɨ > Luiseño
         vowel lengthening?)   o)
      ʔesáawt (unstressed i > e)   ʔiswut (unstressed o > u)

The relationship between the two cognates is greatly obscured, primarily
because of the Luiseño syncope rule and the fact that the two words
wind up stressed on different original vowels.

The development of initial stress (exemplified here in Luiseño) is part
of a general trend in Cupan, a trend which has resulted in a regulariza-
tion of stress patterns in Cupeño and particularly in Cahuilla, where all
noun and verb stems receive initial stress (except in the Wánikik dialect
[Seiler 1967], where prefixes are stressed). As Hill and Hill (1968) argue,
the tendency toward initial stress in Cahuilla, particularly the prefixal
stress in Wánikik, is innovative. The original pattern of stress in Cupan
was a second-mora stress rule much like that currently operative in
Southern Paiute (cf. Munro 1977; 1981), but all the Cupan languages
have adopted extensive first-syllable stress patterns, thus conforming to
the generalization proposed by Hyman (1977) that second-syllable stress
is inherently unstable.

[21] Stress in Luiseño is quite a problem. An approximation to a synchronic stress rule
(which works better for verbs than for nouns) or, more properly, rules is given by Munro
and Benson (1973). See also Munro (1981).

Although the question of Gabrielino vowel length remains unresolved and an extensive comparison of Gabrielino forms with reconstructed Proto-Cupan forms must still be made, the reduplication pattern observed in the Gabrielino words above suggests that Gabrielino also developed from a language with something like a second-mora stress rule. In this pattern, the first syllable is stressed if it contains a long vowel, and the second syllable is stressed otherwise.

The most exceptional group of reduplicated words in Gabrielino is those whose first syllables contain glides derived by the rule discussed in **2.3**, such as:

(54)	Singular	Plural
'lazy' (cf. 43 above)	*čwii-t*	*čo-čwii-m*
'fish'	*kyuu-r*	*ke-kyuu-r-am*
'moon'	*mwaa-r*	*mo-mwaa-r-am*

These words do not follow the schema outlined in (47), because they contain a consonant cluster after the first vowel of the reduplicated form, and because that first vowel is not a copy of the first vowel of the singular.

Words like those in (54) suggest a revision of the reduplication schema (47):

(55)   REDUP. II: $\# \, C_1 \, [\text{+voc}]_1 \, (C_2) \, V_2 > \# \, C_1 \, [\text{+voc}] \, C_1 \, [\text{+voc}]_1 \, (C_2) \, V_2$
$$[\text{+syll}]$$
$$[\text{-long}]_1$$

(55) assumes the existence of a later rule of "second-syllable dominant" stress (Hyman 1977).

But even (55) can be greatly simplified. Where etymologies are clear, as in the last two cases in (54), there is a Proto-Takic source of the form CVGV-ABS where the medial protoglide is deleted by the process discussed in **2.3** and the original first vowel glides. Since the gliding rule is needed synchronically to handle the possessed nouns displayed in (37), it is possible to assume that the glides in both the singulars and plurals of (54) are derived by a rule like:

(56)   GLIDING: $V \rightarrow [\text{-syll}] \, / \, \underline{\hspace{1cm}} \, V$
$$[\text{-low}]$$

(This statement ignores the occasional variation by which the second of two high vowels in sequence may glide—cf. 32 above.)

With (56), we may specify reduplication simply with the schema:

(57)   REDUP. III: $\# \, C_1 \, V_1 \, (C_2) \, V_2 > \# \, C_1 \quad V \quad C_1 \, V_1 \, (C_2) \, V_2$
$$[\text{-long}]_1$$

If the first copy of V_1 is specified in this schema as short, it is possible to predict by independently motivated rules all the other features of the

reduplicated word which are needlessly specified by (49) and (55). Words like 'moon' may be thought of as underlyingly *muaar* or *moaar*.[22] Reduplication, a morphological word-building process, precedes any of the other three rules discussed here, vowel height neutralization (53), gliding (64), or stress. These three rules, as sketched here, also seem crucially ordered. Gliding must precede stress, or else the vowel to be glided might be stressed in some reduplicated forms. Height neutralization must follow stress, since it affects only unstressed vowels.[23]

4. Conclusion. Doing Uto-Aztecan phonology well must be a collective enterprise, since no one can adequately control all the relevant data. This article has, I hope, provided some data and analyses which will fill gaps in others' work and, in turn, spark some readers to show how to better understand what has been presented here.

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[22] Perhaps the gliding rule should have built into it a raising of the initial glided vowel, if 'moon' is underlyingly *moaar*. On the other hand, Harrington sometimes records this and similar words with mid glides, as [mǫaar]. The height variation in unstressed nonlow vowels (cf. n. 19 above) apparently extends to vocalic glides.

[23] The discussion of Proto-Cupan presented here and in Munro (1981) owes a great deal to the groundwork laid by Bright and Hill (1967).

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