Glottalized and aspirated sonorants in Kashaya

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Kashaya (Southwestern Pomo), a Hokan language of northern California, has a large inventory of consonants which undergo a number of changes in different environments. In the standard analysis (Oswalt 1961), the large number of consonants derives in part from the fact that glottalization and aspiration are distinctive features of all voiceless stops, which occur at five places of articulation. In this paper I propose that there are even more phonemic segments, specifically that glottalization and aspiration are distinctive features for sonorants as well as obstruents. It turns out that there are numerous advantages in this analysis, with respect to both the underlying inventory, and in explaining distributional and phonological characteristics of the segments.

Much of the data cited here comes from Oswalt (1961), which is the primary source for all matters on Kashaya grammar; other forms have been drawn from Oswalt (1975) or elicited from Milton ‘Bun’ Lucas. Although my analysis differs in certain respects from what is presented in his grammar, my debt to Oswalt’s comprehensive coverage of Kashaya is enormous, and the present paper would not have been possible without the data collected and thoroughly analyzed by Oswalt. My purpose here is simply to suggest modifications in the analysis.

Section 1 presents the traditional inventory and the proposed changes, with general comments on complex sonorants. Section 2 discusses phonological evidence in Kashaya for considering the sonorants as single segments. Section 3 describes derived instances of the complex sonorants. The remainder of the paper focuses on the glottalized nasals as the underlying form of the voiced stops, with implications for both synchronic (section 4) and diachronic (section 5) perspectives on Kashaya.

1. Inventory. Kashaya stops are found at six supralaryngeal places of articulation, and all contrast in aspiration and glottalization. Oswalt (1961) gives the following complete inventory of consonants:

(1) TRADITIONAL INVENTORY

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The segments /f/ and /r/ exist only in borrowed words, and are placed in parentheses here to indicate their marginal status. The voiced alveolar stop /d/ is written simply d, since there is no contrast with a voiced dental stop. In the table above, as well as elsewhere in this paper, I treat the palatal affricates [c, cʰ, ç] as palatal stops which are realized as affricates; this follows recent work such as Steriade (1989).
I argue for a revised interpretation of the consonants, where glottalization and aspiration are distinctive for sonorants as well as obstruents. (There is no change in the fricative series.) In addition, voiced stops are treated as derived from glottalized nasals.

(2) PROPOSED INVENTORY

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Oswalt includes in his transcriptions sequences where a sonorant is followed by /h/ or /r/, such as /nh/ and /nr/. In the following sections I give evidence that these sequences should be treated as single segments, /nh/ and /nr/, where in effect the same features are present but they occupy a single segmental slot.

1.1. Representation. I assume a theory of FEATURE GEOMETRY as developed in recent years (Clements 1985, Sagey 1986). The goal of feature geometry is to organize features hierarchically according to their behavior in phonological rules. The basic arrangement is in articulatory terms, with features dominated by NODES that represent natural classes. The important aspect here is that the Root node, which serves to anchor all the features to the segmental C slot, branches into Laryngeal and Supralaryngeal nodes. Under the former are features marking glottal activity, such as voicing [voice], glottalization [constricted glottis], and aspiration [spread glottis]. Under the Supralaryngeal node are features for place, such as [back] and [anterior], and manner, such as [nasal] and [continuant]. This arrangement is schematized below, ignoring the details of the lower levels of the hierarchy:1

(3)

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    C
     |  
    /   
   Root
   /    
  /     
Laryngeal Supralaryngeal
   /        
  [glottal activity] [place and manner]
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Because the segments /h/ and /r/ involve only glottal activity, they do not have a Supralaryngeal node and are represented as shown:

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1 The relative ordering of the nodes in the diagram is unrelated to temporal ordering in the phonetic string.
In other words, /h/ consists simply of the feature [+spread glottis], and /ʔ/ is simply [+constricted glottis]. These are precisely the features that are used to mark aspiration and glottalization, respectively; for example, /pʰ/ differs from /p/ only in the presence of [+spread glottis] under the Laryngeal node. An aspirated stop, then, is represented as a plain stop with the equivalent of an /h/ as part of its features. Similarly, an ejective is represented as a plain stop plus a /ʔ/, i.e. the feature [+constricted glottis].

The difference between the aspirated or glottalized sonorants that I am proposing, and their plain versions, is precisely the same: the presence or absence of one of these Laryngeal features. So in this respect it is quite literally true that /nʰ/ is nothing more than a single-segment version of /n/ plus /h/, and /nʔ/ is simply /n/ plus /ʔ/.

Before discussing the appropriate phonemic representation further, however, we should consider the actual phonetic data that we are faced with.

1.2. Distribution. On the surface, complex sonorants are found only in coda position. I argue below in section 4 that there are underlying glottalized nasals in onset position, but the aspirated nasals occur only in coda position (syllable breaks are shown with a space):

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2 Neither segment needs to be marked as [-voice] underlyingly, since this is predictable for obstruents in Kashaya, just as [+voice] is predictable for sonorants. When no laryngeal features are present, as for /p/, the Laryngeal node is omitted from the representation.
(7) camʰ ciʔ  ‘shrink’
    yemʰ ɾe  ‘gill net’
    lanʰ kʰo  ‘seven’

Similarly, the aspirated (8) and glottalized (9) versions of the other sonorants are found only in codas:

(8) baʔ mu liʔ  ‘turn around’
    muʔ ɾulʰ mo  ‘hollow log’
    qʰayʰ ɾiʔ  ‘pelican’
    hayʰ ɾa  ‘redbud’

(9) wolʰ wo  ‘badger’
    qʰalʰ ɾa  ‘weasel’
    ɾoʔ ɾoʔ ko’y  ‘cricket’
    tuʔ tu  ‘sugar’
    koʔ ɾaɣ  ‘mosquito’
    saʔ  ‘tight’
    suʔɾ ɾi  ‘chick’

The segment [wʰ], which I have found only in derived contexts, is illustrated in (31). The borrowed segment /ɾ/ does not have glottalized or aspirated variants.

1.3. Phonetic plausibility. We would expect a sequence /nh/ to be pronounced as [nɳ], a regular voiced nasal followed by a voiceless nasal; in other words, halfway through the articulation of the nasal, voicing ceases. This phonetic situation is consistent with an analysis as /nh/, since /h/ is typically realized as the voiceless counterpart of the adjacent segment. Similarly, /nʔ/ is pronounced as [nŋʔ], a nasal with normal voicing at the beginning and creaky voice toward the end, followed by a glottal stop. This in turn is consistent with /nʔ/, since a glottal stop often causes creaky voice, especially when noninitial. At the same time, however, both of these phonetic realizations are perfectly consistent with a phonologically complex nasal, since the features of oral closure and velic opening are maintained throughout; an additional feature of glottalization or aspiration would account for the fact that creaky voice or voicelessness takes over partway through the segment. The point of this discussion is to show that the phonetic facts cannot determine the choice between these analyses; rather, we must use phonological evidence to determine the best phonological representation.

1.4. Typological plausibility. Glottalized sonorants are found in a number of Native American languages, and in syllable-final position (where, as mentioned above, the Kashaya segments are found) they are typically realized as a sonorant with creaky voice and a glottal stop toward the end of the segment. For example, in Kutenai (Larry Morgan, personal communication):

(10) /ʔaɾi/  →  [ʔanŋʔ]  ‘shoe, moccasin’

Data such as this show that similar phonetic sequences in Kashaya can plausibly be related to single phonological units.
More specific typological and areal support for this analysis comes from other California languages. Jacobsen (1976:215) suggests that in Yana, a Hokan language related to the Pomoan family, the sequences /bʔ/ and /dʔ/ derive historically 'from nasals m or n plus ʔ, and further that their common syllable-final location implies that they may come from earlier glottalized nasal unitary phonemes (besides which there may have been also a glottalized l).’ The similarity to what I have proposed for Kashaya is striking, and it would be interesting to explore whether this similarity sheds any light on the historical phonology of northern Hokan. In addition, Kingston (1985:352) discusses data from Yokuts (an unrelated Penutian language) where glottalized sonorants do not occur in word-initial position, and reduce to plain nasals when following another consonant, concluding that ‘glottalization shows a strong preference for syllable codas.’ This is precisely where it is found in Kashaya: in addition to (37) which creates voiced stops, see (25) for a rule which removes the glottalization from a word-final nasal which comes to be in onset position.

The term ‘aspirated sonorant’ is more surprising, considering that the phonetic realization is a partly devoiced sonorant. Phonologically, however, this seems to be precisely the correct notion. A relevant illustration is presented by Shaterian (1976, 1983) in his analysis of the Yuman language Yavapai, where an /h/ combines with a following sonorant to produce a voiceless sonorant:

\[(11) \quad \text{/hl}a/ \rightarrow [l\acute{a}] \quad \text{‘moon’} \]
\[\text{/ʔh}\text{nah}:l/ \rightarrow [ʔ\text{pə}:l] \quad \text{‘gourd’} \]
\[\text{/t}h\text{a}+m+i/ \rightarrow [\text{t}\acute{a}n\acute{\i}\i] \quad \text{‘throw (away from speaker)’} \]

In addition to these examples with /h/ plus a sonorant, there are sporadic examples of /h/ plus a stop becoming an aspirated stop; for example, /ʔ+h-ta/ → [ʔaʔ-ta] ‘reed, cane’. Shaterian treats this as simple metathesis, but it is more faithful to the phonetic realization to analyze the outcome as an single segment, an aspirated stop. The closely related language Havasupai has similar examples of both types (Hinton 1984, personal communication); there are variant pronunciations of a number of words where /h/ and a following voiceless stop can be separated by an ephenetic vowel or combined into an aspirated stop:

\[(12) \quad \text{/h}k\acute{a}:y\acute{k}/ \rightarrow [h\acute{a}k\acute{a}:y\acute{k}] \text{ or } [k\acute{a}:y\acute{k}] \quad \text{‘be different’} \]
\[\text{/h}d\acute{a}w/ \rightarrow [h\acute{a}d\acute{a}w] \text{ or } [d\acute{a}w] \quad \text{‘material, cloth’} \]

The forms with ephenesis are most common in slow speech among older speakers. A parallel alternation occurs for /h/ followed by a sonorant; in this case the result of combining the sounds is a voiceless sonorant:

\[(13) \quad \text{/hm}a\acute{i}/ \rightarrow [h\acute{a}m\acute{a}i] \text{ or } [m\acute{a}i] \quad \text{‘boy’} \]
\[\text{/hl}aʔ\acute{a}/ \rightarrow [h\acute{a}l\acute{a}:ʔa] \text{ or } [l\acute{a}:ʔa] \quad \text{‘moon, month’} \]

These patterns shows a clear correlation between (phonetic) aspiration in obstruents and devoicing in sonorants, which can be united by a phonological feature of aspiration.

Similarly, Clements (1985) argues that in Klamath the phonetically voiceless lateral [l] should be treated with the aspiration feature [+spread glottis] rather than [-voice]. He also equates the relationship between [l] and [h] with that between [l'] and [ʔ]; in other words, the Laryngeal node that represents the purely glottal segments is what marks the voicelessness (aspiration) or glottalization of the sonorant — precisely what I have suggested for Kashaya. In a more general context, Mester and Itô (1989) argue on the basis of data from a number of languages that voicing is a privative feature that exists only in the form [+voice], so that it is impossible to use [-voice] to mark a contrast between plain and voiceless sonorants (giving language-particular evidence from
Burmese). Instead, voicelessness in sonorants is the equivalent of aspiration in obstruents: both are marked by [+spread glottis]. Not only is there good cross-linguistic precedent for treating voiceless sonorants in Kashaya as phonologically aspirated, but the theoretical arguments adduced by Mester and Itô suggest that this is the only possible analysis.

1.5. Features, not phonemes. One objection that might be raised about the proposal in (2) is that it constitutes an unacceptable complication of the consonant inventory. After all, the addition of ten glottalized and aspirated sonorants is hardly offset by the elimination of two voiced stops. This argument only carries force, however, if the most important measure of complexity is counting phonemes, a strategy which appears to be wrong in light of advances made in modern phonology.

At an earlier stage of phonological theory, phonemes were regarded as indivisible units. Even when it was recognized that acoustic or articulatory features could be used to describe natural classes of phonemes, the phonemes were often still seen as inseparable ‘bundles’ of features (Bloomfield 1933). With the advent of generative phonology (e.g. Chomsky and Halle 1968), features came into their own and replaced the phoneme as the basic underlying unit. Today the segmental inventory of a language is generally analyzed not as a list of segments, but as a list of features and principles determining how the features can cooccur to form segments; in this view, phonemes are secondary or epiphenomenal, and the important issue is what features are present and how they interact (e.g. Archangeli 1988). For example, phonological rules manipulate features rather than phonemes, so that natural classes are directly expressed by the features present in the rules. Similarly, asymmetries in the inventory take their toll on the cooccurrence restrictions that determine how features can combine to form segments: for example, if /q/ or /qʰ/ were missing from Kashaya then a special statement would be necessary in the grammar to prevent the features marking uvular place from combining with the features marking glottalization or aspiration. Since all voiceless stops occur also as ejectives and aspirates, however, no such statement is necessary.

Seen from this perspective, the proposed inventory in (2) can actually be thought of as a simplification of that in (1). The glottalized and aspirated sonorants are simply the result of allowing the glottalization and aspiration features — already necessary for the stops — to cooccur with the sonorant features, which are themselves already needed for the plain sonorants. Further, the elimination of /b/ and /d/ from the underlying inventory means that voicing is no longer required as a distinctive feature; although there are other segments that are phonetically voiced, in all cases this is predictable in accordance with the universal default pattern: sonorants are voiced, and obstruents are voiceless. The voiced stops will be discussed more fully in section 4.

2. Phonological evidence. Having explained my proposal and given general arguments for its plausibility, I turn now to specific language-internal reasons for pursuing such an analysis in Kashaya.

2.1. Root structure. There are two pervasive patterns of Kashaya that are better accounted for if we assume these single-segment representations. First, monosyllabic verbal roots have the shape (H)CV(C), where H is a laryngeal increment (see section 4.4). The relevant fact here is that there is normally no more than a single consonant at the end of the root. Typical examples are given here:

(14)  
-ša-  ‘break’
-hťay-  ‘touch’
-bil-  ‘blaze’
-hp’ọt-  ‘knock off’
-hmuɭ-  ‘do incompletely’
There are some roots, however, that in Oswalt’s transcription end in two consonants:

(15) -ʔbalh-  ‘turn’
    -poli-  ‘cause liquid to flow out’
    -ʔsonh-  ‘dent’

The root-final /h/ does not always surface (depending on the following segment, but it is found only after the coronal sonorants /l/ and /n/). If the final sequence is treated as a single segment — /lb/ or /nb/ — then the generalization that roots end in a maximum of one consonant is preserved, and we also explain why the apparent /h/ occurs only after plain sonorants. The additional fact that it is not found here after other (noncoronal) sonorants is presumably a restriction on root structure and not a characteristic of the phonology.

2.2. Syllable structure. A more compelling argument comes from syllable structure. Most of the time we can describe Kashaya syllables in a simple way: one C in the onset, a V in the nucleus, and an optional C or V in the coda; this yields the possible syllables CV, CVC, and CVV. Word-finally an additional C is permitted, making CVCC and CVCC possible there as well. This is an attested type of syllable structure cross-linguistically, and can form part of a natural analysis of Kashaya (cf. Itô 1986). Exceptions to this pattern are found when a sonorant is apparently followed by /h/ or /ʔ:

(16) lanhk'o  ‘seven’
    wol?wo  ‘badger’
    q'ayhc'i  ‘pelican’

These forms cause problems for the otherwise straightforward syllable structure, which itself explains alternations in vowel length and epenthesis (see below). If the sonorant and glottal segment are a single unit, however, they fit perfectly in the same syllable pattern:

(17) lan'k'o  ‘seven’
    wol’wo  ‘badger’
    q'ay'c'i  ‘pelican’

Each word in (17) then has two syllables, CVC and CV. This analysis explains why in Oswalt’s transcriptions there are no three-consonant clusters where the first two segments are not a sonorant and a glottal.3 A word of the form *lan'tk'o is impossible since that really would have three consonants in a row, and could not be reanalyzed in conformity with the syllable structure. It would be possible to add a statement to the grammar such that only /l/ and /ʔ/ are permitted as the final consonant of a word-internal CVCC syllable, but this is a needless complication when we have the option of treating the sonorant and the laryngeal as a single segment.

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3 Borrowed vocabulary sometimes violates the native syllable structure. In European loan words it is common to find long vowels in closed syllables, since the stressed syllable in the source language is typically long in the Kashaya form; e.g. kát'pa ‘fault’ from Spanish culpa, péc'ka ‘brick’ from Russian pecka ‘oven’. Two words with similar violations that are not from European languages are básk'oi ‘raspberry’ and huaŋybo’bo ‘gnat’ (with syllabically regular variant ḳybo’bo). The first is borrowed from Central Pomo; the source of the second is obscure, but it is also irregular in the nonapplication of a rule which would normally change the /yl/ in a coda to vowel length (this rule also fails to apply in the Russian loan caynik’ ‘teapot’).
Aside from permitting a simple expression of permissible underlying forms in the native vocabulary, this clear statement of syllable structure also accounts for two active processes in Kashaya phonology. First is the loss of unsyllabifiable consonants: when a morpheme beginning with a two-consonant cluster is added to a stem ending in a vowel, there is no problem syllabifying both consonants; but when added to a stem ending in a consonant, the limited syllable structure means that one of the consonants will be unsyllabifiable, and it is lost (see Itô 1986 for a fully worked-out theory). This accounts for alternations in the causative -hqa (-qa) and -ltow (-tow) 'from, by, since':

(18)  mo + hqa + w  \rightarrow\ \text{mo}h\text{qaw}  \quad \text{make run; drive’}
    mo + aqac + hqa + w  \rightarrow\ \text{mo}aq\text{c}q\text{aw}  \quad \text{drive up from here’}

(19)  maya + ltow  \rightarrow\ \text{mayal}t\text{ow}  \quad \text{‘by you (pl)’}
    \text{ma?aw} + ltow  \rightarrow\ \text{ma?a}t\text{ow}  \quad \text{‘caused by eating’}

Since the maximum word-internal syllable is CVC, there can be no cluster of three consonants. In a string VCCCV, the first C will be the coda of the preceding syllable, and the last C will be the onset of the following syllable. The middle consonant cannot join a syllable, so it is lost. This is what happens in /achqa/ and /awlt\text{o}/ above.

Under different circumstances an unsyllabifiable consonant can be saved by epanthesis. Specifically, when there is a two-consonant cluster at the end of a word during its derivation, a vowel (whose quality is determined by the preceding consonant) is inserted and the final consonant at that point becomes the onset to the syllable headed by the epanthetic vowel:

(20)  p^b + ne + t + m + w  \rightarrow\ p^b\text{anet}\text{maw}  \quad \text{‘punch (pl)’}
    suwac + c + w  \rightarrow\ suw\text{ac}\text{c}j\text{w}  \quad \text{‘dry one by one’}
    mo + ht + w  \rightarrow\ moh\text{t}\text{i}\text{w}  \quad \text{‘run (pl)’}

This rule operates only at earlier levels of the derivation and the absolute suffix /w/ comes after the inserted vowel. Both this pattern of epanthesis and that of consonant loss show that the syllable structure proposed above has ramifications in several areas of the grammar, and is well motivated.

2.3. Deaspiration. A minor point of advantage for the single-segment analysis is found in the expression of a rule of deaspiration. When a word-initial aspirated stop is followed by a consonant with the [+spread glottis] feature, the initial stop loses this feature and becomes a plain stop. This is similar to Grassmann’s Law that operated historically in Greek and Sanskrit:

(21)  c^b + c^a + w  \rightarrow\ cic^a\text{aw}  \quad \text{‘grasp with handled instrument’}
    p^b + hol + ?  \rightarrow\ pihol\text{t}  \quad \text{‘look for unseen object with stick’}
    p^b + hc^b + a + w  \rightarrow\ puhc^aw  \quad \text{‘blow over’}

The simplest and most restricted way of expressing this rule is by referring to the first consonant that follows the word-initial consonant:

(22)  [+spread glottis]  \rightarrow\ \emptyset / _ V C  
        [+sg]

---

4 By other rules the forms with deleted consonants become mo\text{qac}\text{qaw} and ma?at\text{iow}. For discussion see Buckley (1990).
There is a root *-m̃ni* - ‘do in detail’ which also triggers deaspiration:

(23)  \[ pʰi + m̃ni + w \rightarrow pim̃niw \]  ‘see in detail’

If the first consonant of the root is represented as an aspirated nasal, then the rule of deaspiration as expressed in (22) will apply straightforwardly. If we assume a representation such as \*-m̃ni*-, however, the first consonant of the root is a plain /m/ and we would not expect the rule to apply; it would have to be complicated to account for this situation. By admitting /m̃/, we are able to keep the rule in a simple form where this root behaves in a way parallel to all others.  

2.4. Deglottalization. If a glottalized sonorant at the end of a word precedes the vowel-initial copula /e/, it resyllabifies as the onset and loses its glottalization:

(24)  \[ \text{ma’c’ mu} \rightarrow \text{ma ne’ m̃u} \]  ‘it’s her’

\[ \text{dolo’m e’ mu} \rightarrow \text{do lo ne’ m̃u} \]  ‘it’s a wildcat’

This can be accounted for by a simple rule of deglottalization which deletes the glottal feature from a sonorant in onset position:

(25)  \[ [\text{+constricted glottis}] \rightarrow \emptyset / [\sigma \quad [\text{+son}]] \]

This rule is well motivated by the general constraint in Kashaya against glottalized sonorants in onsets. Under a cluster analysis, where for example ‘wildcat’ is *dolo*m̃, the rule would have to be something like the following:

(26)  \[ ? \rightarrow \emptyset / [\text{+son}] \quad \text{V} \]

Such a deletion has no apparent motivation, unlike the process in (25). It would also have to be formulated in such a way that it would not apply to word-initial glottal stops which follow a word ending in a sonorant. There are two examples of the sequence /nʔ/ across a word boundary in the following sentence which are unaffected by deglottalization (from Oswalt 1964:36):

(27)  \[ \text{menši’li pʰiʔtan } uʔhʔa m̃in }呼ul \quad pʰiʔayiʔ \quad m̃r ki’qaw } d̃ahalalal i \]

‘Then, suddenly, it looked like there was a little water there where he was digging.’

To prevent application of the rule in (26) it would have to be further complicated by including a word boundary after the glottal stop, which makes it even more unnatural. Since my analysis treats these cases as true clusters of /n/ plus /ʔ/, they would be unaffected by the rule in (25).

3. Derived complex sonorants. Although in many cases a complex sonorant exists as such in the underlying form of a word (see (8), (9), (32)), in other cases it is derived. For example, the Assertive morpheme is a floating [+constricted glottis] feature which links to an immediately preceding consonant, thereby glottalizing it:

---

5 This root is the only one I am aware of which violates the pattern outlined in section 2.1. Note, however, that it would be an even greater exception to the (H)CV(‘)C pattern if it were *-mlni*-, with three initial consonants; if it is *-m̃ni*-, as I suggest, then the essence of the violation is that the laryngeal increment (H) shares the place features of the following consonant. My consultant, Bun Lucas, has simplified this root to *-hni* - (HCV), which fits the canonical pattern.
Similarly, the Absolutive suffix has the allomorph /ʔ/ when it follows a consonant. When this consonant is a sonorant, it merges with the glottal stop to produce a glottalized sonorant:

(29) \( p^a \)anem + ? \( \rightarrow \) p\( ^a \)ane\( ŋ \)  
      duhtay + ? \( \rightarrow \) duhtay

'punched'
' touched'

If the vowel-initial copula /c/ follows either type of derived sonorant, then the glottalization is lost, as we saw above in (24):

(30) \( ċiš \)ka e\( ŋ \) mu \( \rightarrow \) ċiš ka ne\( ŋ \) mu
      duhtay e\( ŋ \) mu \( \rightarrow \) duh ta ye\( ŋ \) mu

'that's pretty'
' he touched'

This suggests that the derived glottalized sonorants are represented the same as underlying ones. In fact, many underlying instances of glottalized sonorants appear to be derived, at least historically, from a root ending in a plain sonorant to which the absolutive /ʔ/ has been added. This derivational possibility accounts for the large number of words ending in glottalized sonorants.

The aspirated sonorants follow a different pattern. There is no /h/ suffix which would lead to their creation, but an aspirated sonorant can result from the merger of a plain sonorant which is followed across a word boundary by a consonant that has an /h/ laryngeal increment:

(31) yow hcedu \( \rightarrow \) yow\( ^a \) ce du

'All right,' he said'

Further, it may be the case that the same merger accounts for many word-internal aspirated sonorants. For example, in q\( ^a \)ay\( ^b \) 'pelican' the aspiration on /y/ may at the most abstract level of representation be associated with the following segment /c/ as its laryngeal increment, and only later becomes connected with the preceding sonorant as an aspiration feature. The motivation for this treatment comes from the distribution of aspiration in the language as a whole (for more discussion see Buckley 1990).

4. Voiced Stops. Up to this point I have argued in general terms for aspirated and glottalized sonorants in Kashaya. This analysis makes possible another modification in the inventory, namely the elimination of voiced stops as underlying phonemes. I suggest that the voiced stops are derived from the glottalized nasals, which I have already argued to exist underlyingly as single segments. I now turn to evidence in favor of deriving surface [b] and [d] from phonemic /\( ǐ \)/ and /\( ŋ \)/. To the extent that the arguments for this derivation are persuasive, they also constitute arguments in favor of including glottalized (and aspirated) sonorants in general.

4.1. Alternation and distribution. We already need a rule which relates the phones [d] and [\( ǐ \)], since they alternate in the same morphemes. For example:

(32) cad-u  
    cañi

'look!'
'looked [FACTIVE]'

The two segments are in complementary distribution: [d] occurs only in onset position, [\( ǐ \)] only in coda position. Oswalt assumes that /d/ becomes [\( ǐ \)] in coda position:

(33) cad \( \rightarrow \) cañ?  

'looked'
Instead of treating [d] as underlying, I propose to take /n/ as the basic form and change it to a voiced stop in onset position:

(34)  ca'n → cadu  ‘look!’

This can be accomplished by a rule of Oralization of the following form:

(35)  n → d / [σ —

In other words, the nasal loses its nasality and glottalization when it occurs at the beginning of a syllable. This rule is by itself not more complicated, nor simpler, than Oswalt’s description.

The complementary distribution of [b] and [n] is parallel, with the voiced stop found only in onsets and the glottalized nasal only in codas:

(36)  ba' ba‘  ‘father’s father’
      do lo'n  ‘wildcat’
      ba‘ imi śi  ‘chipmunk’

Although the morphology does not provide an occasion for the phones to alternate (such as at the end of a root or in a consonant-final suffix), we can derive [b] from /m/ by generalizing the rule in (35), i.e. not specifying a place of articulation (expressed here informally):

(37)  N’ → C / [σ —

That is, a glottalized nasal becomes a nonnasal, nonglottalized consonant in an onset; I assume that the voicing of the resulting stop is derived from the fact that nasals are voiced by default. This rule then expresses the relationship of complementary distribution without complicating (indeed, by simplifying to more general terms) the rule in (35) that we already need.

There are two objections that might be raised to this analysis. First, there are at least two words with geminate [d]’s which could be thought to contradict the rule: ḫeseddū ‘feathered dancing skirt’ and ḫikaddū ‘main, chief’. Although there might be ways of carefully formalizing the rule to predict such possibilities, these geminates are not found in native Kashaya vocabulary and do not figure at all in the productive phonology of the language (for example, ḫeseddū is borrowed from Southern Pomo (McLendon 1973:47)). A similar complication, cited by Oswalt but which I could not successfully relicit, is word-final [d] in the Independent Intitative (1961:260), as in cohōrtītīnd ‘He is not about to leave.’ This is a problem for any analysis, however, whether the [d] is underlying or not, since the [d] appears to be in the coda and violates the simple descriptive generalization about its distribution. For the time being I assume an special dissimilatory rule of Oralization applying in the environment n _ _ ] (i.e. following /n/ word-finally). Another option which draws on the analysis of Arabic by McCarthy and Prince (1989) is to treat the final [d] as the onset of a defective syllable (one consisting only of an onset), in which case rule (37) would apply automatically.

Second, as R. Oswalt (personal communication) points out, treating the allophone which appears in codas (i.e. the glottalized nasal) as underlying is unlike the pattern for other consonants (specifically, the stops) in Kashaya, where many underlying distinctions are lost in codas. For example, in (20) the segment /c/ becomes [h] before another /c/. There is a crucial difference, however, which I feel mitigates the apparent inconsistency: the mutations which operate on consonants in coda position (often reducing them to [h] or [ʔ]) eliminate phonemic distinctions. The rule in (37) does not eliminate distinctions in onset position; rather, it changes the phonetic
realization of the glottalized nasals. Since no other phonemes will become voiced stops (in any position), no distinction is lost. In this respect, there is no inconsistency, and we preserve the generalization that distinctions are lost in codas rather than onsets. It is true, however, that the complex sonorants of all types occur as such only in coda position, and this distinguishes them from other consonants, some of which surface unchanged only in onset position. At any rate, the deglottalization illustrated in (24) is a clear example of the loss of contrast in onset position, which either account must accept.

4.2. Distinctiveness. Voicing is not distinctive in Kashaya: obstruents are voiceless, sonorants are voiced. Glottalization, on the other hand, is distinctive for all stops — and, I have argued, for other sonorants as well. Treating [b] and [d] as derived from /m/ and /n/ fits much better with the rest of the inventory. If the voiced stops are underlying, then we must include [+voice] as a distinctive feature, even though it is needed for only two segments in the entire language — voicing in other segments is completely predictable from the value of [sonorant]. We already have a clear need for the feature [+constricted glottis] since all of the oral stops occur in glottalized and nonglottalized versions. Recall the modern view that features, and not phonemes, are the basic units of phonology. This means that a simpler inventory is one which minimizes the number of underlying features rather than the number of underlying segments. By using this same feature to distinguish the glottalized nasals (which become voiced stops by rule in onset position) we eliminate a redundant feature from the underlying inventory.

4.3. Gaps. Voiceless stops occur at six places of articulation. We could reasonably expect that, if voicing is distinctive in Kashaya, then voiced stops should also occur at most or all of these same places. In fact, of course, voiced stops are found only at the labial and alveolar places of articulation. Why should this be the case? I suggest that it is no coincidence that this is precisely where the plain nasals /m, n/ are found. In describing the inventory of Kashaya, we already need to say that the feature [+nasal] is found only at the labial and alveolar places. By allowing the feature [+constricted glottis] to cooccur with these nasals, we understand immediately why /m, n/ and their allophones [b, d] exist to the exclusion of other potential voiced stops. There is no dental [q] simply because there is no /y/ from which to derive it — and this glottalized nasal does not exist because the plain nasal /y/ is absent. If the underlying segments are /b/ and /d/, we have no explanation for why we do not find /q, f, g/ as well.6

4.4. Laryngeal increments. An underlying feature of glottalization has positive benefits, beyond avoiding the disadvantages of underlying [+voice]. Many morphemes contain a laryngeal increment which may or may not surface depending on the environment (Oswalt 1961, 1986). This can be represented informally as a segment preceded by /h/ or /f/. Glottalized stops are only preceded by /f/ and aspirated stops only by /h/; in other words, the increment must agree with the features of the Laryngeal node of the following consonant:

\[\begin{array}{lll}
(38) & \text{hp'o} & \text{overflow} \\
& \text{hr'i} & \text{do to pieces} \\
(39) & \text{?pan}' & \text{shut} \\
& \text{?taq} & \text{smear, rub} \\
& \text{* hp'o} \\
& \text{* hr'i} \\
& \text{* ?pan}' \\
& \text{* htaq}
\end{array}\]

---

6 Actually, the absence of voiced stops further back in the mouth could potentially be explained in aerodynamic terms: the smaller oral cavity during closure makes voicing more difficult. This might account for the lack of /g/, but it becomes less convincing when forced to explain the absence of /f/ and /j/, not to mention /q/ which is further forward in the mouth than the alveolar stop which does exist.
Formally we can represent the restricted nature of the increment, and the unitary nature of the increment and the following segment, by saying that it must be linked directly to a following Laryngeal node, and to the same C-slot. Schematically:

(40)  
      C  
     / \  
    Root Root  
   / \ / \  
Laryngeal Supralaryngeal

Thus, in /hp'/ the same Laryngeal node and [+spread glottis] feature mark the increment /h/ and the aspiration of /p'/, giving direct expression to the constraint.

It is quite interesting to note that both [b] and [d] take /r/ rather than /h/ as a laryngeal increment:

(41)  
?ba 'crack'  
?di 'pick up, carry'  

* hba  
* hdì

This is explained if, as I have proposed, the segments are actually underlyingly /n/ and /ɛ/, since the [+constricted glottis] feature will be realized as /r/. The constraint is satisfied in the underlying representation; when rule (37) later applies to change the nasal to a voiced stop, the increment /r/ will be unaffected. Oswalt (1961) captures these similarities by proposing a cover term 'glottalic' for ejectives and voiced stops, but this gives no explanation for why this grouping should include precisely ejectives and voiced stops: why not ejectives and plain fricatives, or ejectives and sonorants (which are also voiced)? My treatment explains the grouping directly.

4.5. Dissimilation. As mentioned above, consonants in Kashaya often undergo changes when followed by another consonant. For example, there is a dissimilatory process whereby all Supralaryngeal features are lost on a coronal consonant which is followed by another coronal. This means that the first consonant will reduce to /h/ or /r/ depending on its Laryngeal features. Once again the glottalized nasals pattern like ejectives (omitting irrelevant steps):

(42) dahùyùti + ti → dahùyùhti 'intend to rub'  
caɛ + ti → caɛʔti 'intend to look (pl)'  
wànti + ti → waʔtì 'intend to walk along'

If voiced stops are underlying, we will require a special statement saying that they reduce to /r/ in this environment; but if glottalized nasals are underlying, the result follows automatically.

4.6. Glottalization. Another change is found when a consonant precedes what on the surface is a voiced stop; in this environment it becomes glottalized:

(43) cañox + ba → cañoxba 'after speaking'  
dahùyùt + ba → dahùyùbba 'after rubbing'  
pn'ænem + ba → pn'ænembba 'after punching'  
duhtay + do → duhtaydo 'they say he touched'

This change is rather surprising, since we would normally expect a voiced stop to spread its voicing to an adjacent segment, e.g. *cañoxba. But if, as I have suggested, the voiced stops are really glottalized nasals underlyingly, this process is much easier to understand: the nasal spreads its glottalization to the preceding segment before undergoing oralization in (37).
(44)  cañoc + ma → cañoc'na → cañoc'ba
     niñyút + ma → niñyút'ma → dahuyut'ba
     p'änem + ma → p'änem'ma → p'änem'ba
     nuhtay + no → nuhtay'ño → duhtay'do

By assuming glottalization in the underlying representation, we can express this rule in an entirely straightforward fashion.

4.7. Borrowings. Since Kashaya has no /g/, when a word is borrowed from a language such as Spanish which contains a voiced velar stop, a /k/ is substituted:

(45)  gallina → kay'na
      vinagre → wina'kre
          'chicken'
          'vinegar'

If Kashaya has voiced stops at the labial and alveolar places, we might expect them to be used in borrowings that have similar stops. This is not the case, however. Tokens of /b/ are borrowed as /w/, which we can largely attribute to Spanish spirantization:

(46)  yaca → wa'ka
      caballo → kawayu
          'cow'
          'horse'

Spanish /d/, however, is borrowed as /l/, even when it follows a nasal and would be a fully voiced, nonspirantized stop in the source language:

(47)  san'da → san'ya
      tienda → ten'a
      tenedor → tenedor
          'watermelon'
          'store'
          'fork'

If Kashaya speakers intuitively understand that [d] is not underlyingly a voiced stop, but rather a glottalized nasal, then we have an explanation for why it is not used in these borrowings.

4.8. A small advantage. The Plural Agent morpheme, which changes tokens of /d/ into [c'], is somewhat less drastic if the rule is really /h/ → [c']. Although still unusual phonetically, under this analysis at least the feature of glottalization remains the same; the only changes are loss of nasality and a shift in place of articulation.

5. Historical implications. My arguments in section 4 for analyzing voiceless stops as allophones of glottalized nasals are relevant only to Kashaya, and I make no claims about the synchronic description of other Pomoan languages, nor any other language that might have a similar inventory to Kashaya. In other languages, even if the ultimate origin of voiced stops is the same, the surface voiced stops may have taken on a life of their own and been reanalyzed as the underlying form; but by the same token, in such languages I would not expect the wide range of evidence we find in Kashaya suggesting an underlying glottalization feature. Of course, in many languages nasals and voiced stops show various phonological relations and alternations which are unrelated to glottalization, and my analysis has nothing to say about that.

Within the limited context of comparative Pomoan studies, however, I believe the proposed treatment of Kashaya voiced stops offers a new perspective. Specifically, we can reexamine the reconstruction of voiced stops in Proto-Pomo in light of what I have suggested for Kashaya. McLendon (1973) gives the following correspondences among the seven Pomoan languages for
what she reconstructs as a voiced stop followed by a glottal stop; this set exists only morpheme-
finally.\(^7\)

\[(48) \text{Proto-Pomo (PP)} \quad *-b? \quad *-d?\]

<table>
<thead>
<tr>
<th>Language</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kashaya (Pk)</td>
<td>-m?</td>
</tr>
<tr>
<td>Southern Pomo (Ps)</td>
<td>-n</td>
</tr>
<tr>
<td>Northern Pomo (Pn)</td>
<td>-m</td>
</tr>
<tr>
<td>Central Pomo (Pc)</td>
<td>-m</td>
</tr>
<tr>
<td>Northeastern Pomo (Pne)</td>
<td>-?</td>
</tr>
<tr>
<td>Southeastern Pomo (Pse)</td>
<td>-b</td>
</tr>
<tr>
<td>Eastern Pomo (Pe)</td>
<td>-p</td>
</tr>
</tbody>
</table>

In several of the languages (Pk, Ps, Pn, Pc) the reflex of *-d? is [d] when a vowel follows, a nasal otherwise (in Pc [r] alternates with [∫], and in Pne [n] alternates with zero).

McLendon gives separate sets for nonfinal instances of the voiced stops, which have more complicated reflexes:

\[(49) \text{PP} \quad *b\]

<table>
<thead>
<tr>
<th>Language</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pk</td>
<td>b</td>
</tr>
<tr>
<td>Ps</td>
<td>w before o</td>
</tr>
<tr>
<td></td>
<td>b elsewhere</td>
</tr>
<tr>
<td>Pn</td>
<td>w after o</td>
</tr>
<tr>
<td></td>
<td>b elsewhere</td>
</tr>
<tr>
<td>Pc</td>
<td>p(^b) initially before an aspirated consonant</td>
</tr>
<tr>
<td></td>
<td>p(^p) initially before a plain or glottalized consonant</td>
</tr>
<tr>
<td></td>
<td>b elsewhere</td>
</tr>
<tr>
<td>Pne</td>
<td>b</td>
</tr>
<tr>
<td>Pse</td>
<td>w intervocally after the stress</td>
</tr>
<tr>
<td></td>
<td>b elsewhere</td>
</tr>
<tr>
<td>Pe</td>
<td>b</td>
</tr>
</tbody>
</table>

\[(50) \text{PP} \quad *d\]

<table>
<thead>
<tr>
<th>Language</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pk</td>
<td>d</td>
</tr>
<tr>
<td>Ps</td>
<td>d</td>
</tr>
<tr>
<td>Pn</td>
<td>d</td>
</tr>
<tr>
<td>Pc</td>
<td>p(^a) word-initially before any vowel except *a</td>
</tr>
<tr>
<td></td>
<td>d elsewhere</td>
</tr>
<tr>
<td>Pne</td>
<td>d</td>
</tr>
<tr>
<td>Pse</td>
<td>r word-initially before a consonant</td>
</tr>
<tr>
<td></td>
<td>d elsewhere</td>
</tr>
<tr>
<td>Pe</td>
<td>r morpheme-finally after the stress</td>
</tr>
<tr>
<td></td>
<td>d elsewhere</td>
</tr>
</tbody>
</table>

In all cases the voiced stop has been retained in the daughter languages in at least some environments. Notice that in Pc and Pse one of the reflexes of *d is /ʔ/. In addition, while in Pc /p\(^p\)/ is found before an aspirated consonant (agreeing in aspiration), /p\(^p\)/ occurs before both plain and

\(^7\) McLendon does not give a reflex of *-d? for Central Porno; the form here is from Marianne Mithun (personal communication).
glottalized, suggesting that it is the default choice in this position (since it occurs when the following consonant has no glottal features). These distributions are consistent with the reconstruction of some form of glottalization in the proto-segment. There is no sign of nasalization in these non-final sets, since they appear to be in onsets only.

I would simply like to suggest that, as in Kashaya, in PP there are no underlying voiced stops. Rather, they are allophones of glottalized nasals in onset position. There are several advantages to this analysis. Note that every daughter language has a single segment, rather than a cluster, as the reflex of the voiced stop—glottal stop cluster reconstructed by McLendon. It is more conservative to posit a single segment, such as a glottalized nasal, for the protolanguage as well. In addition, no daughter has the final sequence /bh/ or /dh/, which seems like quite a marked cluster in that position anyway. If Kashaya has final /m/ and /n/, however, it is reasonable to assume that the protolanguage could as well. If we take the Kashaya glottalized nasals as representing the situation in the protolanguage, the changes which produced the modern reflexes are fairly straightforward:

<table>
<thead>
<tr>
<th>PP</th>
<th>*m (b)</th>
<th>*n (d)</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pk</td>
<td>ˊm (b)</td>
<td>ˊn (d)</td>
<td>no change</td>
</tr>
<tr>
<td>Ps</td>
<td>n</td>
<td>n (d)</td>
<td>deglottalization, merger to /n/</td>
</tr>
<tr>
<td>Pn</td>
<td>m</td>
<td>n (d)</td>
<td>deglottalization</td>
</tr>
<tr>
<td>Pc</td>
<td>m</td>
<td>n (d)</td>
<td>deglottalization</td>
</tr>
<tr>
<td>Pne</td>
<td>ꙅ</td>
<td>ꙅ (n)</td>
<td>reduction to laryngeal features, or to ꙅ</td>
</tr>
<tr>
<td>Pse</td>
<td>Ꙇ</td>
<td>Ꙇ (d)</td>
<td>generalized from onset to coda</td>
</tr>
<tr>
<td>Pe</td>
<td>Ꙇ</td>
<td>Ꙇ</td>
<td>oralization, devoicing</td>
</tr>
</tbody>
</table>

In Pne, the nasal quality of *n is preserved only when a vowel follows. The preservation of at least some form of nasality in five of the seven languages, however, also supports the reconstruction of a nasal.

6. Conclusion. I have argued for a relatively minor change in how we treat certain segments and clusters in Kashaya. By incorporating glottalized and aspirated sonorants into our analysis—in itself only a modification of how already necessary distinctive features combine—we achieve a simpler expression of the root and syllable structure. Further, by linking glottalized nasals to surface voiced stops, we can explain a number of phonological contrasts and processes that otherwise seem unmotivated. In turn, the new perspective on voiced stops suggests that we take another look at the reconstruction of these segments in Proto-Pomo.
References

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PREFACE

The 1990 meeting was the twentieth anniversary of the First Hokan conference, which met at the University of California, San Diego. From time to time, the conference has met with other groups such as the Penutian conference and the Uto-Aztecan conference. It now regularly meets with the Penutian conference.

The conference is again indebted to Margaret Langdon and the Department of Linguistics at the University of California, San Diego, for hosting the conference. Our thanks are also due to the various graduate students who took care of the numerous details such as supplying the endless coffee.

The papers in this volume appear in the same order as they did on the program at the conference. Unfortunately, a few of the presenters were not able to send in a paper for publication. All of the papers in the volume except the last one were presented at the 1990 meeting.

In 1983, 1984, and 1985, very few of the presenters sent in their papers for publication. In 1986, a few papers from each of these years were assembled into a single volume. Werner Winter sent his 1983 paper in so early that the editor lost it in the files, and Winter’s paper was omitted from the 1986 volume. It is now egg-on-the-face time for the editor. Winter’s paper is included in this volume as the last paper. Mea culpa.

Arrangements have been made with Coyote Press, P.O.B. 3377, Salinas, CA 93912, 408-422-4912, to reprint the various Hokan and Hokan-Penutian conference volumes. Dr. Gary S. Breschini of Coyote Press has told me that he will try to keep all the volumes in print. I have just sent him part of the original manuscripts and will be sending him the rest of the manuscripts very shortly. Only a very few of the original publications are still available. Please see the list at the end of the volume for details on the few remaining original volumes. I do not know how long it will be until Coyote Press will begin issuing reprints of the backissues.

James E. Redden

Carbondale, December 1990

Historical Note: The proceedings of the First Hokan conference were edited by Margaret Langdon and published by Mouton. I have edited all the other volumes of proceedings except those of 1988 and 1989, when I was in Africa. The 1988 and 1989 volumes of proceedings were edited by Scott Delancey in the series published by the Department of Linguistics at the University of Oregon. Please do not request these two volumes from me. Please address orders for the 1988 and 1989 volumes to: Department of Linguistics, University of Oregon, Eugene, OR 97403. I hope that Scott will be willing to publish the Hokan-Penutian volumes regularly, when I retire in a few years.

JER
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