Gamma Bonding and Contraction in Tsimshian Uvular Syllables

John A. Dunn
R. A. Hays
University of Oklahoma

0. Tsimshian syllables containing glottalized and plain uvulars exhibit a number of interesting and puzzling properties. Peaks and other syllable elements may become pharyngealized or laryngealized. At the same time the uvulars degrade or decay thru a series of weakening steps that lead to their ultimate effacement or contraction with adjacent segments. Recent work in natural and theoretical phonology provides a set of heurestic principles that allows for the interrelation of the Coast Tsimshian dialect variants of uvular lexical items; these principles thus suggest logically prior forms that might have cognitive and/or historical significance. Parts 1 thru 6 deal with uvulars in syllable final position. Part 3 in particular posits scale additions for both consonants and vowels to Foley's gamma (bonding) parameter (Foley 1977:39-43). Part 6 discusses the possibility of the compensatory laryngealization of non-uvular consonants in syllable initial position. Parts 7 and 8 describe the contraction and effacement of uvulars occurring in consonant clusters. The conclusion includes a discussion of the implications of all these phenomena for the historical

comparative study of the Tsimshian language family.

1. LARYNGEALIZATION AND PHARYNGEALIZATION OF VOWELS IN C_nVX SYLLABLES. Vowels preceding glottalized segments, whether uvular or other, often assimilate a laryngeal constriction and become creaky. But they may be more than just creaky: they may also be rearticulated. This rearticulation of laryngealized vowels can be quite pronounced or so slight as to be barely noticeable. Boas referred to this phenomenon as a parasitic vowel (Boas 1912:68). His orthographic convention for the rearticulation was a superscript zero: V^0. Stanley Newman (personal communication) feels that it is more important to use an orthographic convention that makes explicit the laryngealization since it is the primary characteristic distinguishing these from other syllabic peaks: V̍. The convention Dunn has used (following Rigsby and Hindle (1973)) in both his broad (systematic phonetic) and practical orthographies has been Vowel + Glottal Stop + Vowel: V'V or $V^{ʔ}V$. In this way he has attempted to explicitly picture both the laryngealization and the rearticulation. He has also referred to these vowels as interrupted. Discussion of the phonological properties of syllables involving laryngealized, rearticulated vowels is, however, greatly facilitated and simplified by the use of Newman's convention. Accordingly, in this paper

laryngealized vowels with varying degrees of rearticulation will be represented simply as apostrophe-vowel, V̍, with the intention that this cursive symbol will represent the feature complex:

+syllabic
-consonantal
laryngeal constriction
length
rearticulation

This discussion will ignore the phonetic facts that laryngeal constriction, length, and rearticulation represent gradual oppositions and that variation in these features can even alter syllable structures.

A superficial survey of the variation patterns for Tsimshian words containing laryngealized vowels suggests that laryngealization in Tsimshian closely parallels the phenomenon (observed in French and other languages) of vowel nasalization by regressive assimilation and subsequent nasal effacement:

VN	→	ṼN	→	Ṽ		
VC̍	→	V̍C	→	V̍		
ha:q̍	∿	ha̍X	∿	ha̍		<u>goose</u>
na:q̍	∿	na̍X	∿	na̍		<u>dress, skirt</u>
loq̍	∿	lo̍X				<u>eel</u>.

In similar fashion vowels before plain voiced uvulars may become pharyngealized as the uvular is effaced:

VG	→	ṾG	→	Ṿ

Xso:G-m-laXa-y̍ens ∿ Xsọ:mlaXay̍ens <u>killing frost</u>

laGaX-ʔalgʸaX ∿ lạ:Xʔalgʸ aX <u>a dying person</u>

loG-m-t̍a: ∿ lọ:mt̍a: <u>sit near</u>.

2. THE DECAY OF C_nVX SYLLABLES. But a closer look at lexical variants (dialect and other) indicates that the regressive assimilation plus effacement model is woefully inadequate and that something much more complex is involved:

ha:q̍ ∿ haq̍ ∿ haʔX ∿ ha̍X ∿ ha̍ <u>goose</u>

so:q̍ ∿ so̍HX ∿ so̍aX ∿ soHq^h ∿ so̍eq^h <u>early; robin</u>

(Note: H represents a centralizing vocoid offglide)

na:q̍ ∿ na:ʔGa ∿ na̍X ∿ na̍ <u>dress; skirt</u>

t̍^{s}aX ∿ t̍^{s}aq^h ∿ t̍^{s}a̍G ∿ t̍^{s}a̍ <u>clam</u>

ne:q̍ ∿ neq̍ ∿ ne̍iX <u>anal and dorsal fins</u>

be̍X ∿ be̍HX ∿ beHX <u>tear up</u>

wa̍ʌX ∿ wa̍ <u>bury</u>

d^{z}oHX ∿ d^{z}oX <u>be ashamed</u>.

First of all, the laryngeal feature has not been assimilated from the uvular consonant: it has rather been <u>removed</u> from the uvular consonant and placed on the vowel in a "feature metathesis." Furthermore, once this laryngeal feature has been removed, the uvular is not simply effaced but rather degrades thru a series of stages, as e.g., X → q^h → G → ∅.

This gradual degradation is also evident in uvulars that never were laryngealized but that cause vowels to take on a pharyngeal constriction:

Xso:GmlaXa'yens ∿ Xsoʁm- . . . ∿ Xso:m- . . .

killing frost; strong North wind at the beginning of winter

laGaXʔalg^{y}aX ∿ laʁaX- . . . ∿ la:X . . .

a dying person, lit. "talks in both (houses)"

loGm'ta: ∿ loʁm'ta: ∿ lo:m'ta: sit near.

3. BONDING, UNBONDING, AND CONTRACTION. These stages of decay coincide precisely with Foley's bonding (γ) and lenition (β) parameter strength value scales (Foley 1977:33ff,39-43):

γ1	γ2	γ3
kh	k^h	x
ai	a^y	e

β1	β2	β3	β4
voiced spirants	voiced stops	voiceless stops	aspirates and voiceless spirants.

The bonding (γ) parameter indicates the degree of strength with which phonetic elements are bound together. Thus an x is a very tightly bound k^h which is in turn a coalescence of k+h. The lenition (β) parameter represents the weakened reflexes of aspirates and voiceless spirants. Figure 1 shows the attested uvular variants in Tsimshian in relation to these hypothetical scales. Figure 2 shows the attested syllable peak variants in Tsimshian in relation to the bonding scale.

β1 β2 β3 γ1 β4 γ2 γ3	Foley's scales
∅ ← ʁ ← G ← q^h ← X ← ʔX ← q'	attested Tsimshian variants

Figure 1. Tsimshian uvular attrition.

γ1 γ2 γ3	Foley's scale
V ← VV ← VH ← V: ← V'	attested Tsimshian variants

Figure 2. Tsimshian syllabic peak variation.

If X is a bonding/contraction/coalescence of q and h, and if V̄ is a bonding of V and H, then it follows from the Tsimshian data that q' is a bonding of ʔand X and that V' is a bonding of ʔ and V. Therefore, in this analysis we have added a fourth strength level to Foley's gamma parameter (See Figure 3).

weakening			→ effacement	
γ4	γ3	γ2	γ1	
q'	(ʔ)X	q^h	q,G,ʁ,h	∅
V'	V̄(ʔ)	VH	VV	V

Figure 3. Laryngealization as γ4 bonding.

The processes that move the q' to its effacement thus are not simply regressive assimilation and apocope as in French nasal effacement. They are rather an intricate series of natural unbonding and compensatory rebonding (contraction, coalescence) adjustments that intergrade the attrition of the uvular consonant and of the syllabic peak in a large number of attested combinations.

Foley's beta and gamma parameters and his natural inertial development hypothesis provide a principled, a priori, heuristic device for positing logically and/or historically antecedent forms for a number of Tsimshian lexica. His inertial development principle (Foley 1977:107ff,143) states that weakened sounds will tend to weaken further. We do not claim that the Tsimshian data support Foley's theories but rather that these theories make certain claims about the phonological and historical structure of Tsimshian. In this paper we have confined ourselves to this principled analysis/reconstruction of some Tsimshian lexica with (base final) vowel + uvular. Other consonants both glottalized and plain exhibit parallel attrition and identical effects on adjacent syllable peaks. We will extend this analysis to other lexica in a subsequent paper. The heuristic device, i.e., the rules posited for Tsimshian, is contained with data support in section 4. The posited prior forms and their weakening derivations for the selected Tsimshian lexica are presented in section 5. In both sections the asterisk indicates forms not attested in the data but posited by the rules.

4. THE WEAKENING RULES.

Rule 1. Apocope.

V q̍ a ## → 1 2 4
1 2 3 4

na:ʔa ∿ na:q̍ <u>dress</u>

g^we:ʔa ∿ g^we: ∿ g^weX- <u>poor</u> (<*g^we:q̍a)

Rule 2. Unbonding of a glottalized uvular.

V q̍ → 1 ʔ [2: -laryngeal constriction, +continuant]
1 2

haq̍ ∿ haʔX <u>goose</u>

na:q̍ ∿ na:ʔGa <u>dress</u>

Rule 3. Compensatory vowel bonding.

V ʔ X → [1: laryngeal constriction, length] 3
1 2 3

The laryngeal constriction and length features represent gradual rather than privative oppositions. Therefore rules 3.1 and 3.2 describe the derivation of the two extreme opposite cases in a continuum of possible acoustic objects.

Rule 3.1 Vowel-laryngeal contraction.

V ʔ X → [1: +laryngeal constriction, +long] 3
1 2 3

Rule 3.2 Glottal stop syncope.

V ʔ X → 1 3
1 2 3

haʔX ∿ ha̍X <u>goose</u>

na:ʔGa ∿ na̍X <u>dress</u>

$g^{w}e{:}ʔa \sim g^{w}e{:} \sim g^{w}eX$-   poor

Rule 4.1 Long vowel unbonding (type 1).

$$\underset{1}{V{:}} \to \left| \begin{matrix} 1 \\ -\text{long} \end{matrix} \right| H$$

Ga:X ∿ GaHX   raven; black bass

Xe:X ∿ XeHX   foam

likso:X ∿ liksoHX   doorway

be:X ∿ beHX   tear up

ha-Xbe:Xs(k) ∿ ha-XbeHXsk^{h} hand saw

This type of unbonding ($\gamma 3 \to \gamma 2$) occurs in vowels that have no laryngeal constriction. If the vowel has laryngeal constriction, then the unbonding is to a rearticulated vowel sequence ($\gamma 3 \to \gamma 1$):

Rule 4.2 Long vowel unbonding (type 2).

$$\underset{1}{\acute{V}} \to \left| \begin{matrix} 1 \\ -\text{long} \end{matrix} \right| a$$

so:q́ ∿ sóaX   early; robin

be:X ∿ beHX ∿ béaX   tear up

likso:X ∿ liksoHX ∿ liksóaq^{h} doorway

Rule 5. Offglide effacement.

$$\underset{1}{V}\ \underset{2}{H} \to 1$$

d^{z}oHX ∿ d^{z}oX   be ashamed

Rule 6. Uvular spirant unbonding.

$X \to q^{h}$

sóaX ∿ sóeq^{h} early; robin   (Note: the change in vowel quality is not accounted

for by these rules)

d^{z}oHX ∿ d^{z}oHq^{h} be ashamed

liksoHX ∿ liksóaq^{h} doorway

meHX ∿ meHq^{h} pine nut

t́^{s}aX ∿ t́^{s}aq^{h} clam

ýa:X ∿ ýa:q^{h} eat

Rule 7. Aspirate uvular unbonding with subsequent syncope and voicing lenition.

$q^{h} \to qh \to \{G,h\}$, i.e.,

Rule 7.1 $\underset{1}{q^{h}} \to \left| \begin{matrix} 1 \\ -\text{aspirate} \end{matrix} \right| h$

Rule 7.2 $\underset{1}{q}\ \underset{2}{h} \to \{1,2\}$

Rule 7.3 $q \to G$

Since the unaspirate voiceless stop is not represented in the data, Rules 7.4 and 7.5 will be sufficient in this analysis.

Rule 7.4 $q^{h} \to G$

Rule 7.5 $q^{h} \to h$

liksóaq^{h} ∿ likso:G   doorway

t́^{s}aq^{h} ∿ t́^{s}aG   clam

wáXwó:msk^{h} (∿*wáq^{h}wó:msk^{h}) ∿ wáhwó:msk^{h}

suffer (plural agreement form)

wáXwánsk^{h} (∿*wáq^{h}wánsk^{h}) ∿ wáhwá:nsk^{h}

stubborn; disobey

Rule 8. Lenition and contraction of the voiced uvular. VG → Vʁ → V, i.e.,

Rule 8.1 V G |+syllabic| → |1 pharyngeal constriction| |2 +cont| 3
1 2 3

Rule 8.2 V ʁ |+syllabic| → |1 long|
1 2 3

See examples in section 2 above.

Rule 9. Effacement of laryngeal glides and voiced uvular stops.

{G,h} → ∅

waXwansk^h ∿ wahwa:nsk^h ∿ wawa:nsk^h

stubborn, disobey

yeHh ∿ ye:h ∿ ye: spring salmon

na:ʔGa ∿ na dress; skirt

t^{s}aG ∿ t^{s}a clam

5. POSITED DERIVATIONS FOR SOME LEXICA. (Note: in the following derivations letters in parentheses under each lexical variant indicate the place where that item was collected as either Hartley Bay (hb), Kitkatla (k), New Metlakatla (m), or Prince Rupert (pr)).

1. ha:q (k) →4.1, 5→ haq (hb) →2→ haʔX (hb) →3.1→ haX (k) →6,7,9→ ha (k)
   └→2,3.1→ haX (k) goose

2. *na:qa →1→ na:q (k) →2,3.1→ naX (k) →6,7,9→ na (hb,k,pr)
   └→2,6,7.4→ na:ʔGa (pr) dress; skirt

3. ne:q (hb) →4.1,5→ neq (m) anal and dorsal fins
   └→2,3.1,4.2,vowel adjustment→ neiX (hb)

4. *t^{s}aq →2,3.2→ t^{s}aX (hb) →6→ t^{s}aq^h (hb,k,m) clam
   └→2,3.1,6,7.4→ t^{s}aG (pr) →9→ t^{s}a (m)

5. *wa:q →2,3.1,4.2,vowel adjustment→ waʌX (pr) →9,7,6→ wa (pr) dig; bury

6. *so:q →2,3.2,6,7.4→ so:G (m,pr) early; robin
   └→2,3.1,4.2→ soaX (k,m) →6,vowel adjustment→ soeq^h (m)
   └→4.1→ soHq (k,m)

7. *ʔayaqas →2,3.1,6,7.4→ ʔayaGas (k) a good hunter

8. *be:q →2,3.1,4.2→ beaX (k,m,pr) tear up
   └→2,3.2→ be:X (hb) →4.1→ beHX (k,m,pr)

8.1 *be:q-k^h →2,3.2,4.1→ beHX-k^h (k,m,pr) tear bark from a cedar tree

9. *d^{z}o:X →4.1→ d^{z}oHX →5→ d^{z}oX be ashamed
(k,pr) (hb)
→6→ d^{z}oHq^{h}
(k,pr)

10. Ga:X →4.1→ GaHX raven; black bass
(hb,k,pr) (k)

11. ha-Xbe:Xs →4.1→ ha-XbeHXs-k^{h} hand saw
(m) (hb)
Note: the rules do not account for the variation in the -k^{h} suffix

12. y̍a:X →6→ y̍a:q^{h} eat (plural agreement form)
(k) (k)

13. ya:wX-k^{h} →4.1,5→ yawX-k^{h} eat
(pr) (k)
→4.1, w elision→ yaHX-k
(k)

14. *ha-ya:wX-k^{h} →4.1,5→ ha-yawX-k^{h} fork
(k,m)
→4.1, w elision→ ha-yaHX-k^{h}
(k)

15. *he:Xl →4.1→ heHXl persevere
(m,pr)

16. loq̍ →2,3.1→ lo̍X eel
(hb) (k,m)

17. *lik-so:q̍ →2,3.2→ lik-so:X →6,7.4→ lik-so:G
(pr) (pr)
→4.1→ lik-soHX
(k)
→2,3.1,4.2,6→ lik-soa̍q^{h} doorway
(m)

18. *ɨa̍q →2,3.1→ ɨ̍aX bite
(pr)

19. *me:X →4.1→ meHX →6→ meHq^{h} pine nut
(k) (pr)

19.1 maX-me:X →4.1,6,7,9→ maX-meH grouse
(hb) (pr)

20. $t^{'s}$o:X-s →4.1→ $t^{'s}$oHX-s hard soles of leggings
(k,m) (hb)

(Note: from $t^{'s}$o:X salmon belly)
(hb)

21. *Xe:X →4.1→ XeHX foam
(k)

21.1 *Xe:X-s →4.1→ XeHX-s cry; weep
(pr)

6. LARYNGEAL BONDING IN SYLLABLE INITIAL CONSONANTS. Derivations 12, 13, and 14 above suggest the possibility that the laryngeal constriction mark not only moves leftward from the syllable coda to the syllable peak, but that it may move even farther leftward from the peak to the syllable onset:

CVC̍ → CVʔC → CV̍C → CʔVC → C̍VC
*ya:wq̍ → *ya:q̍ → *ya:ʔX → *ya̍X → *yʔa:X → y̍a:X
↓
*ya:wq̍-k→*ya:q̍-k→*ya:ʔX-k→*ya:X-k
↓
yaHX-k^{h} eat

Claims about syllable structure (Hooper 1972; Venneman 1972 and cit. apud Hooper 1976; see also Jesperson cit. apud Malmberg 1963, Saussure 1915, and Jakobson and Halle 1956), namely that the syllable onset is strong in relation to the peak and coda, have as a corollary (for Tsimshian) the possiblity that the laryngeal bonding of the syllable onset is phonetically motivated. This possibility gives some substance to Dunn's impression that Tsimshian laryngealization might better be described as a prosodic feature at least at the phonetic level. Many of the examples cited here tend to be produced with laryngeal constriction thru-out; it is only that the constriction is more noticeable first in one part of the syllable, then in another. The laryngeal bonding of syllable onsets can account for an enormous amount of lexical variation in Tsimshian:

$d^{z}$is ∿ t^{s}i   grandmother (address form)
(pr)   (pr)

d^{z}awest^{h} ∿ t^{s}awes   salal
(k,m)   (hb)

bunsk^{h} ∿ pun?aks ∿ pu:naks   splash
(hb)   (k,pr)   (m)

beaX ∿ peHG-l   tear up ∿ tear out and turn over
(k,m,pr)   (k,m,pr)

Gat^{s}aɨ ∿ qad^{z}aɨ   swallow
(k)   (pr)

It can also provide a principled basis for the reconstruction of prior forms for an even larger number of lexica:

d^{z}abaH ∿ t^{s}ɨba: run a short distance
(m,pr)   (pr)

d^{z}i:$^{w}k^{w}$sa ∿ t^{s}i:$^{w}k^{w}$sa   bail water out of a canoe
(m,pr)   (m)

d^{z}o:ks ∿ t^{s}o:ks   drain the water off of
(m,pr)   (m,pr)

buy ∿ puy-ɨk^{h} get out of the way
(k,m,pr)   (k,m,pr)

gabala:s ∿ gapila:s   mosquito larvae and pupae
(k)   (hb)

We also find that this idea is useful in explaining certain kinds of consonant cluster simplification discussed in part 8 below.

7. UVULAR EFFACEMENT IN CONSONANT CLUSTERS. The voiceless uvular fricative is often effaced when it occurs in clusters. In some cases these clusters cross syllable boundaries ($); in such cases rules 6,7, 8, and 9 adequately account for the effacement:

aX$miHl$k^{h}$ ∿ a$miHl$k^{h}$ mask; disguise; effigy
(k,m,)   (k,m,pr)

When the cluster is contained within syllable boundaries, it most often involves an ess or barred-el:

ɨeyaXsk^{h} ∿ ɨayask^{h} climb
(hb)   (pr)

t^{s}ɨksna:Xs ∿ t^{s}aksnaHs   bracelet
(hb)   (k)

lik$Xso:$k^{h}$ ∿ lik$so:X   doorway
(pr)   (pr)

sGaniHs ∿ sXani:st^{h} ∿ sani:st^{h} mountain
(m)   (k)   (k)

?aXɨk^{h} ∿ -?aɨk^{h} (in ?aX?aɨk^{h})   arrive (note: the
(k,m,)   (m)

reduplicated form is a plural agreement inflection)

XswaXɨa:s ∿ Xswaɨa:sk^{h} huckleberry color
(hb) (hb,k,m)

These variations stand in accordance with Foley's claim that contraction/effacement occurs in clusters with high strength similarity more frequently than in clusters with low strength similarity (similarity condition for contraction: Foley 1977:20f,78f). X, s, and ɨ, all being voiceless fricatives, have the same γ parameter value and the same β parameter value.

In Dunn's data only three examples of complete X effacement occur in other types of clusters:

Xalda^{w}Xk^{h} ∿ Xalda^{w}k^{h} medicine
(m) (pr)

limXk̓o^{y} ∿ li:mk̓o^{y} funeral song
(k,m) (k,m)

t̓aHp̓Xnsk^{h} ∿ t̓aHp̓nsk^{h} nail (building tool)
(hb) (m)

Even so, the third of these examples involves a syllable boundary between the p̓ and X.

8. UVULAR CONTRACTION IN CLUSTERS. We use the term contraction to refer to coalescence, i.e., where there is some residual trace of the lost X. The contraction of X in Tsimshian consonant clusters is evidenced by some kind of regressive compensation:

$$|\text{+segment}|_{1} \; . \; . \; . \; X_{2} \rightarrow \left| \begin{matrix} 1 \\ \text{+some feature of } 2 \end{matrix} \right| .$$

In some examples the leftmost segment takes on the characteristics of a voiceless fricative (l→ɨ, d^{z}→s,

t→s):

g^{w}ilXt̓u:s ∿ g^{w}iɨt̓u:s push (human patient)
(k,m) (k,m)

liHd^{z}Xk^{h} ∿ liHsk^{h} count; read
(hb,m,pr) (k)

g^{y}istXalt̓mt^{h}k^{h} ∿ ʔiksaldamt^{h}k^{h} pattern; picture
(m) (m,pr)

Finally there are a few examples in which the leftmost segment becomes glottalized when the X is effaced. Following the argument in section 6 above we have assumed that the X in these cases derives from a prior q̓:

t̓aXtXoHGn ∿ t̓aXt̓oHsk^{h} golden shiner; minnow <*tq̓o:
(hb) (m)

tXa:p̓nsk^{h} ∿ t̓aHp̓nsk^{h} nail (building tool) <*tq̓a:p̓
(pr) (m)

Xba:laX ∿ Xbal̓a ∿ Xbal̓a south wind <*Xba:laq̓
(hb) (hb) (pr)

hu̓mt^{sh}aX ∿ humt̓^{s}a kiss <*humt^{sh}aq̓
(m,pr) (hb)

9. SUMMARY AND CONCLUSION. We have assumed that uvulars in syllable final position and in consonant clusters are weak consonants, have weakened in the past, and will continue to weaken (Foley's principle of inertial development). This assumption allows us to posit a set of phonological rules and reconstructed forms for several lexical items. This analysis and these data have left us with a number of impressions. Glottalized uvulars are contractions/bondings of

glottal stops and voiceless spirant uvulars. Laryngealized vowels are contractions of glottal stops and vowels. Pharyngealized vowels are contractions of uvulars and vowels. Laryngeal unbonding (a form of weakening) of one segment, whether consonant or vowel, often results in a regressive compensatory rebonding so that CVC̓ and CVʔC are stronger (more marked) than C̓VC which is in turn more marked than C̓VC. In other words the laryngeal feature is a mark associated with strength and, if assigned to a weaker position in a syllable, will tend to relocate in stronger positions in that syllable. Consequently, at a systematic phonetic level, laryngealization in Tsimshian might better be described as a prosodic rather than segmental feature. In uvular-X consonant clusters with high strength identity, i.e., where another member of the cluster is also a voiceless fricatives, i.e., s or ɬ, the uvular is often effaced. In uvular-X consonant clusters with less strength identity the X is not completely effaced, but rather coalesces with other members of the cluster so that tX and $t^{s}X$ become s and lX becomes ɬ.

Since the data presented in this paper comprise all the examples in Dunn's data (Dunn 1968) of variable uvular syllables, they might reasonably be subjected to statistical analysis. Such an analysis indicates that

there is no significant correspondence whatsoever between the operation of specific rules and geographic distribution. However we posit from these data a conservative index (CI) for each of the local communities. The CI is figured by the formula,

$$CI = \frac{s}{d},$$

where s is the number of lexical variants that serve as sources for other variants, and where d is the number of lexical variants derived from prior forms whether posited or attested. The higher the CI of a community the more closely its lexicon approaches prior forms as defined by the rules developed in this paper. The lower the CI of a community the more closely its lexicon approaches derived forms as defined by these same rules.

The CI for Hartley Bay is the highest (1.21 = 17÷14). The CI for Prince Rupert is the lowest (.56 = 15÷27). Kitkatla (.69 = 22÷32) and Metlakatla (.68 = 19÷28) have intermediate CI's. These values correspond with two other features of the speech community: geography and history. There is a south to north distribution with the highest CI scores in the south and the lowest in the north. The highest CI scores come from the two aboriginal communities (Hartley Bay and Kitkatla); the lowest CI scores come from new (post-contact) towns

(Prince Rupert and New Metlakatla).

The rules posited here and extensions of these rules can account for many wider dialect differences involving Coast Tsimshian, Southern Tsimshian (Klemtu), and Giksan comparisons. In fact these rules define systematic correspondences in these wider comparisons whereas the variation is random within Coast Tsimshian. Without exception these correspondences indicate that Gitksan and Southern Tsimshian will have higher CI scores than the Hartley Bay dialect of Coast Tsimshian. The following examples illustrate these correspondences. The Gitksan cognates are from Rigsby and Hindle (1973). We have kept the Rigsby/Hindle orthography intact. Orthographic equivalents include: k̲=q, x̲=X, g̲=G, aa=a:, etc., a'a=ȧ, etc., xy=ç; hl=ɫ.

1. Gitksan VĊ corresponds to Southern Tsimshian V̇C and to Hartley Bay VC.

Gitksan (G)	Klemtu (ST)	HB	
geṅ	Gȧ^{w}n ∿ Gȧɨn	Ga^{w}n	chew
ṁoot'ixs	mi̇s	məsX	breast
ts'eeẇ	ṫ^{s}ȧ^{w}t^{h} ∿ ṫ^{s}ȧəy	ṫ^{s}a:ɣ̈	inside part

(Note: the ɣ̈ is an unrounded velar glide). This correspondence illustrates the operation of rules generalized from rules 2, 3.1, and 3.2 developed in part 4 of this paper.

2. Gitksan and Southern Tsimshian V(:) and V̇ correspond to Coast Tsimshian VH.

G	ST	HB	
mo'on	mȯn	moHn	salt
lo'op	lȯp^{h}	loHp^{h}	rock
	ndȯçeltgn	ndoHyeltgn	go home.

Southern Tsimshian V̇V corresponds to Coast Tsimshian V(:).

ST	HB	
lu̇əlp^{h}	lu:lp^{h}	fish trap
ṫilGȯəlsk^{h}	ṫilGolsk^{h}	think
ṫ^{s}ȧəy	ṫ^{s}a:ɣ̈	inside part.

These correspondences illustrate the operation of rules 4.1, 4.2, and 5.

3. Gitksan x and x^{w} correspond to Southern and Coast Tsimshian k^{h} and k^{wh}. These correspondences illustrate the operation of a rule generalized from rule 6.

G	ST	HB	
ṁo'oxw	mȯk^{h}	mo:k^{h}	pus
xwdax	k^{wh}dax	k^{wh}di:	hungry
baasxw ∿ bahasxw	bahȧsk^{h}	ba:sk^{h}	wind

4. Gitksan and Southern Tsimshian X, x^{w}, ç, and x correspond to Coast Tsimshian ∅, thus indicating the operation of rules generalized from rules 6, 7, and 9.

G	ST	HB	
	g^{w}elgaX	g^{w}elga	burn
muxw	t̓^{s}m-mɯ:x	t̓^{s}m-mu:	ear
daxw	daX	dɯ:	die (plural subject)
	Xpism-gux^{w}ʔəsk^{h}	Xpism-gu:sk^{h}	fall
	t̓^{s}mt̓aç	t̓^{s}mt̓i:	back of neck

5. Southern Tsimshian t^{s}ç and t^{s}x correspond to Gitksan and Coast Tsimshian s. This correspondence indicates the operation of a consonant cluster contraction rule similar to the one discussed in part 8 above.

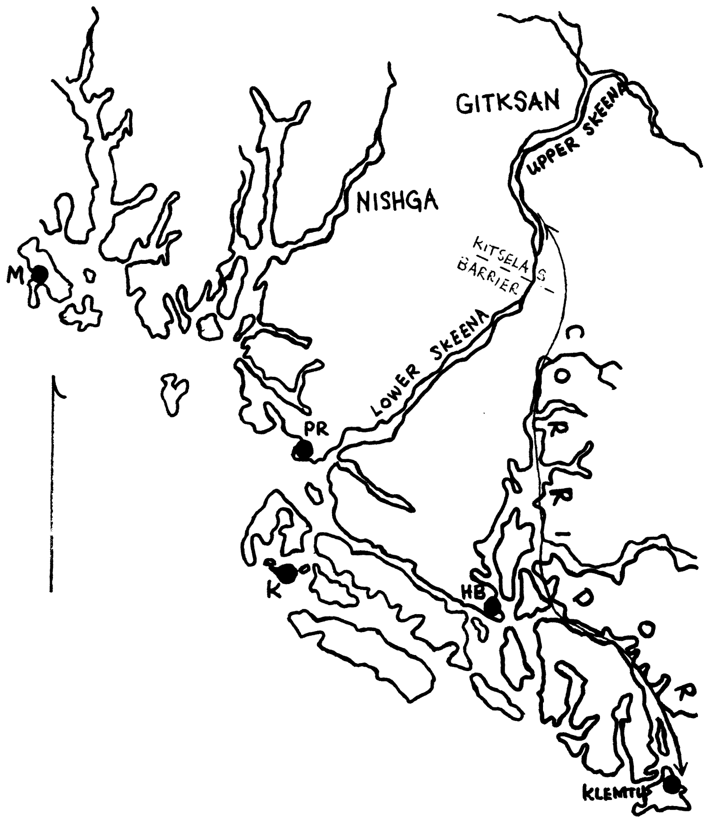
ST	HB	G	
t^{s}xanya:k^{wh}t^{h}	snya:k^{wh}t^{h}		hold in hand
t^{s}ça:ksk^{h}	sa:ksk^{h}	saksxw	clean
t^{s}ça:yp^{h}	sa:yp^{h}	sip	bone

In addition to these systematic correspondences there are C̓VC∿CV̓C variations that are not systematic. These variations further indicate the leftward movement of the laryngeal feature as discussed in part 6 above.

G	ST	HB	
m̓oot̓ixs	m̓is	məsx	breast
m̓o'oxw	m̓ok^{h}	mo:k^{h}	pus
	n̓it^{sh}k^{h}	ni:d^{z} ∿ n̓i:d^{z}	see
iiw̓xt	y̓ax^{w}t^{h}	y̓u:t^{h}a	man
k̲'aax	Ga-q̓a:ç	Ga̓y ∿ Ga-qʔay	wing

These dialect and/or language variants indicate that the higher CI scores will be found in the interior and in the southern part of the coast and that the lower CI scores will be found in northern coastal communities, which also happen to be (for the most part) post-contact amalgamations and relocations of former lower Skeena River communities. The distribution of CI scores also fits well the ecological facts that (1) there is a significant ecological barrier, the Kitselas gorge and cataracts, separating the lower Skeena from the upper Skeena, and (2) there is no such barrier separating the Gitksan from Klemtu. On the contrary the latter two are connected by a natural corridor comprised of the upper Skeena valley, the Kitamat valley, Kitamat Sound, Douglas Channel, Fraser Reach, Graham Reach, Tolmie Channel, and Milbanke Sound.

The material presented in this paper lends some support to the notion that the Tsimshian language family is a dialect chain bent into a circle with the Gitksan and the northern dialects of Coast Tsimshian representing the divergent extremes (See Map 1). New data from the Nass River and from the northernmost Gitksan communities, e.g., Qaldo, will help complete our understanding of this dialect chain.



MAP 1. THE KITSELAS BARRIER AND GITKSAN-SOUTHERN TSIMSHIAN CORRIDOR.

REFERENCES

Boas, Franz. 1912. Tsimshian texts new series. Leyden: Brill.

Dunn, John. 1978. A practical dictionary of the Coast Tsimshian language. Ottawa: Canadian Ethnology Service.

Foley, James. 1977. Foundations of theoretical phonology. Cambridge: University Press.

Hooper, Joan. 1972. The syllable in phonological theory. Language 48.525-540.

____. 1976. An introduction to natural generative phonology. New York: Academic Press.

Jakobson, Roman and Morris Halle. 1956. Fundamentals of language. The Hague: Mouton.

Malmberg, Bertil. 1963. Phonetics. New York: Dover.

Newman, Stanley. 1969. personal communication.

Rigsby, Bruce and Lonnie Hindle. 1973. A short practical dictionary of the Gitksan language. Northwest Anthropological Research Notes volume 7,1.

Saussure, Ferdinand de. 1915. Cours de linguistique générale. Paris: Payot.

Venneman, Theo. 1972. On the theory of syllabic phonology. Linguistische Berichte 18.1-18.