

VOWEL–SONORANT METATHESIS IN ALSEA

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ABSTRACT:

Stems in Alsea exhibit pervasive alternations involving the root vowel, which may be present or absent (/c \bar{x} ^wat/, /c \bar{x} ^wt/ ‘fight’). Stems with a medial sonorant consonant have an additional form, in which the order of the consonant and vowel is reversed by metathesis (/tmus/, /tums/, /tms/ ‘close’). The central goal of this paper is to describe and analyze this metathesis and its relation to syllable structure in Alsea, with connections to patterns in other languages. At the same time, the analysis shows how approaching some difficult data sources from a perspective informed by theoretical typology can provide a valuable tool in resolving uncertainties in the linguistic record.

KEYWORDS:

Alsea; Penutian; metathesis; syllable weight; mora

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The metathesis, or reordering, of segments is a relatively unusual process in the world's languages. Recent work, however, has shown that metathesis can be understood in terms similar to those that underlie more common processes such as assimilation (see Blevins and Garrett 1998; Hume 2001; 2004). In this paper I describe the metathesis of a vowel and sonorant that derives new stem forms in Alsea, an extinct language of the central Oregon coast. Alsea roots are found in a full stem form that includes a root vowel, e.g., /cɣ^wat/ 'fight', which occurs in other contexts as a short stem lacking the root vowel, /cɣ^wt/. A root containing a medial sonorant, such as 'close', has the stem forms /tmus/ and /tms/, but also a stem with metathesis, /tums/. Based on similar processes in other languages, I argue that the vowel+sonorant ordering is induced by a requirement for a heavy syllable in the context where the metathesized stem occurs; necessarily, then, only sonorants confer coda weight in the language. Further, while the original

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transcriptions of Alsea data are of uneven quality and include considerable nonphonemic detail, a theoretically informed perspective helps to motivate the phonemic representations to which the metathesis and other generalizations refer.

The paper is organized as follows. Section 1 gives an overview of the transcriptions on which the paper is based, and the evidence for the more abstract phonemicizations adopted here. Section 2 presents more fully the stem alternations that include metathesis. Section 3 addresses the question of underlying form and the direction of metathesis. Section 4 discusses an analysis of metathesis based on syllable weight. Section 5 elaborates on assumptions about Alsea syllable structure and how this connects to the CV orderings. Section 6 discusses a special case of metathesis under conditions of prefixation. Section 7 provides a historical perspective and similarities to patterns in the Penutian family. Section 8 is a brief conclusion, and the Appendix collects the original transcriptions that form the basis of the phonemicizations in this paper.

1. Overview. Alsea has often been classified as Penutian, in the Coast Oregon subgroup, though the matter is unsettled (see Buckley 1987; Golla 1997; and Grant 1997). The main body of data comes from the texts collected by Leo Frachtenberg in 1910 and 1913, and published as Frachtenberg (1917; 1920). Related, unpublished materials are Frachtenberg's grammar (1918) and his notes

in the National Anthropological Archives.² The second large body of data was collected by Melville Jacobs (1935*a*); these notes are unpublished, and located at the University of Washington. Jacobs worked with John Albert, the last known speaker of the language, who died in 1951. The examples in this paper are drawn from these two corpora; for discussion of remaining sources of Alsea linguistic data, see Buckley (1988).

1.1. Interpretation of transcriptions. A particular problem in interpreting Alsea data is that the sources present phonetic transcriptions of varying detail and quality. In the phonemicization adopted here, Alsea includes the following obstruents, with plain and glottalized versions of all stops (and the affricate /c/=/ts/), but no contrastive voicing: /p, p̰, t, t̰, k, k̰, k^w, k̰^w, q, q̰, q^w, q̰^w, c, c̰, s, ʧ, ʧ̰, x, x̰, x^w, h, h^w, ʔ/. Phonemically voiceless stops are sometimes transcribed as voiced, especially between two vowels or other voiced segments, and most frequently by Jacobs, who uses the small capitals [B, D, DJ, G, Ġ] for “lenis” versions of /p, t, c, k, q/. Both Frachtenberg and Jacobs generally transcribe velars as fronted, e.g., [k̰, x̰], but that articulation is not distinctive (Jacobs 1954;

² The majority of Frachtenberg’s manuscript notes on Alsea were hand-copied by Paul Kroeber in the spring of 1995; he generously shared with me xeroxes of his notes, which have proved very useful in compiling sets of related stem forms for this paper. I also checked a few crucial forms during a visit to the archive in September 2005.

phonetically fronted velars are an areal trait, as noted by Thompson and Kinkade (1990). The sonorants are /m, n, l, w, y/; it is likely that all exist in glottalized versions as well, but the transcriptions are often difficult to assess in this regard; see footnote 5 for related discussion.

Only three vowels are phonemic, /i, a, u/. Other transcribed vowel qualities and length differences are here considered nondistinctive, derived largely on the basis of adjacent consonants and stress. The examples provided below illustrate this analysis; for example, the (long) mid vowels [ē, ō] are variants of high /i, u/ found typically near the uvulars /q, ɣ/ and [ō] often adjacent to the laterals /l, ʎ/. Transcribed vowel length is a fairly reliable indicator of phonemic status, as opposed to a short vowel symbol that often notates an inserted vowel. There may be distinctive nasalization of some vowels, but the indications are not always consistent, and Jacobs (1935*b*) considers them to be derived from vowel+nasal sequences.

Frachtenberg's transcriptions are generally not as reliable as Jacobs' are, for example regarding glottalization (cf. Jacobs 1954, fn. 4), so Jacobs is given more credence in cases of disagreement. For more discussion of most of these issues in phonemicization, see Buckley (1988); that paper is more conservative and retains certain features, such as fronted velars and vowel length, that have been abandoned here as the result of further study. See the Appendix for extensive examples of original transcriptions. Throughout this paper, those transcriptions are reproduced in italics, e.g., *təmū'səɣ*, while the phonemicizations based on

them are in slashes, e.g., /tmus-ɣ/. Material in phonetic brackets refers to the content of original transcriptions, e.g., the inserted vowel [ə], although square brackets with moraic subscripts are also used in section 5 to indicate syllable constituency in phonemic strings, e.g., [mus]_μ for a light closed syllable.

1.2. Inserted vowels. A fundamental claim made here is that many of the transcribed vowels are not phonologically active, at least in the lexical phonology where stem forms are determined. I will typically describe them as “excrement”, present only at a shallow phonetic level rather than as a distinctive or phonemic property of that word. Such vowels can often be seen as a phonetic effect of the articulators moving from one position to another: See Gafos (2002) for a theory of such “schwa-like vocalic elements”. It could be claimed that at least some of these inserted vowels arise at a late point in the phonology, and so are “epenthetic” rather than “excrement”; the crucial point is that they are absent at the earlier stage where the stem alternations are derived.³ For more background

³ Hall (2003:90) makes the explicit claim that EPENTHETIC vowels are necessarily syllabic — i.e., they head syllables and affect the syllabification of adjacent segments once they are inserted — whereas an INTRUSIVE (excrement) vowel “is not a phonological entity either in the lexical representation or the output representation.” A detailed examination of this question in Alsea is a topic for another paper, but it is clear that the vowels called excrement here do not affect the syllable structure to which metathesis refers.

on excrescent vowels as distinct from epenthesis, see Kinkade (1998) and Hargus and Beavert (2002*b*) on Northwest Coast languages, and Levin (1987); Gafos (2002); and Hall (2003) for broader typology and formal analysis.

The stem alternations found as part of Alsea morphology shed very important light on the interpretation of the transcriptions. However, because Alsea is an extinct language, it is also instructive to make a brief comparison to a living language that is typologically similar and better studied. The languages of the Northwest Coast are famous for their long strings of consonants (Thompson and Kinkade 1990). Although excrescent vowels often occur among these consonants, these vowels typically do not play a role in the phonology (cf. Kinkade 1998). For example, Nater (1979; 1984) includes contrasting phonetic and phonemic representations in Bella Coola (Nuxalk), a Salish language with especially long consonant strings (shown here in slightly modernized notation).

(1) Bella Coola phonetic and phonemic representations (Nater 1979:174f)

[p ^(h) ɬ ^h]	/pɬ/	‘thick’
[p ^h ʔəm]	/pʔm/	‘mosquito’
[t ^h k ^w ʊm]	/tk ^w m/	‘to dig clover roots’
[mənæ]	/mna/	‘offspring’
[k̥ɪk̥ɪ]	/kɪkɪ/	‘herring’
[sənɣ] ~ [sən ^ɔ ɣ]	/snɣ/	‘sun’

[tǣnχ ^w] ~ [tǣn ^u χ ^w]	/t̥nχ ^w /	‘head’
[χ ^w ɔ̃χ ^w nǣm]	/χ ^w -χ ^w nm/	‘hummingbird’
[qɛ:q ^x te:]	/qɪqti:/	‘little’
[lo:lχ] ~ [lōwəlχ]	/lu-lx/	‘bark is getting loose’

The similarities to Alsea are in many cases quite striking, as will be seen in the examples below: the presence of excrescent vowels before sonorant consonants; coloring of vowels such as [ǔ] next to a labialized consonant and [i] next to a fronted velar; lowering next to a uvular; and variation in glide/vowel realization. It is therefore not surprising to find that many vowels phonetically present in Alsea are also phonologically irrelevant.

1.3. Stem alternations. In the discussion of Alsea morphology here, I use the term ROOT to refer to a lexical entry for a verb or noun that might be realized in more than one STEM form. The stems that instantiate Alsea roots are broadly classified as FULL (containing a root vowel that is absent at other times) and SHORT (lacking that vowel). Thus the verb root meaning ‘fight’ can be realized as full /cχ^wat/ or short /cχ^wt/; the underlying form of this root is /cχ^wat/, from which the short stem is derived by deletion of /a/. Most often there is only one vowel in the root, but longer roots such as /culaq̣n/ in (6) show that it is actually the rightmost vowel that is deleted in the short stem.

The difference between full and short stems can be seen most straightforwardly for roots of the shape CVC with two obstruents, such as /tap/; these

normally alternate with short CC in the transcriptions. In roots containing three or more obstruents, however, we generally find a transcribed vowel in the short stem. In these examples, stems are shown in bold, with hyphens separating affixes from the stem, but not separating individual affixes. In comparisons with the original transcriptions, the phonemicization of the stem is shown in slashes.

(2) Alsea stem alternations with obstruents only

Full stem		Short stem		Gloss
<i>tā'p-al</i>	/tap/	<i>tp-aī'</i>	/tp/	'fly, jump'
<i>tsχwā't-a</i>	/cχ ^w at/	<i>tšχwD-a''a</i>	/cχ ^w t/	'fight'
<i>tsī'k-al</i>	/cik/	<i>tsk-ī'χ</i>	/ck/	'lie down'
<i>Bī'tG-at</i>	/pitq/	<i>BətG-ī'nχ</i>	/ptq/	'upset, spill'
<i>mə-pū't-al</i>	/puʔ/	<i>pʔ-ūi'χ</i>	/pʔ/	'stick out'
<i>sū'pχ-ī</i>	/supʔ/	<i>sipʔ-ūi'm</i>	/spʔ/	'scrape'

In short stems with no transcribed vowel, there can be little doubt that the vowel has been deleted, and that the morphology of the language includes a process that eliminates an underlying root vowel. By extension, even in short stems that include a transcribed vowel, that vowel must not be phonological but is present for phonetic reasons. As noted above, an imperfect rule of thumb is that a

transcribed long vowel is phonemically present, while a transcribed short vowel is often excrescent.

Both Frachtenberg and Jacobs sometimes vacillate in their transcriptions of vowels in the same stem form, suggesting that the vowel is quite short or partly dependent on rate of speech. (See the Appendix for variation in transcriptions.) Phonetic context also plays an important role: In particular, when one or more of the stem consonants is a sonorant, an adjacent transcribed vowel in the short stem is very common.

(3) Stem alternations involving sonorants

Full stem		Short stem		Gloss
<i>lā'tq-aī</i>	/latq/	<i>iltq-aī'm</i>	/ltq/	'do what'
<i>tsā'm-al</i>	/cam/	<i>tsim-aī'nχ</i>	/cm/	'try'
<i>kwa'l-a</i>	/k ^w al/	<i>kul-aī'</i>	/k ^w l/	'reach'
<i>qē'l-nχ</i>	/q̣il/	<i>q̣al-ī'nχ</i>	/q̣l/	'tie, hang'
<i>χēm-ī'sal</i>	/χim/	<i>χam-ī'</i>	/χm/	'turn back'
<i>mə-χwī'n-alχ</i>	/χ ^w in/	<i>λ-χun-ī'yū</i>	/χ ^w n/	'tear down'
<i>lō't-sitχanχ</i>	/lut/	<i>ild-ūi'mi</i>	/lt/	'frighten'
<i>mu'sḳ-itχanχ</i>	/musḳ/	<i>miṣḳ-u'inχ</i>	/msḳ/	'suck poison'

In all these examples, where we would expect no phonological vowel in the short stem, we find a transcribed vowel adjacent to the sonorant. This vowel is not a phonemic property of the stem; its quality and location are determined not by the true root vowel but rather by the properties of the stem consonants, as we would expect for an excrescent vowel. Typically [a] is transcribed next to a uvular, [u] next to a labialized consonant, and [i] or [ə] in other cases. The prothetic vowels in [iltq], [ild] for /ltq/, /lt/ show clearly that the vowel in the short stem is not related to the phonemic vowel of the full stem (which occurs following the liquid in both these cases): instead, the true root vowel is deleted phonologically to create the short stem, and later a phonetic vowel may be inserted depending on the string of consonants that remains.

1.4. Glides. The Alsea glide–vowel pairs [y]~[i] and [w]~[u] alternate according to syllable structure; when the glide is not adjacent to a vowel, it is most often realized as the corresponding vowel, usually transcribed as long.

(4) Stem alternations with glide vocalization

Full		Short		Gloss
<i>yā'ts-χ</i>	/yac/	<i>īts-ai'</i>	/yc/	'live, stay'
<i>χo-wa'st-aux</i>	/wast/	<i>ūst-ai'nχ</i>	/wst/	'follow'

Note in particular that the short stem of /wast/ is not realized as, say, **wist*, as one would expect if the rule creating a short stem consisted of inserting /i/ as the transcriptions of so many roots suggest. Instead, the excrescent [i] is found in clusters of consonants, but when a glide is realized as a phonological vowel, no excrescent vowel is required.⁴

1.5. Metathesis. In roots containing a medial sonorant adjacent to the vowel, the FULL stem has two subtypes: a HEAVY stem with an internal ordering of vowel plus consonant (VC), for example CVCC, and a LIGHT stem with the corresponding segments in the order CV, for example CCVC. The terminology anticipates the analysis pursued below.

(5) Heavy and light stem alternations

Light (Full)		Heavy (Full)		Short		Gloss
<i>timū's-iyəm</i>	/tmus/	<i>tū'ms-a</i>	/tums/	<i>ɫ-ti'ms-iyū</i>	/tms/	'close'

⁴ If the glide continues to function as a consonant, then an excrescent vowel can be found. Jacobs (1935*b*) is quite explicit about speech-rate variation between glides and vowels, using the example of 'followed him/her' that I phonemicize as /wst'-áy-nx/: "Thus *uštai'nx* <> *wštai'nx* <> *wəštai'nx*, where the first form is heard in the most rapid speech, the third form in the slowest speech."

sīla'xw-asax /sla^w/ *ša'lxw-ət* /sal^w/ *sī'lxu-tx* /sl^w/ 'melt'
qalī'^h-tsaxam /qlih/ *qē'lh-ya* /qilh/ *λ-qa'lh-iyū* /qlh/ 'be tired'

These patterns are important support for the view that many of the short transcribed vowels are actually exrescent. For example, if the light form of 'close' were actually */timus/, and the heavy stem is derived by reversing the order of /mu/, then the expected outcome based on other patterns in Asea is */tiums/, with survival of the /i/. The following examples show specifically that a vowel adjacent to a glide or another (nonidentical) vowel does not delete, as would be required to derive /tums/ from */tiums/; therefore the transcribed [i] vowel must not be underlyingly present in /tmus/.

(6) Vowel/glide alternations including heavy and light stems

Light (Full)		Heavy (Full)		Short		Gloss
<i>tšīya's-anx</i>	/cyas/	<i>ł-tsaī's-lnx</i>	/cays/	<i>tsīs-a'lnx</i>	/cys/	'divide'
<i>tspi'ūd-īm</i>	/cpyut/	<i>tspūi't-iyū</i>	/cpuyt/	<i>tspīd-ūi'</i>	/cpyt/	'float'
<i>łwa'q-aDūt</i>	/łwaq̣/	<i>λaū'q-atəx</i>	/ławq̣/	<i>łūq̣-a'i</i>	/łwq̣/	'dry'
<i>łōwī'ł-ītsū</i>	/łwił/	<i>mə-łi'ūt-stayū</i>	/łiwił/	<i>łū'ł-iyū'łi</i>	/łwił/	'enjoy'
<i>DJūlā'qan-txa</i>	/culaq̣n/	<i>DJuwa'lqan-t</i>	/cualq̣n/	<i>DJū'lqan-a'a</i>	/culq̣n/	'pack'

A particularly close parallel to hypothetical */timus/ is /culaḳn/, where clearly both vowels /u, a/ are preserved in the heavy stem /cualḳn/ (with a transitional glide). On the evidence of such alternations, it would be highly problematic to posit the excrescent vowels as present underlyingly or in the lexical phonology where the stem alternations are derived.

2. Stem forms. As shown in section 1, alternating stems in Alsea have at least two forms, the FULL stem with a vowel (called “long” in Buckley 1989) and the SHORT stem without that vowel.

(7)	Full (V present)	Short (deleted V)	
	/cam/	/cm/	‘try’
	/ḳil/	/ḳl/	‘tie, hang’
	/musk/	/msk/	‘suck poison’

Stems with a sonorant consonant that is adjacent to the vowel and stem-medial (i.e., not at the absolute edge of the stem) show the further distinction between LIGHT and HEAVY versions of the full stem.

(8)	Full (V present)		Short (deleted V)	
	Light (CV)	Heavy (VC)		
	/slaχ ^w /	/salχ ^w /	/slχ ^w /	‘melt’
	/qlih/	/qilh/	/qlh/	‘be tired’
	/tmus/	/tums/	/tms/	‘close’

Reference to “stem-medial” is crucial. A sonorant at the right edge of a root never undergoes metathesis with the preceding vowel: e.g., /cam/ does not alternate with */cma/. In the presence of a consonantal prefix, however, metathesis with a root-initial sonorant is possible, as in /m-latq/ → /m-altq/ ‘have something’; see section 6.

From this point on, phonemic representations are used; the original transcriptions on which they are based can be found in the Appendix. I will return to an explicit discussion of the transcriptions where necessary. It can be noted at this point, however, that these phonemicizations are supported by language-internal and crosslinguistic evidence. The simple distribution of transcribed vowels plays a role; for example, no word in Frachtenberg’s corpus starts with [tm], so the proposed insertion of a vowel [i] in /tmus/ is consistent with the observed outputs. In addition, alternations such as [timūs] and [tūms] are greatly simplified if the [i] is treated as a later effect. At the same time, comparison with languages such as Bella Coola, which have underlying consonant strings similar

to those proposed here for Alesa, exhibit very similar vowel insertion and coloring; this precedent supports the plausibility of the processes required by the Alesa phonemicizations.

2.1. Metathesis in light and heavy stems. Metathesis of CV to VC is responsible for the light and heavy stem alternations in the case of a medial sonorant, belonging to the set /m, n, l, w, y/. Further examples are shown in (9)–(11), with the light CV stems in the left column, and the heavy VC in the right. Below I argue that the light stem is the underlying representation.

(9) Metathesis with nasal

<u>Light stem</u>		<u>Heavy stem</u>	
/tmús-χ/	‘is closed’	/túms-a/	‘a door’
/tmús-sa-nχ/	‘had closed it’	/túms-t/	‘close it!’
/p-tmáq ^w -cus-/	‘try to quiet’	/támq ^w -χ/	‘be quiet!’
/fmás-sal-tχ/	‘agreed to it’	/fáms-t/	‘finish it!’
/ʔmíst-χ/	‘was like that’	/ʔímst-ay/	‘(don’t) do it!’
/knáχ-χ/	‘dances with them’	/kánχ-χ/	‘dance with them!’
/cnús-χ/	‘are lying in bed’	/cúns-χ/	‘lie down!’
/cnús-al/	‘always sleep’	/cúns-tχ/	‘are sleeping’

(10) Metathesis with lateral

/mláh-sa-nx/	‘had lost it’	/málh-stx-a/	‘lost (adj.)’
/stlák-sal-tx/	‘had been sliding’	/stálk-t/	‘slide it!’
/culáqn-tx/	‘is packing’	/cuálqn-t/	‘pack it!’
/łqłít-x/	‘is sick’	/łqłít-ay/	‘(don’t) hurt it!’
/xłłít-sa-nx/	‘had caught it’	/xłłít-ay/	‘(don’t) catch it!’
/qłłh-al-tx/	‘is often tired’	/qłłh-a/	‘(don’t) get tired!’
/tlúq ^w -x/	‘is close to shore’	/túlq ^w -t/	‘bring it close to shore!’

(11) Metathesis with glide

/cwás-al/	‘crawling around’	/cáws-x/	‘crawl!’
/łwáh-aw/	‘were climbing’	/łáwh-x/	‘climb up!’
/swáłł/	‘fresh, new’	/sáwłł-iyu/	‘get fresher’
/twíh-x/	‘poured’	/tíwh-ay/	‘(don’t) pour it!’
/pyáx-x/	‘is hiding’	/páyx-x/	‘hide!’
/pyáx-aw-tx/	‘is in act of hiding’	/páyx-t/	‘hide it!’
/cpyút-x/	‘is floating’	/cpúyt-x/	‘float!’
/cpyút-al/	‘was floating’	/cpúyt-iyu/	‘floated (quickly)’
/qłyút-sal/	‘had pierced’	/qłúyt-t/	‘prick him!’

As can be observed, certain suffixes correlate strongly with either a light or heavy stem. (Others, such as /tʰ/ and /iyu/, do not follow such a clear pattern.)

2.2. Conditioning environment. The more common suffixes with a strong stem-shape correlation are listed in (12).

(12) Suffixes correlated with stem type

	Light stem	Heavy stem
C-initial	/x̣/ realis completive	/x̣/ intransitive imperative
	/sa(l)/ distributive, past tense	/s/ 1st pers obj imperative
		/t/ 3rd pers obj imperative
V-initial	/aw/ continuative	/ay/ transitive prohibitive
	/a/ habitual	/a/ intransitive prohibitive
	/i/ irrealis completive	/a/ nominal, adverbial

It is clearly impossible to predict the heavy versus light stem form based on the phonological context; in particular, the realis completive and the intransitive imperative both consist of the single segment /x̣/, yet require different stems. As seen in (12), one generalization regarding the two options for the full stem (i.e., light vs. heavy) is that several imperative suffixes (including the prohibitive, used

with a separate negative particle) correlate with the heavy stem. This stem is also found with the suffix *-a* that derives various nouns and adverbs. The light stem is found most consistently with a range of aspectual suffixes, such as the habitual, continuative, and completive.

Both Frachtenberg and Jacobs allude to aspectual differences between the various stem forms (full and short as well as light and heavy), but uncertainties remain. Perhaps as a result of the strong association of many suffixes with a specific stem form, minimal pairs involving solely a stem difference are not easy to find. The following few pairs do, however, suggest an aspectual difference, where the light stem is more durative than the heavy.

(13) Contrasting light and heavy stems

<u>Light stem</u>		<u>Heavy stem</u>	
/tmús-t/	‘keep it shut!’	/túms-t/	‘shut it!’
/cɿyáq-tx/	‘is stretched out’	/cɿáyq-tx/	‘made it straight’
/cq ^w náq ^w -ɩn-x̄/	‘was (not) overtaken’	/cq ^w ánq ^w -ɩn-x̄/	‘was being overtaken’

Unfortunately, most such minimal contrasts come from elicitation notes without further clues to the larger situation in which they would be appropriate. The semantic or other factors that determine the choice of stem form are beyond the

scope of this paper, but the correlation with certain suffixes provides a convenient diagnostic for the expected stem form, heavy or light.

2.3. Lack of metathesis with a medial obstruent. As the next examples show, a medial obstruent does not undergo any reordering, regardless of the suffix present. In fact, the opposite ordering for a particular stem is never attested — each of these full stems is consistently CVCC or CCVC.

(14) Stable VC obstruent orderings in light and heavy contexts

<u>Expected VC</u>		<u>Expected CV, actual VC</u>
/káχk-al/	‘habitually assemble’	/káχk-t/ ‘gather them!’
/tásn-sal-nχ/	‘pointed to it’	/tásn-t/ ‘point at him!’
/kíst-i/	‘(will) leave (it)’	/kíst-ay/ ‘(don’t) leave him!’
/síq ^w l-al/	‘stand a long time’	/síq ^w l-χ/ ‘stand up!’
/l-tíq ^w l-aw-sχ/	‘is undressing himself’	/tíq ^w l-t/ ‘undress him!’
/súpł-aw/	‘slid along’	/súpł-t/ ‘slide it!’

(15) Stable CV obstruent orderings in light and heavy contexts

<u>Expected VC, actual CV</u>		<u>Expected CV</u>
/tkás-sal/	‘has been broken’	/tkás-ay/ ‘(don’t) break it!’
/cχ ^w át-sal-nχ/	‘had a fight with him’	/cχ ^w át-a/ ‘(don’t) fight!’

/c ^x á ^p -sal-n ^{x̣} /	‘threw it all away’	/c ^x á ^p -ay/	‘(don’t) throw it all away!’
/l-mkín-al- ^{x̣} /	‘keep hitting it’	/l-mkín-t ^{x̣} -t/	‘hit him!’
/p ^k wús- ^{x̣} /	‘urinates’	/p ^k wús-a/	‘(don’t) urinate!’

A central question, then, is why sonorants alone participate in this alternation, and an insightful answer to this question is a major goal of this paper.

3. Underlying form. As seen in (14)–(15), Alsea roots with medial obstruents have clear vowel+consonant ordering contrasts, and so the specific VC or CV ordering must be listed lexically for such roots: a near-minimal pair is /cix^wt/ ‘push’ versus /c^{x̣}at/ ‘fight’. There is at present, however, no clear evidence to suggest that sonorant roots contrast underlyingly for VC versus CV, presumably as a result of the metathesis process. Do they uniformly have one of these orderings in underlying form? For example, in Straits Salish languages, it is generally agreed that the Non-Actual form of the stem, such as Klallam *čk^wu-* ‘shoot’, is basic, and the Actual form *čuk^w-* is derived from it by metathesis (Thompson and Thompson 1969; see section 4). The analogous approach in Alsea takes the light stem (/tmus/) as the basic form, and derives the heavy stem (/tums/) from it by metathesis. I argue that this approach is correct.

3.1. Stems with a repeated vowel. The strongest evidence for the light stem as basic comes from longer stems that have two underlying vowels, only one of which is deleted to create the short stem. Recall from (8) that a root with a medial sonorant typically has three distinct stem forms, such as /tmus/ ‘close’ with light

/tmus/, heavy /tums/, and short /tms/. Certain roots, however, contain an additional underlying vowel on the “other side” of the sonorant, yielding a basic shape of CVCVC. The clearest examples of such stems have identical vowels repeated in the two positions (a kind of stem-internal harmony; see also section 7 for historical context).

In the heavy stem, when the rightmost vowel has metathesized to precede the sonorant, that vowel would be expected to follow another vocalic element, i.e., CVVCC. In fact, the cluster of two identical vowels simplifies to one vowel, so that the heavy stem is identical in form to the short stem.

(16) Conflation of heavy and short forms of /ʔilit/

Light <u>CVCVC</u>	/ʔilít-sa-nx/	‘have talked to him’
Heavy <u>CVCC</u>	/ʔilt-t/	‘talk to him!’
Short <u>CVCC</u>	/ʔilt-íy-nx/	‘talked to him’

In other words, for ‘talk’, expected heavy */ʔiilt/ reduces to /ʔilt/, the same result as deleting the rightmost vowel and therefore homophonous with the short stem. This pattern is illustrated for several other stems in the following examples.⁵

⁵ Collapse of two identical vowels must not be confused with the maintenance of distinct adjacent vowels in forms such as /cualq̣n/ in (6). However, the original

(17) Light and heavy forms in roots with repeated vowel

UR	Light stem		Heavy stem	
/yalas/	/y al ás-aw/	‘is returning’	/y á ls-ɣ/	‘go home!’
/młanat/	/m łan át-ɣ/	‘is hidden’	/m łán t-t/	‘hide it!’
/salasɣ/	/s al ásɣ-al/	‘survived (again)’	/s ál sɣ-ay/	‘(not) live’
/timix ^w m/	/t im íɣ ^w m-aw/	‘keep making fun’	/t ím ɣ ^w m-t/	‘make fun of him!’
/tiwił/	/t i wíł-h ^w an-nɣ/	‘made it’	/t í wł-h ^w an-t/	‘fix it!’
/nunus/	/n un ús-al-tɣ/	‘(usually) ate’	/n ún s-t/	‘eat it!’

transcriptions provide some suggestion that, at least with stems containing two /a/ vowels, elision may not always occur, and instead the metathesized version of a stem such as *yalas-* may be *yaʔals-* rather than *yals-*, by insertion of a glottal stop onset: *yalas* → *yaals* → *yaʔals*. The evidence is by no means certain, however, since glottalization is not consistently transcribed and in some cases may be due to a glottalized sonorant or simply non-phonemic. See the Appendix for examples; the fact that glottalization is transcribed more often in a heavy stem such as possible /yáls/ could be due to the typical location of stress on that stem form, as opposed to the short stem that normally is not stressed and where glottalization might be less perceptible. At any rate, the pattern still supports treating light /yalas/ as the underlying form.

Crucially, we must distinguish a root for which a heavy stem such as /nuns/ alternates with light /nunus/, from a more typical root in which a heavy stem such as /tums/ alternates with light /tmus/. Since the heavy stems both have the shape CVCC, the simplest analysis is that the underlying form of the root reflects the light stem, i.e., /nunus/ versus /tmus/.

3.2. Derived VC. Additional evidence for the light stem as basic comes from another context of metathesis. While not as well attested, reversal of CV to VC is sometimes found in stems derived by addition of a single-consonant prefix: intentional /p/, intransitive /m/, or transitive /ʎ/. When the stem begins with a sonorant plus a vowel, this C+CV sequence can reverse to C+VC.

(18) Metathesis of initial sonorant-vowel sequence following prefix

/múk ^w ʔcu/	‘bow’	/p-umk ^w ʔcu-áʔa/	‘(will) make it a bow’
/látq/	‘something’	/m-áltq/	‘have something’
/wasʔ-/	‘follow’	/ʎ-áwsʔ-tut/	‘chasing’

This pattern is discussed more fully in section 6; for the present, it serves to illustrate that a change in the direction CV → VC is a necessary part of the morphology. In a more parsimonious grammar, stem-initial metathesis supports treating stem-internal metathesis in the same way, starting from light stems with

the order CV. Since the evidence favors treating the light stem as underlying, I proceed under this assumption in the discussion that follows.⁶

4. Phonologically driven metathesis. Hume (2001) makes the important point that metathesis, like other processes affecting the sounds of language, is a means to correct an ill-formed structure — specifically, by a reversal of segment order. For example, in a common change such as nasal place assimilation, /nb/ surfacing as [mb], the /n/ violates a constraint on place of articulation and is modified to bring it into conformity. By the same token, in a metathesis such as Faroese /skt/ becoming [kst], the violation is that a stop, here /k/, cannot occur

⁶ Less conclusive evidence regarding the underlying stem shape is not discussed here, but one additional pattern should be mentioned. For certain words ending in /ays/, there is an apparent light stem ending /ayas/ derived from it. In at least some such words, the ending is the well-attested combination of nominalizing /s/ with the inchoative /ay/. Examples include /cutáys/ ‘salmon’ versus /cutayás-aw-tx^ws/ ‘little fish’, and /m-ʔanáy-s-χ-m/ ‘(will) have a friend’ versus /m-ʔanayás-sal-tx/ ‘had a friend’. I take this to be a backformation by analogy with verb stems such as /yalas/ ~ /yals/ in (17). There may also be a role for language contact, since stem alternations in the nearby languages Siuslaw and Hanis Coos can largely be analyzed as insertion of /a/ before a stem-final consonant; see section 7.4.

between two other consonants, and the reordering eliminates the problem without deleting a segment.

Hume discusses metatheses that are motivated by phonological context, and operate to repair a phonologically defined violation. In Alsea, as we have seen, the fundamental trigger is not phonology but rather morphological context, or some set of morphosemantic features. Nevertheless, the behavior of sonorants in contrast with obstruents suggests that phonological factors play a central role as well. I argue that while morphosemantic context determines whether prosodic conditions are imposed on the stem, satisfaction of the conditions proceeds according to the same principles as in cases of a completely phonological trigger.

4.1. Rotuman. A related insight lies behind McCarthy's (2000) analysis of Rotuman metathesis. This Oceanic language shows a distinction between complete and incomplete "phases" (Churchward 1940); the incomplete form is derived from the complete, in the default case by metathesis of the final CV to VC, for example *hosa* → *hoas* 'flower'. McCarthy argues that this metathesis responds to a prosodic pressure, namely that a word in the incomplete phase end in a monosyllabic foot (cf. also Blevins 1994). The consonant-final *hoas*, a single syllable with a short diphthong, satisfies this requirement, while the basic form *hosa* does not. Short diphthongs must, however, consist of two vowels with rising sonority (i.e., movement from a higher to a lower vowel). Where this condition cannot be met, the heavy-syllable constraint of Rotuman is satisfied in other ways: by dropping a final vowel, as in *tokiri* → *tokir* 'to roll', or by fusing two

vowels, as in *mose* → *mös* ‘to pull’. Thus the reversal in order is just one way of satisfying the heavy-syllable constraint; there is no specific rule demanding metathesis.

4.2. Klallam. In another context, Stonham (1994) also argues for metathesis as phonologically induced rather than as a specific operation. He proposes that a syllable or stem template combines with the underlying ordering of segments to force a reordering of those segments to satisfy the template, rather than as a direct statement of reversal. (See Callaghan 2000 for an opposing view on Sierra Miwok.) This approach resembles McCarthy’s analysis of Rotuman phases as a prosodic effect, in which the reordering is not directly required, but necessary to satisfy a particular shape constraint.

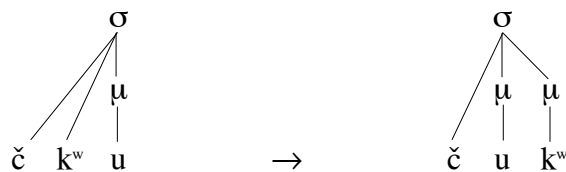
A strong parallel to Alesa is found in Straits Salish, analyzed by Stonham. The following Klallam verb forms illustrate a metathesis that differentiates Actual and Non-Actual stems (Thompson and Thompson 1969; see Montler 1989 for closely related Saanich).

(19) Klallam stem alternations

<u>Non-Actual</u>	<u>Actual</u>	
<i>čk^wú-</i>	<i>čúk^w-</i>	‘shoot’
<i>xč^ší-</i>	<i>xíč^š-</i>	‘scratch’
<i>čq^wé-</i>	<i>čšq^w-</i>	‘burn’

Stonham argues for a rule of mora insertion, which has various consequences on the verb depending on its phonological shape. For CCV verbs, the result is metathesis to match the heavy syllable CVC.

(20) Moraically driven metathesis in Klallam



Syllable weight as the trigger for metathesis in languages as diverse as Rotuman and Klallam suggests a similar account of Alesia metathesis as well. In particular, the relevance of syllable-weight connects insightfully with the observed sonorant/obstruent distinction: These classes of sounds differ specifically in sonority, which is known to interact with the moraic status of a coda consonant.

4.3. Kwakwala. It is widely acknowledged that languages may restrict the coda consonants that render a syllable heavy — for example, a sonorant in the coda might induce a heavy syllable, where a coda obstruent does not (Prince 1983; Hyman 1985; Zec 1988; 1995; Hayes 1989). We can see this in the Wakashan language Kwakwala. Stress is on the leftmost heavy syllable of the word, or on the final syllable if all are light (Bach 1975). A vowel-sonorant

rhyme counts as heavy and attracts the stress, whereas a vowel-obstruent rhyme counts as light and the stress defaults to the final syllable. Syllable constituency is indicated bracketing, and mora count by subscripts.

(21) Stress attraction to sonorant rhymes in Kwakwala

Heavy VC with sonorant

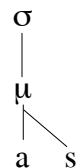
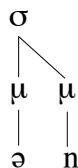
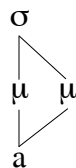
[m̌ə́n]_{μμ}[sa]_μ ‘to measure’
 [sáɫ]_{μμ}[ýa]_μ ‘to pick out’
 [dʒə́m]_{μμ}[bə]_μ[tə́ls]_{μμ} ‘to bury in the ground’

Light VC with obstruent

[gas]_μ[xá]_μ ‘to carry on fingers’
 [tə́ʔ]_μ[čá]_μ ‘to warm oneself’
 [max^w]_μ[čá]_μ ‘to be ashamed’

The attraction of stress to both long vowels and sonorant-closed syllables is easily captured by assigning moras to a coda sonorant such as [n] but not to an obstruent such as [s]. Long vowels such as [a:] necessarily have two moras as the representation of their length.

(22) Sonority-sensitive moraic representations



We can understand the differing patterns for obstruents and sonorants in Alsea by combining insights from these analyses of Klallam (where metathesis is triggered by a moraic difference) and Kwakwala (where only sonorants contribute a mora to a syllable). It is noteworthy that all three languages belong to the Northwest Coast language area (Thompson and Kinkade 1990), and overlapping properties of this sort come as no surprise.

The contrast in Alsea between light and heavy stems will thus be exactly what is implied by the names introduced in section 1: Heavy stems (/tums/ ‘close’) contain a heavy syllable with a sonorant coda, while light stems (/tmus/) do not.

(23) Partial prosodic structures of /tmus/ and /tums/



I have not discovered supporting patterns from other aspects of Alsea phonology, such as stress or reduplication, that require the same distinction in moraicity; at

the same time, I know of no pattern that requires moraic obstruents.⁷ I turn now to a closer examination of Alsea syllables.

5. Alsea syllable structure. The examples presented in section 1 show that the existing transcriptions often contain vowels that are not part of the underlying form of words, and seem to play no role in the lexical phonology at all. Like other Northwest Coast languages, such as Bella Coola in (1), Alsea has strings of consonants that challenge common approaches to syllable structure, and the best treatment of such languages remains a matter of debate. For example, it has been claimed that strings of obstruents not adjacent to a vowel serve as the heads of full syllables (Hoard 1978) or headless syllables (Shaw 1996; Cho and King 2003); are moraicly licensed (Bagemihl 1991; 1998); or have no syllabic affiliation (Newman 1947; Cook 1994). Differences in the empirical predictions of these various approaches can sometimes be difficult to find, but a generally shared theme is that conventional syllables in these languages — in particular, those

⁷ The analysis of Klallam crucially relies on obstruents such as /k^w/ bearing a mora in the coda of a syllable — this is the essential connection between the mora and the reversal in order — so Klallam does not assign moras in the same way that Kwakwala and Alsea do. Another important difference from Klallam is that in Alsea the segments participating in metathesis are never located at the edge of the stem, so there is no alternation quite like Klallam *čk^wu ~ čuk^w*.

headed by a vowel — do not exhibit large consonant clusters in the margins (the onset and coda).

5.1. Simple syllables. Recent work on Salish languages tends to favor relatively simple syllables despite long strings of obstruents. Bagemihl (1991) permits a maximal syllable of CRV:C for Bella Coola (where R is a sonorant consonant); Cho and King (2003) allow a fricative to head a syllable, but similarly do not permit obstruent clusters in the onset or coda. Bates and Carlson (1998) analyze Spokane (Npoqínišcn) using even simpler syllables of the shape CV(C), although two adjacent consonants lacking a vocalic nucleus will syllabify together as CC. Matthewson (1994) posits larger CCVCC syllables in Lillooet (St'át'imcets), but the syllables resemble more ordinary patterns insofar as onset clusters cannot have falling sonority and a consonant cannot head a syllable. Shaw (2002) permits at most two obstruents in the onsets of Musqueam (hənqəmínəm) root syllables. Hargus and Beavert (2002*a,b*) demonstrate a similar maximum of two obstruents in Sahaptin onsets, and exclude sonorant+obstruent onset clusters. Czykowska-Higgins and Kinkade (1998) cite several unpublished studies that also claim rather simple CVC syllables in other Salish languages.

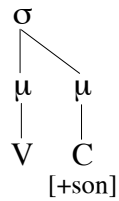
The consensus view for languages that resemble Alsea, then, is that a vowel syllabifies with adjacent consonants to create simple syllables, rather than complex clusters within the syllable — called the SIMPLE SYLLABLE HYPOTHESIS by Bagemihl (1991). To this extent, we can rely on the theoretical position

advocated on the basis of these other languages. Because metathesis involves a consonant and a vowel, there is no doubt about the presence of a syllable in these cases: the vowel heads it. But given the lack of scholarly consensus on how to prosodify consonants outside the basic syllables, and the apparent absence of empirical support one way or another, I take no position here on the prosodic structure outside the core syllables that are relevant to the metathesis process. I leave for future work the status of Alsea consonants that are not adjacent to a vowel.

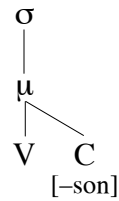
5.2. Representations. In standard moraic theory, when the coda of a syllable contributes to weight (what Hayes 1989 calls “weight by position”), then that consonant projects its own mora; and when the coda does not contribute to weight, it links to the preceding mora, without increasing the mora count of the syllable. As noted, Alsea appears to resemble Kwakwala in that only a sonorant in the coda triggers weight by position.

(24) Coda consonants and syllable weight

Weight by position



No weight by position



Following the simple syllable hypothesis, I assume that only one consonant is permitted in the coda, so that only the first post-vocalic consonant has a potential effect on syllable weight.

I also assume that only a single consonant occurs in the onset. Evidence against onset clusters in Aleva is that extraneous vowels are very often written between a consonant and a following sonorant, even if a true vowel then follows: cf. [xamĩ'] for /xm-iy/ 'turned back'. A transitional vowel of this sort seems unlikely within an onset cluster.⁸ Contrast this with Bella Coola, where obstruent+sonorant onset clusters do occur (Bagemihl 1991); while an extraneous

⁸ A reviewer points out that an inserted vowel can indeed occur within a syllable, as in the history of Slavic (cf. Old Church Slavic *grad*, Russian *gorod* 'city'). While this is common for obstruent+liquid onsets, I do not know of any examples that apply generally to obstruent+sonorant onset clusters.

vowel is obligatory in initial sonorant-sonorant sequences (which cannot form an onset cluster), it is “never articulated” or only “occasionally heard” in obstruent+sonorant sequences, depending on the obstruent (Nater 1979:177). That makes sense if such sequences are valid onset clusters.

Assuming a simple CVC syllable structure for Alsea, we can add to the representations given above in (23). The words /tmús-χ/ ‘closed’ and /túms-t/ ‘close it!’ are presented; I follow the notational practice of Hayes (1989) in the linking of onsets and coda consonants.

(25) Core prosodic structures of light and heavy stems



(26) Compact representations

t [mus]_μ χ

[tum]_{μμ} s t

The moraic consequence of metathesis from underlying light /tmus/ to heavy /tums/ is to place the sonorant in a position to bear a mora and make the syllable

heavy.⁹ For compactness of representation, subsequent syllable structures will be shown by square brackets, as in (26). Consonants outside the basic syllable structure are shown without specific prosodification, since the matter is uncertain and has no particular consequences here.

For roots that resemble /tmus/, in which the medial consonant is a sonorant and the flanking consonants are obstruents, the analysis based on syllable weight works easily, and serves as an effective means of connecting the special status of sonorants in Alesa metathesis to cross-linguistically motivated properties of these sounds.

(27) Metathesis to yield a heavy syllable

Light:	/t ^w lax ^w s- ^w /	t [lax ^w] _u s ^w	‘rained’
Heavy:	/t-m-t ^w lax ^w s- ^w mt/	t m [tal] _{mu} ^w s ^w m t	‘torrents’

⁹ I assume for Alesa a heavy-syllable requirement rather than mora insertion as Stonham posits for Klallam. A particular reason for the templatic analysis is stems such as /nusus/ in (17); its heavy stem /nuns/ has the same number of moras (two), but allocated to a single heavy syllable rather than the two light syllables in /nusus/.

Light:	/cɸyút-ɣ/	c p [yut] _u ɣ	‘is floating’
Heavy:	/cɸúyt-ɣ/	c [puy] _{uu} t ɣ	‘float!’

When the sonorant occurs to the left of the vowel (in the light stem), the following consonant is an obstruent, and does not render the syllable heavy. Similar reasoning accounts for obstruent-medial stems that cannot be made heavy by metathesis, since moving an obstruent after the vowel does not result in a new mora. Thus /tkás-ay/ ‘(don’t) break it!’ (15) does not become */táks-ay/ because the syllable /tak/ is still light. In these stems, the preference for a heavy syllable in the usual morphosemantic context goes unfulfilled, due to the lack of appropriate phonological options. Metathesis fails because it is gratuitous, simply creating a new light syllable.¹⁰

5.3. Opacity. The situation is more nuanced for stems in which the final consonant is a sonorant, such as /xlum/ ‘move, travel’. When the suffix begins with a vowel (28), metathesis to VC results in the requisite heavy syllable; but if the suffix begins with a consonant (29), the sonorant in the stem syllabifies as the coda and even the “light” stem contains a heavy syllable.

¹⁰ The grammar must also include restrictions to prevent modifications other than metathesis, such as inserting a sonorant (*/tkáns/) or changing an obstruent into a sonorant (*/táns/).

(28) Metathesizing stem with final sonorant: Vowel-initial suffix

Light:	/x lú m-al-tʃ/	x [lu] _μ [mal] _{μμ} t ʃ	‘is moving’
Heavy:	/x úl m-itʃ/	[xul] _{μμ} [mitʃ] _μ	‘road’

(29) Metathesizing stem with final sonorant: Consonant-initial suffix

“Light”:	/x lú m-ʃ/	x [lum] _{μμ} ʃ	‘moved’
Heavy:	/x úl m-tʃ-m/	[xul] _{μμ} m t ʃ m	‘will travel’

In (29), metathesis is not directly motivated by surface syllable weight, and the stem choice is opaque. One analysis is to assume an intermediate representation in which the stem-final consonant is unsyllabified (i.e., extrasyllabic), so that it has no effect on syllable weight whether it is an obstruent or a sonorant (cf. Borowsky 1986; Itô 1986; Rice 1990). This stage results in a stem syllable structure identical to that found with a vowel-initial suffix, i.e., $x[lu]_{\mu}\langle m \rangle$ where angled brackets indicate an extrasyllabic consonant. Metathesis is necessary to achieve a heavy syllable at this stage, yielding $[xul]_{\mu\mu}\langle m \rangle$. This approach also avoids a different problem of syllable weight: In obstruent-medial roots containing a final sonorant, such as /tasn/ ‘point at’, we fail to find metathesis in the heavy stem, despite the fact that this could yield a heavy syllable, e.g.,

$t[san]_{\mu}t$ for the attested $[tas]_{\mu}nt$ ‘point at him!’). In such stems, the “heavy” context goes unsatisfied due to lack of metathesis. If weight is calculated at an intermediate stage with extrasyllabicity, i.e., $[tas]_{\mu}\langle n \rangle$ versus $*t[sa]_{\mu}\langle n \rangle$, then the stem-final sonorant is unavailable and this consequence is avoided because metathesis is gratuitous.¹¹

In summary, under the reasonable assumption that only sonorants render a syllable heavy, reference to syllable weight can account for the fact that only sonorants participate in metathesis. Some morphosemantic contexts require a heavy syllable, leading to metathesis in sonorant stems but not in obstruent stems. An element of opacity arises in (29), but this complication can be accommodated by final-consonant extrasyllabicity at the point in the derivation where the stem

¹¹ For extrasyllabicity as invisibility to phonological processes, see Poser (1984); Inkelas (1989). A stem-initial consonant will fail to metathesize because the initial syllable requires an onset; notably, as discussed in section 6, the stem-initial consonant can switch order with the vowel if a consonantal prefix precedes it. Another potential solution to the opacity problem, in an Optimality Theory context (Prince and Smolensky 2004), is to compare the heavy stem with vowel- and consonant-initial suffixes, under the requirement that a verb stem be realized in a uniform way throughout the “paradigm” of heavy stem contexts (cf. Kenstowicz 1996); in this context, the constraint ANCHOR (McCarthy and Prince 1995) will prevent the right-edge consonant from undergoing metathesis.

form is chosen. I now consider an extension of the analysis to metathesis that occurs in certain prefixed stems.

6. Stem-initial metathesis. Recall from (18) that CV metathesis is sometimes found in the presence of a consonantal prefix; this phenomenon is illustrated further in the examples below. Three suffixes are relevant: /p/ signifies intention or creation, /m/ possession or an intransitive meaning, and /t/ a transitive or causative relation.

(30) Metathesis in initial sonorant+vowel sequence following prefix

/máhac/	‘child’	/p- amhac -áy/	‘gave birth’
		/m- ámhac -x/	‘had a child’
		/t- ámhac -t/	‘be the parent of’
/mákł/	‘parent-in-law’	/p- ámkl -n-tx ^w s/	‘future parent-in-law’
/múk ^w ču/	‘bow’	/p- umk^wču -á [?] a/	‘(will) make it a bow’
		/m- úmk^wču -t/	‘have a bow’
/nátk/	‘river’	/t- ántk -s-i/	‘(will) have it as a river’
/látq/	‘something’	/m- áltq /	‘have something’
		/t- áltq -aw-łn/	‘is being done’
/wasł-/	‘follow’	/p- áwsł -al-ist/	‘(pretend) to track him’
		/t- áwsł -al-x/	‘is following’

These forms show that the trigger for stem-initial metathesis is not simply phonological, e.g., to avoid an impossible consonant cluster. It does appear that suffixes requiring a light syllable more generally, such as /sal/ and /al/, do not trigger stem-initial metathesis; so the basic morphosemantic conditions are possibly the same as for the more widespread stem-internal case.¹²

6.1. Imperatives. An additional context for stem-initial metathesis is a particular imperative form. For a number of verbs that begin with a single sonorant but do not otherwise have a sonorant adjacent to the root vowel, metathesis of the initial CV is attested in such imperatives. In addition, an element /h/ occurs consistently at the beginning of the word, which would otherwise be vowel-initial.¹³

¹² The correlation is not perfect, just as it is not for stem-internal metathesis (see (13)). Some verbs with “light” suffixes show initial metathesis, e.g., /ʔ-áwstʰ-al-χ/ ‘is tracking him’ alongside /ʔ-wástʰ-aw-χ/ ‘is following tracks’. Unfortunately, since the few attested examples come mainly from Frachtenberg’s notes, there is no larger context to help tease apart the differences in meaning that might clarify the morphosemantic context.

¹³ This consonant is perhaps an epenthetic onset — found somewhat sporadically in other transcriptions before initial glides and vowels — but it might also be historically a weakened form of the second-person /χ/ that occurs as a proclitic in some imperatives.

(32) Initial metathesis in imperative forms

/maχ-/	/h-ámχ-ay-χ/	‘paddle!’
/latq-/	/h-áltq-ay-t/	‘handle him!’
/lis-/	/h-íls-i-t/	‘punch him!’
/yupč-/	/h-úypč-i-t/	‘drive it away!’
/yaq-/	/h-áyq-ay-s/	‘touch me!’
/was-/	/h-áws-i-t/	‘spin the top!’
/wastʔ/	/h-áwstʔ-i-s/	‘go with me!’

As we have seen previously, the imperative suffixes /χ, t, s/ nearly always occur with a heavy stem, although a light stem is occasionally found (cf. (13)). Given the strong correlation of imperatives with the heavy stem, it is reasonable to treat the condition for metathesis in these stem-initial contexts — under prefixation with /p, m, ʔ/ and in imperatives with /h/ — as essentially the same as for stem-internal metathesis.

6.2. A counterexample? A single form in Frachtenberg’s notes is an apparent counterexample to extension of the syllable-weight hypothesis to the prefixation context. Despite the necessary heavy syllable /wal/ in the stem /walc/, we find metathesis to /awlc/.

(33) Initial-metathesizing stem with sonorant plus final consonant

/ɬ-wálc-tʰ/	ɬ [wal] _{μμ} c t ʰ	‘has persuaded him’
/ɬ-áwlc-u-t/	[ɬaw] _{μμ} l [cut] _μ	‘to persuade to come’

Assuming there is not a speech or transcription error in this case, the root may simply be irregular: it is not attested in the expected light stem */wlac/ or short */wlc/. On the other hand, stem-initial metathesis might not be formally the same as stem-internal. Every root attested with metathesis under prefixation begins with a single consonant, so that the resulting stem (excluding the prefix) comes to be vowel-initial. Conceivably there is a distinct requirement here that the stem begin with a vowel, which is achieved by metathesis (rather than consonant deletion), although the restriction to sonorant consonants must still be maintained. Note that this analysis cannot account for stem-internal metathesis, which never results in a vowel-initial stem: It could be that reversal of CV to VC is an available process in Alsea and is exploited in more than one context, for different reasons. No broad conclusions can be reached on the basis of one form.

7. Historical perspective. Blevins and Garrett (1998) analyze the diachronic origins of consonant–vowel metathesis in a wide range of languages and propose a restricted typology. The first type, termed PERCEPTUAL METATHESIS, arises when a VC or CV sequence is perceived by the listener as reordered relative to the speaker’s intention, as when some feature is realized over a relatively long

duration. An example is Cayuga [aʔ] reinterpreted as [ʔa] due to the spread of laryngealization through the vowel. The Alsea case is not an obvious candidate for perceptual metathesis because it involves all sonorants, not just some smaller class (such as liquids) that might be subject to an accidental ordering reinterpretation; but see section 7.5.

Blevins and Garrett's second type, COMPENSATORY METATHESIS, entails an interaction of vowel features. An example is Rotuman, where we have seen that final V_1CV_2 becomes V_1V_2C , sometimes to V_3C with a new output vowel combining features of the two input vowels. This result could be thought of as metathesis to V_1V_2C followed by possible coalescence of the adjacent vowels; but Blevins and Garrett argue that the pattern results historically from "extreme vowel-to-vowel coarticulation"; in other words, $V_1V_2CV_2$ with eventual loss of the final vowel (for example, *hosa* → *hoasa* → *hoas*). This situation is clearly not the origin of the Alsea heavy-light alternation because nearly all roots contain just one vowel.

Both perceptual and compensatory metathesis are considered by Blevins and Garrett to be natural processes, since they emerge from normal aspects of the perceptual apparatus. A final category is PSEUDOMETATHESIS, which refers to synchronic $CV \sim VC$ alternations that do not arise by either of the two established means. This is more likely the category to which Alsea belongs, since they cite the quite similar situation in Klallam as one of their examples and propose a

historical stage with two vowels, VCV, and deletion of one or the other of the vowels, leading to CV versus VC outcomes.

7.1. Alsea repeated vowels. For Alsea, a similar origin would entail historical forms such as */tumus/ for ‘close’. Deletion of either vowel, presumably dependent on different stress patterns, would yield heavy /tums/ and light /tmus/.¹⁴ Complete lack of stress on the stem (due to stress on a suffix) would similarly have led to the short stem /tms/. Here is a plausible scenario that begins from a uniform stem shape, using ‘close’ as an example.

(34) Proposed origin of Alsea metathesis

	Light stem	Heavy stem	Short stem
full vowels	*/tumús-al/	*/túmus-t/	*/tumus-úy/
vowel reduction	*/təmús-al/	*/túməs-t/	*/təməs-úy/
vowel loss	/tmús-al/	/túms-t/	/tms-úy/

Interestingly, Sapir (1921) points to “stems with repeated vowel” as a common thread in Oregon Penutian languages, as Alsea has often been classified. We

¹⁴ Demers (1974) proposes a similar (synchronic) analysis to account for apparent CV metathesis in Lummi, but does not explicitly advocate this approach for Salish in general.

have, in fact, already seen examples in section 3.1 of Alsea roots that contain two tokens of the same vowel, separated by a sonorant consonant, such as /yalas/ ‘return’ and /nunas/ ‘eat’. Conceivably, these represent relics of an earlier, more pervasive pattern that failed to undergo the vowel reduction and deletion posited for */tumus/, perhaps because a lexical diffusion of the change did not go to completion (Wang 1969). Indeed, such stem-internal repeated vowels appear to be overwhelmingly separated by a sonorant, rather than an obstruent, although /kihiks/ ‘turn over’ is a possible exception.

7.2. Alsea vowel copying. Synchronic vowel feature copying into certain suffixes, especially the inchoative /Vy/ and transitive irrealis /V[?]V/, lends credence to similar copying within stems at an earlier stage of the language.¹⁵ These suffixes are nearly always transcribed as stressed by Frachtenberg and Jacobs.

¹⁵ Of course, the copying of vowel features to suffixes such as the inchoative presumably originated as vowel-to-vowel coarticulation, similar to the source of Blevins and Garrett’s compensatory metathesis, but in Alsea that coarticulation has not been interpreted as reordering. Rather, it remains as feature spread, the direct phonological equivalent of the original phonetic effect.

(35) Synchronic vowel copying

	Light stem (...CV...)	Heavy stem (...VC...)	Short stem with vowel copying	
/pyaχ/	/pyáχ-sal-tχ/	/páyχ-χ/	/pyχ-áy-m/	‘hide’
/qlih/	/qlíh-aw-tχ/	/qílh-a/	/qlh-íy-s/	‘be tired’
/cnus/	/cnús-al/	/cúns-tχ/	/cns-úy/	‘sleep (pl.)’

As shown in Buckley (1989) for the attested stage of Alsea, the root vowel can be copied to the suffix from the full stem (i.e., without disappearing from the root), and the short stem can occur without the vowel features occurring in a suffix (i.e., with no surface realization in a stem or a suffix). But in the most common case, the vowel features are copied to the suffix prior to deletion to yield the short stem, for example /tms-úy/ which derives directly from */tumus-úy/ in the scenario outlined here.

After the reanalysis as stem forms, with deletion of the root vowel in particular morphosemantic contexts, the stress was no longer the crucial factor in yielding the short stem. In fact, in the absence of a stress-attracting suffix such as the inchoative, the short stem is sometimes attested with stress, as in [t-ti'ms-iyū] ‘closed (suddenly)’ in (5), phonemically /t-tms-iyu/. It appears that stresses such as this, which do not fall on vowels that are lexically present, are assigned

postlexically at the left edge of the word, at which time excrescent (or epenthetic) vowels are available to bear stress.

7.3. Stress placement. One question is what caused the stress differences: that is, what led to a phonological difference among the stem forms in the first place? Let us speculate that stress at the time was assigned to the penultimate syllable, and that the most common suffixes associated with the morphosemantic context for the light and heavy stems differed in their syllabic status. For example, the location of stress in the eventual light stem, on the second root vowel, might have arisen from syllabic suffixes such as /al, aw, sal/ that now require the light stem, while the stem-initial stress of the heavy stem was based on the imperative suffixes /t, s, x/ that happen to be just one consonant in length. Once these patterns were established, the heavy stem could have been extended as part of the morphosemantic reanalysis to the prohibitive /a, ay/, while the completive /x/ was grouped with the light stem for similar non-phonological reasons. As for the stresses on the vowel-copying suffixes, the transitive irrealis has penultimate stress (e.g., /tms-úʔu/), while the inchoative (e.g., /tms-úy/) may have induced irregular final stress, or perhaps originally included a second vowel that is now lost.¹⁶ At that point in time, it does not appear that closed syllables

¹⁶ Notably, the disyllabic “transitional” suffix *-iyu* also occurs as *-ayu* and *-uyu*, and often marks the (rapid) beginning of a new state, not unlike the inchoative *-Vy*. The transitional suffix does not consistently copy the root vowel,

attracted stress, but this is not evidence against the moraic analysis of sonorant codas: a syllabic trochee stress system (Hayes 1995) could assign stress to the penult regardless of syllable weight. Stress in the latest attestation of Alsea also does not appear to be sensitive to weight or syllable structure, but rather is primarily found on either the stem or specific suffixes (such as the inchoative).

By the time of vowel loss, the phonologically determined alternations must have been reanalyzed as distinct stem types required under particular morphological or semantic conditions. As a result, combinations that would have been impossible under the earlier phonological principles are free to arise, namely a stressed short stem or a full stem occurring with a copied suffix vowel. The resulting pattern is consistent with the usual situation attested in the transcriptions: stress on the root vowel when present, otherwise on a suffixal vowel. Not every token follows this rule — which need not be synchronic at any rate — but it is true for the great majority of cases.

7.4. Penutian repeated vowels. DeLancey and Golla (1997) review evidence for Penutian based on a canonical stem $CV_1CV_1(C)$, and cite relevant studies. A few examples will illustrate the patterns found in other Penutian languages, including VC metathesis and vowel copying.

but the various realizations may reflect in some way a previous connection to the vowel-copying inchoative. Closer study of the transitional and its realizations is beyond the scope of this paper.

The Takelma examples in (36) illustrate the repetition or deletion of a vowel in stem formation; there is not a consistent direction of syllable structure change between the indeterminate and assertive categories, but the pairs show a basic relation between a VC substring and VCV with a repeated vowel.

(36) Takelma stem alternations (Sapir 1922:95ff, Kendall 1997)

<u>Indeterminate</u>	<u>Assertive</u>	
<i>phel-k-</i>	<i>phele-k-</i>	‘go to war against’
<i>lapa-</i>	<i>la·p-</i>	‘carry on one’s back’
<i>han-ki·l-p-</i>	<i>han-kili-p-</i>	‘put across’
<i>al-sgalw-</i>	<i>al-sgalaw-</i>	‘look to side’

Sierra Miwok derives new stems by various changes in syllable structure, including gemination of a medial consonant and — more akin to the Alsea pattern — metathesis of a consonant and vowel. Notably, this language, like Takelma, permits metathesis of segments at the right edge of the stem, unlike Alsea which restricts the alternation to medial sonorants.¹⁷

¹⁷ Takelma pairs such as *phel-k-* ~ *phele-k-*, with a vowel alternation at the right edge of the root followed by a “petrified” suffix *-k*, suggest a connection to Alsea stem-medial alternations. If in the earlier history of Alsea a combination of

(37) Sierra Miwok stem alternations (Freeland 1951:12)

Singleton/CV		Geminate/VC	
<i>ʔú·čú-</i>	‘house’	<i>ʔúčču-</i>	‘to live’
<i>ké·la-</i>	‘snow’	<i>kélla-</i>	‘to snow’
<i>kálŋa-</i>	‘a dance’	<i>kalá·ŋ-</i>	‘to dance’
<i>ʔúmču-</i>	‘winter’	<i>ʔumú·č-</i>	‘to approach winter’
<i>yúpse-</i>	‘to spit’	<i>yu·pes-i-</i>	‘saliva’

Finally, in Yawelmani (Yowlumni), a repeated vowel may arise in either the strong or strong-zero stem category; the vowel [e] is derived from underlying /i/, so that a form such as [ʔile·k] has a repeated vowel in more basic /ʔili·k/. In addition, consonant-vowel metathesis can be found in certain stems created by analogy, e.g., *dama·n-* from *damna·-* ‘try’ (Newman 1944:77).

root, vowel-copying suffix, and lexical suffix, e.g., *phel-e-k-*, was reanalyzed as a single stem, then the resulting alternation would be stem-medial *phelk-* ~ *phelek-*. Although I am not aware of language-internal evidence for such petrified suffixes in Alsea roots, this is a possibility worth considering in future comparative work.

(38) Yawelmani stem alternations (Newman 1944:49ff, 75f)

<u>Zero</u>	<u>Strong</u>	<u>Strong-Zero</u>	
<i>miḱ-</i>	<i>miḱe-</i>	<i>meḱ-</i>	‘swallow’
<i>ʔilk-</i>	<i>ʔelk-</i>	<i>ʔileḱ-</i>	‘sing’
<i>ganw-</i>	<i>ganaḱw-</i>	<i>ganw-</i>	‘tangle’

If Alsea is indeed a member of a Penutian family that includes these other languages, the posited pattern */tumus/ and at least some aspects of stem alternation would seem to reflect a broader inheritance.

Languages of the small Coast Oregon group, to which Alsea has often been assigned along with Siuslaw and Coos (see Grant 1997), show more limited stem alternations. The most common examples involve apparent insertion of /a/ to mark various categories, although further work would be needed to rule out an underlying /a/ that undergoes deletion. In Siuslaw, the amplified verb stem is associated with “intensive and durative actions” (Frachtenberg 1922b:572).

(39) Siuslaw amplified stems (Frachtenberg 1922b:572f)

<u>Basic</u>		<u>Amplified</u>	
<i>ḱōn-</i>	‘to tell’	<i>ḱwaʔn</i>	‘was speaking’
<i>tkūm-</i>	‘to close’	<i>tkwaʔm-</i>	‘(keep on) closing’

<i>šītχ-</i>	‘to flop’	<i>š’iyatχ</i>	‘is flopping’
<i>a’iq-</i>	‘to leave’	<i>aya’q-</i>	‘will leave (it)’
<i>anχ-</i>	‘to give up’	<i>ana’χ-</i>	‘will (not) give up’

Insertion of /a/ also serves the quite different purpose of deriving the ergative (“discriminative”) forms of nouns and adjectives, and can lead to lengthening of an existing /a/ vowel, including in word-final position.

(40) Siuslaw ergative stems (Frachtenberg 1922*b*:570*f*)

Absolutive	Ergative	
<i>hītš</i>	<i>h’iya’tš</i>	‘person, people’
<i>ha’imūt</i>	<i>haya’mūt</i>	‘all’
<i>qī’ūtš</i>	<i>qa’yūtš</i>	‘wife’
<i>pīlq^uts</i>	<i>pałq^uts</i>	‘raccoon’
<i>hkanū’k^u</i>	<i>hkan^uwa’k^u</i>	‘screech-owl’
<i>qā’χa^uxt</i>	<i>qā’χa^uxt</i>	‘wolf’
<i>sqūma’</i>	<i>sqūmā’</i>	‘pelican’

Similarly, in Hanis Coos, Frachtenberg (1922*a*) reports active, transitive, and durative meanings for the amplified stem.

(41) Hanis amplified stems (Frachtenberg 1922a:382)

Basic		Amplified	
<i>stō^uq</i>	‘he stood’	<i>stō^uwaq</i>	‘he stood (there)’
<i>tkwīλ-</i>	‘to follow’	<i>tkwī^uyaλ</i>	‘(can not) follow him’
<i>tšinλ-</i>	‘to reach’	<i>tšin^unaλ-</i>	‘reached’
<i>lišit</i>	‘(they) shake it’	<i>lišat</i>	‘(he) is shaking it’
<i>ḡtits</i>	‘I painted it’	<i>ḡtats</i>	‘I am painting it’

To the extent that these derivations are related to aspect, they share with Alsea a relatively close parallel in function. A more templatic alternation in Hanis can also be seen in certain plurals such as *təmmä^uλe* alongside singular *tō^umīλ* ‘old man’ (Frachtenberg 1922a:374). Assuming the Penutian relationships are real, Alsea seems to have retained more of the historical templatic pattern than Coos and (especially) Siuslaw. More detailed study of the individual languages and their potential interrelationships remains a crucial task for future research.

7.5. Restriction to sonorants. An important point, of course, is that the other claimed Penutian languages do not restrict these patterns to stems with medial sonorants, yet this is the locus of the Alsea metathesis alternation. There are two logical possibilities: the repeated vowels were originally found with all stems, but (pseudo)metathesis arose only with sonorants; or the repeated vowels arose only

with sonorants, and all such stems developed metathesis. In the latter scenario, in which the repeated vowel never arose with a medial obstruent, the Alsea case might actually be related to perceptual metathesis. If we maintain that repeated vowels arose only for medial sonorants, it is more likely that the vowel copy began with a subset of sonorants on a phonetic basis, and only later was extended to the other sonorants on a phonological basis.¹⁸

Another way of thinking about the repeated vowels appearing only next to sonorants is in terms of voicing. The sonorants are the only intrinsically voiced consonants in Alsea, so that the continuation of voicing in an excrescent vowel may have encouraged perception or retention of excrescent vowels as phonologically real, i.e., as true epenthesis. Hall (2003) gives an extensive analysis of how excrescent vowels arise next to sonorants as a copy of another vowel's features, and this might have led in Alsea to a reanalysis as true vowel-copying epenthesis. Similarly, Blevins and Garrett (1998:514) refer to a "single extended sonorant voicing gesture" in Thompson River Salish (Nl̥eʔkepmxcín); the

¹⁸ In particular, if the immediate outcome of perceptual metathesis was alternations with, say, the glides only, and this was reinterpreted in terms of syllable weight, then the alternations could have been extended to all consonants with the potential to make a syllable heavy, i.e., all the sonorants. This scenario presupposes that Alsea already had a distinction in syllable weight between sonorant and obstruent codas.

equivalent in Alsea could account for the persistence of voicing into an excrescent vowel adjacent to a sonorant, but not an obstruent. See also Rice and Avery (1989), Rice (1993), and Steriade (1995) for discussion of differences between the phonological behavior of voicing in sonorants and obstruents.

The reanalysis scenario from the opposite point of view, where repeated vowels were originally present across both sonorants and obstruents, has two points in its favor for Alsea. One is the possible connection with Penutian: If the repeated vowel phenomenon in Alsea is inherited, and the general pattern does not depend on the nature of the medial consonant, then Alsea must have narrowed the context rather than expanding it. The original irrelevance of the intervening consonant features is also supported by the synchronic facts of Alsea vowel copying into suffixes, which occurs regardless of whether the stem-final consonant(s) are sonorants or obstruents (see (35)). This vowel copying would then be relatively faithful to its historical origins, while the metathesis that was once related to it has been subject to reanalysis. It is uncertain, however, what would have motivated a new interpretation in terms of syllable weight, or sonorancy more generally. It might be that one or more of the factors mentioned above as potentially involved in a sonorant-only origin might have played a role in the narrowing of context, such as the nature of voicing in a sonorant that could help to preserve an existing vowel, rather than favor creation of an epenthetic vowel.

Without attestation of earlier stages of Alsea stem forms or clear comparative data, discussion of the historical origin of the metathesis pattern is necessarily speculative. In particular, we have at present no definite answer to the central question of whether metathesis originally affected all consonants, and then was narrowed to sonorants, or originally applied to sonorants due to the specific nature of its inception. As noted, to the extent that comparative information is available — under the assumption that repeated vowels in Penutian are related to the Alsea pattern — a historical narrowing in Alsea makes more sense. That would also relate the Alsea metathesis typologically to the metathesis found in Straits Salish, which occurs with obstruents. We must await a better understanding of the genetic relationships of Alsea and the rest of Penutian — not to mention better synchronic descriptions of many of these languages — before a clearer picture of the history can emerge.

8. Conclusion. Whether or not the Alsea pattern is to be described as “true” metathesis from a diachronic point of view, in the synchronic patterning of the language that is exactly what it appears to be. A child learning the language would have been faced with the task of constructing a grammar to handle the alternations in stem form; I have given an analysis based on syllable weight, certainly a common feature of many languages. This approach is consistent with the more general claim that morphological metathesis has a phonological basis: Although it is triggered by morphosemantic features, the effect of the process is accomplished in a phonologically defined way. At the same time, a more ad-hoc

rule would account directly for all the data of Alsea metathesis without complications related to opacity, and even encompasses the potentially problematic example in (33), but its stipulative and unrestricted nature makes it an unattractive option for most phonologists (though see Hale and Reiss 2000, Blevins 2004).

The analysis presented in this paper also serves as a central clue in interpreting transcriptions of a language that is no longer spoken. In particular, the Alsea metathesis pattern gives us very important information about the true phonemic structure of stems that are transcribed in the linguistic record with a great many nonphonemic vowels. Without the evidence of these alternations, we would be on shakier ground in our assumptions about which transcribed vowels are phonologically real. By the same token, clear expectations of the kinds of stem alternations we ought to find are informed by the crosslinguistic study of similar patterns. The relevant background includes metathesis patterns as diverse as those in Rotuman and Straits Salish, and the ways in which syllable weight can play a role in stating metathesis, as well as its potential sensitivity to sonority. This prior research has considerably aided the analysis of Alsea, showing the relevance of these wider perspectives to the description of individual languages.

APPENDIX: TRANSCRIPTION AND PHONEMICIZATION

The directly quoted transcriptions in this paper have been modernized in minor ways. Frachtenberg uses the simple letter <x> for a uvular fricative, contrasted with fronted velar <x̣>; these are updated to [χ, χ̣] and correspond to phonemic /χ, χ̣/. Frachtenberg's use of <!> for glottalization is replaced by an apostrophe over the consonant, and the symbols <L, k, ε, ' , c> have been changed to [ʎ, ɰ, ʔ, ʰ, ʃ]; for fronted velars, Jacobs uses [ḳ, ɡ̣, x̣] consistent with their reproduction here. Original <s, c>, that is [s, ʃ], both represent the Alsea phoneme /s/ (cf. Jacobs 1954, Bright 1978); in my phonemic notation, <c> is the affricate /ts/. Jacobs uses a raised period to mark vowel length; this is changed to conform to Frachtenberg's macron, preferred here because length is noncontrastive.

The modernized transcriptions do not result in any loss of information: cf. Frachtenberg's <tsk·i'x> rewritten as [tsḳi'χ̣], <x·ū'lamit!> as [χ̣ū'lamitʰ], and <sū'pLī> as [sū'pʎī]. A short vowel written in Frachtenberg's notes as <î> is rendered here as [i] in cited transcriptions. In presenting data from Frachtenberg's notes, I have conservatively retained the categories <î, aⁱ, ūⁱ, a^u> even though he uniformly changed them to <i, aī, ūi, au> in publication; cf. original <stīlk·aⁱn̄x> rewritten as [stīlḳaⁱn̄χ̣]. Jacobs' symbols require much less updating, but for example <tcGitxi·'> is rewritten as [tʃGitχīʰ]. As noted in section

1, Jacobs often writes the stops as “lenis” [B, D, DJ, G, Ğ]; this difference is not contrastive but is retained in the reproduced transcriptions.

In the following lists, each root is presented in various stem forms; the phonemicization is shown in slashes, and the original transcriptions of full words follow in italics. The light stem (equivalent to the underlying form) is given first, then the heavy stem, and finally the short stem; for obstruent-medial roots, of course, there is just a full stem without a heavy/light distinction, except that for roots with metathesis under prefixation, that stem is given as well. For each stem form, original examples from Frachtenberg’s published materials (1917; 1920) come first and carry no annotation; those from Frachtenberg’s unpublished notes are introduced by the letter N; and finally, those from Jacobs’ (1935*a*) notes are preceded by J. Hyphens separate the stem from adjacent affixes to aid in identification, but individual affixes are not separated from each other. In glosses, a word in parentheses indicates a particle or other element occurring outside the verb that completes its meaning — in particular, ‘(don’t)’ in a prohibitive is the negative particle /ʎyáʔ/ preceding the verb, and ‘(will)’ reflects the irrealis clitic /k/. Glosses are not intended to reflect all possible meanings, but are based on the context in the specific data source.

/cam/ ‘try’: *tsā́m-al* ‘kept on trying’, *tsam-aʔyaīnχ* ‘tried it repeatedly’, J
DJa^(ʔ)m-al^(ʔ)yaʔinχ ‘tried it several times’; /cm/ *tsim-aíʔnχ* ‘tried it’, *tsim-āʔnχ*

‘was tried’, *tsim-salsxaī* ‘began to try his own repeatedly’, N *tsəm-a’a* ‘(will) try it’, J *DJəm-a’a* ‘(will) try it’.

/cik/ ‘lie down’: *tsīk-al* ‘always lies down’, N *ḥ-tsīk-alḥ* ‘puts him to bed often’;

/ck/ *tsk-īḥ* ‘was lying’, *ḥ-tsk-īt* ‘(want) to lie down’, J *tšG-īḥ* ‘is lying’, *tšG-īm* ‘(will) lie down’.

/cix^wt/ ‘push (away)’: *ḥ-tsīḥud-əta’lhn* ‘(will) often be pushed’, N *tsīḥ^ut-ānḥ*

‘pushed him’, *ḥ-tsīḥ^ut-atālḥ* ‘is pushing him’, J *tšī^(u)x^uD-ət* ‘push it away!’,

tšī^ux^uD-a’nənḥ ‘pushed it’, *ḥ-DJī’i’ux^wD-a’uḥat* ‘keep pushing it’; /cx^wt/ N

ts·uḥ^ut-alya’inḥ ‘push him back and forth’, J *tšux^wD-i’i* ‘(will) push it’, *DJu’x^wD-*

ət ‘push him!’. (Possibly uvular /ḥ^w/.)

/cl̥yaq/ ‘be straight, stretch’: *tsliya’q-təḥ* ‘straightened out’, J *tšliya’G-aša’lənḥ*

‘(someone) has straightened it’; /clayq/ *tsla’yəq-a*, *tslaī’q-a* ‘straight, directly’,

tslaī’q-atḥ ‘went straight (there)’, N *tšlaī’q-atḥ* ‘made it straight’, J *tšla’iG-at*

‘straighten it!’, *tšla’iG-ašt* ‘is straight’; /clyq/ *tslīq-aī* ‘straightened’, J *tšlīG-*

a’inḥ ‘straightened it’, *tšlīG-a’a* ‘(will) straighten it’. (Possibly /l/.)

/cnus/ ‘go to bed, sleep (plur.)’: *tsinū’s-al* ‘always sleep, usually go to bed’, *ḥ-*

tsinū’s-t ‘in order to lie down in bed’, J *DJinū’š-aḥ* ‘are in bed’; /cuns/ *tsū’ns-*

tuxs ‘all going to bed’, N *tsū’ns-təḥ* ‘were sleeping (not long)’, J *DJū’nš-aḥ* ‘go

to bed!’; /cns/ *tsins-ūī* ‘went to bed’, J *DJinš-u’wim* ‘(will) go to bed’.

/cpyut/ ‘float’: *tspīūd-īm* ‘(that) was floating’, *tspīūt-alyususḥ* ‘floated with him

(for a year)’, N *tšpīyū’t-al*, ‘was floating’, *tšpīyū’t-ḥ* ‘is floating’, J *tšBu’yú’D-au*

‘is rising to the top’; /cpuyt/ *tspūi't-īyū* ‘floated (right away)’, N *tšpūi't-əx* ‘be afloat!’, J *tšBu'īD-ət* ‘make it float!’, *tšBu'īD-iušxšam* ‘(will) float to the top’; /cpyt/ *tspīd-ūi'* ‘floated up’, J *tšBīD-u'im* ‘is floating on top’.

/cq^wnaq^w/ ‘approach, overtake’: *tsqūna'k-īnχ* ‘was (not yet) overtaken’, J *tšGwi')nā'Gw-au* ‘keeps coming closer’; /cq^wanq^w/ *tsqwa'nku-λnχ*, *tsqwanu'k-īnχ* ‘was being overtaken’, *tsqwa'nku-tχ* ‘(after they) came nearer’, J *tšGwa'nGw-Di* ‘be, come close’; /cq^wnq^w/ *tsqūnk-w-a'īnχ* ‘were approached’, J *tšGūnGw-a'ī* ‘is close’. (Possibly /cq^wnak^w/.)

/culaq̣n/ ‘pack, carry on back’: *tsōlā'qan*, *tsūlā'qan* ‘a pack’, *tsōlā'qan-tχa* ‘had packs’, *t-tsūlā'qan-alχ* ‘habitually carry (them)’, J *DJūlā'qan* ‘a pack’, *DJūlā'qan-tχa* ‘is carrying it along’; /cualq̣n/ J *DJuwa'lqan-t* ‘pack it!’, /culq̣n/ *tsūlqan-a'īnχ* ‘packed it’, *tsūlqan-ayū'λχ* ‘carried it like a pack’, J *DJū'lqan-a'a* ‘(will) pack it’.

/cxap̣/ ‘throw away (plur.)’: J *tšxā'p̣-ai* ‘(don't) throw it all away!’, *tšxā'p̣-əšɛ')lənχ* ‘threw it all away’; /cxp̣/ *tsxip-a'īnχ* ‘threw it all away’, J *tšxp̣-a')a* ‘(will) throw it all away’.

/cx^wat/ ‘fight’: *tsxwa't-īyū* ‘fighting’, *tsxwā't-a* ‘(don't) fight!’, *tsxwat-ī'* ‘were fighting (not long)’, J *tšxwā'D-išɛ'lnχ* ‘had a fight with him’, *tšxwā'D-ī* ‘are (always) fighting’, *tšxwā'D-iyu* ‘(like) to fight’; /cx^wt/ *tsxūd-a'īχa* ‘began to fight’, J *tšxwD-a'a* ‘(will) fight with him’.

/cwas/ ‘crawl’: *tsuwa’s-al* ‘were crawling’, *†-tsuwa’s-īl̥x* ‘began to crawl on him’;

J *DJuwāš* ‘lobster, crawfish’; /caws/ N *tšaʷs-əx* ‘crawl!’; /cws/ *tsūs-aī* ‘began to crawl’, N *tšūs-a’i’x* ‘crawls’.

/cyas/ ‘divide, supply’: *tsiyā’s-əx* ‘would supply’, N *tšīya’s-ən̥x* ‘has divided it’, J

†-DJiyēš-iDūt ‘divided it up’; /cays/ *†-tsaī’s-īn̥x* ‘was divided up’, J *†-DJa’iš-īn̥x* ‘is divided up’, *†-DJa’iš-iDi* ‘(can) divide it’; /cys/ *tsīs-a’īn̥x* ‘was divided’, N *tšīs-a’a* ‘(will) divide it’, *tšīs-a’īn̥x* ‘divided it’, J *DJīš-a’īn̥x* ‘divided it up’.

/kaʰk/ ‘assemble, gather’: *ka’haʰk-al* ‘habitually assemble’, *†-ka’xk-əxamt* ‘the assembled people’, *ka’xk-ełī* ‘would assemble around him’, *ka’aʰk-e* ‘together’, J *†-Gā’k-xamt*, *†-GεʰG-εxamt* ‘a gathering’, *GεʰG-ət* ‘pile them up!’;

/kʰk/ *kεxkaī* ‘(they) assemble’, J *Gaʰk-a’im* ‘(will) gather’. (Second /k/ is possibly /k̄/; /x/ is possibly /h/.)

/kist/ ‘leave (behind)’: N *kīst-ī* ‘(will) leave (him)’, *kīst-a’i* ‘(don’t) leave them!’, J

†-GīšəD-a’lx ‘kept on leaving them’, *GīšD-i* ‘(will) leave (it)’, *Gīšt-x* ‘leave (it)!’.

/knaʰ/ ‘dance with (plur.)’: J *Ginā’x-aʰ* ‘is dancing with them’; /kanʰ/ J *Gε’nʰ-aʰ*

‘dance with them!’; /knʰ/ not attested.

/kʷal/ ‘reach, arrive’: *kwa’l-a* ‘reached’, *†-kwa’l-īl̥x* ‘(managed to) reach it’, J

Gwa’ā’l-atx ‘is coming ashore’; /kʷl/ *kul-aī* ‘would (not) reach’, *†-kul-a’yū* ‘(finally) reached’, J *Gwəl-a’im* ‘(will) come ashore’.

/latq/ ‘do (something)’: *lā’təq* ‘something’, *lā’tq-al* ‘usually do’, *l-lā’tq-alx* ‘usually do’, J *lā’Daq* ‘something’, *lε’DĠ-ai* ‘what have (you) been doing’, *lε’DaĠ-aitx* ‘what are (you) doing’; /altq/ *m-a’ltəq* ‘have something’, *l-ā’ltq-auġn* ‘is being done’, *h-a’ltq-aīt* ‘handle them (carefully)!’; J *l-a’ltĠ-aix* ‘(that you) are doing’; /ltq/ *iltq-aīm* ‘(will) do’, *iltq-a’ġnx* ‘was done’, J *lətĠ-a’iġnx* ‘did it’, *əltĠ-a’im* ‘what (will they) do’, *ltĠ-ā’ġənx* ‘what did (he) do with it’.

/lis/ ‘hit, punch’: N *lī’s-a’altxai* ‘keep hitting!’, *p-lī’s-atxanx* ‘intend to hit him’, *λ-lī’s-alsx* ‘hit oneself’, J *līš-aDalīġtix* ‘are punching each other’; /ils/ N *h-ī’ls-īt* ‘hit him!’, *l-īls-atalx* ‘keep hitting him’, J *h-i’lš-īt* ‘punch him!’; /ls/ N *līs-ī’tšġnx* ‘hit him’, J *līš-i(·)DJənx* ‘punched him’, *ləš-i(·)DJi* ‘(will) punch him’.

/lut/ ‘be scared away’: *lō’t-sitxanx* ‘scared them away’, N *lū’t-īsānx* ‘is scaring him’; /lt/ *ild-ū’imi* ‘will be scared away’, N *l’t-ū’iġnx* ‘was frightened away’.

/laχ^ws/ ‘rain’: *lla’χus* ‘rain (n.)’, *λla’χus-əχ* ‘rained’, *λla’χus-ī* ‘(will) rain’, N *λā’χ^us-āl* ‘rained’, J *lla’χ^uš*, *ləla’χ^uš* ‘rain (n.)’, *ləla’χ^uš-aχ*, *lla’^uχš-aχ*, *lələ’χ^uš-aχ* ‘rains (every day)’; /laχ^ws/ *him-la’lχus-χamt* ‘torrents’, J *ləm-lalχuš-χamt* ‘it is raining’; /laχ^ws/ *λlχus-aī*, *llχus-aī* ‘began to rain’, J *lluxš-a’i*, *lələχ^us-a’i* ‘is starting to rain, is raining’.

/lqilt/ ‘be sick, hurt’: *λqalī’t-əχ* ‘is sick’, J *lqalī’D-aχ* ‘is sick’, *lqalī’D-išel* ‘has been sick’; /lqilt/ J *lqi(·)lD-a(·)i* ‘(don’t) hurt it!’, *lqī’lD-ayimtš* ‘(don’t) hurt me!’; /lqilt/ *λqalt-īyaī* ‘became sick’, *λqald-īyaīs* ‘sickness’.

/ʌwah/ ‘climb up’: *ʌowaʰ-au* ‘were climbing’, *ʌowaʰ-asal* ‘had climbed up’;
 /ʌawh/ *ʌaūʰ-əx* ‘climb up!’, J *ʌuwāʰ-ašɛl* ‘have climbed it’; /ʌwh/ *ʌōh-aīm*
 ‘(will) climb up’, *ʌōʰ-əx* ‘climb up (here)!’, J *ʌuh-aʼim* ‘(will) climb it’.

/ʌwaq̣/ ‘dry’: *ʌowāʳq-al* ‘(after it) is dry’, J *ʌuwaʳq̣-Dənχ*, ‘is smoke-drying it’,
ʌuwaʳq̣-aDūt ‘smoke-drying of meat’; /ʌawq̣/ *ʌaūʳq-atəx* ‘was dry’; /ʌwq̣/ *ʌōq̣-*
atχwaiʳ ‘started to dry (them)’, J *ʌūq̣-aʼi* ‘is drying’, *ʌūq̣-aʳa* ‘(will) smoke-dry
 it’.

/ʌwit/ ‘enjoy’: *ʌōwīʳt-ītsū* ‘(will) enjoy you’, J *ʌəʳwiʳʳt-ʳiʳʳɬχ* ‘(always) enjoy it’;
 /ʌiwʳ/ *mə-ʌīʳūt-stayū* ‘enjoyable things’; /ʌwʳ/ J *ʌūʳt-iyūʳi* ‘(will) enjoy it’.

/mahac/ ‘child’: *maʰhats* ‘a child’, N *māʰhats̃* ‘child’, J *maʰhats̃* ‘child’; /amhac/
m-aʳmhats-aχ ‘had a child’, *m-aʳmhats-t* ‘has a child’, *p-aʳmhats-aī*, *p-amhats-*
aīʳ ‘gave birth’, N *ʌ-amhats̃-tū* ‘have you as a child’, J *B-amhats̃-aʼi* ‘is giving
 birth’, *B-amhaDJ-aʼim* ‘(will) give birth’.

/makʌ/ ‘parent-in-law’: *makʌ* ‘parent-in-law’, J *məʳkʌ* ‘father-in-law, mother-in-
 law’, *məʳkʌ-auχ* ‘my (two) parents in law’, *məʳkʌ-ən-uʳ* ‘my parents in law’;
 /amkʌ/ J *B-aʳmkʌ-in-tχuʳš* ‘my future parent-in-law’. (Status of /n/ in /makʌ-n/ is
 unclear; possible stem allomorphy before certain suffixes.)

/maχ/ ‘paddle’: *māʳχ-aīsχai* ‘paddle!’, J *māʳχ-ayux* ‘is paddling’; /amχ/ J *h-aʳmχ-*
aiχ ‘paddle!’; /mχ/ *məχ-aʳyusχ* ‘paddled with it’, J *maχ-aʼim* ‘(will) paddle’.

/mḳin/ ‘hit target with projectile’: *ʌi-mḳēʳn-auχ* ‘keep hitting it’, *ʌi-mḳīʳn-auwī*
 ‘(always) hit it’, *ʌi-mḳēʳn-auʌn* ‘was repeatedly (not) hit’, *ʌə-mḳēʳn-auχ*

‘(always) hitting it’, *ʔə-mkĩ'n-ɪnɣ* ‘was hit’, *ʔə-mkĩ'n-iyū* ‘would be hit’, J *ʔə-mkĩ'i'n-Dəɣat* ‘hit it!’.

/mlah/ ‘lose’: *mila'h-asanɣ* ‘had lost it’, N *ʔ̣i-mla'h-alɣ* ‘is losing it (more than once)’; /malh/ *ʔə-ma'lh-ɪsɣ* ‘became lost’, *mā'l-stɣa* ‘lost (adj.)’, *ma'lh-ya* ‘as if lost’, J *ʔə-ma'lh-išɣ* ‘suddenly lost the trail’; /mlh/ N *mīlh-a'ɪnɣ* ‘lost it’.

/mʔanat/ ‘hide’: *məʔanā't-ɣasɣ* ‘had hidden themselves’, *məʔanā't-nɣ* ‘hid them’, J *məʔa(ʔ)nā'D-aɣ*, *məʔā'nā'd-aɣ* ‘is hidden’, *məʔana'D-əšɛlənɣ* ‘has put it out of sight’; /mʔant/ (heavy) N *mʔ̣ʔ̣ā'ant-ɣəsɣaɪ* ‘hide yourself!’, J *məʔa(ʔ)a'nD-ət*, *məʔa''and-ət* ‘hide it!’; /mʔant/ (short) N *mʔ̣ʔ̣ānt-a'ɪɣasɣ* ‘hid (my)self’, J *məʔānD-a'ɪnɣ*, *məʔānd-a'ɪnɣ* ‘hid it’, *məʔā'nd-a'a* ‘(will) hide it’. (Possibly /n/, but see fn. 5.)

/muk^wɕu/ ‘bow’: *mū'kutsū* ‘bow’, N *po-mō'qtšō^u-saltɣ* ‘made a bow’, J *mū'k^wtšū*, *mu'k^wtšū* ‘bow’, *tš-mu'k^wtšū-k* ‘his bow’; /umk^wɕu/ *m-u'mkutsū-t* ‘with a bow’, N *m-ū'mk^utšū-t* ‘with a bow’, *p-ūmktšūw-a'a* ‘(will) make a bow out of it’, *p-ūmktšū-t* ‘making a bow’, *p-ōmqtšō^u-ɣ* ‘make a bow’, J *mu'-ū'muk^wtšū-Da* ‘with a bow’, *B-ū'mk^wtšū-ɣ* ‘is making a bow’.

/musḳ/ ‘suck out poison’: J *mu'sḳ-itɣanɣ* ‘is sucking it’, *ʔə-mu'sḳ-ɪDi* ‘(can't) suck it out’; /msḳ/ J *miṣḳ-u'ɪnɣ* ‘sucked it out’, *ʔə-mṣ̌iḳ-ɛlt* ‘(stopped) sucking on him’, *ʔə-miṣḳ-u'išuyəɣ* ‘is trying to suck it out’.

/natk/ ‘river’: *nā'tkⁱ* ‘river’, *nā'tkⁱ-autuχs* ‘various small rivers’, J *na^ʔt^hk* ‘river’,
na'ā'tG-au ‘creek’; /antk/ *λ-a'ntik-sī* ‘(will) have it for a river’, *λ-ā'ntk-istū*, *λ-*
a'ntik-stū ‘(will) have you for a river’.

/nisk/ ‘far’: *nī'sk* ‘far’, *mə-nī'sk-auχ* ‘kept going farther’, *λ-nī'sk-iyū* ‘(after he) got
far away’, J *nī'sk²* ‘far away’, *λə-nī'sG-iyušχam* ‘(will) go a long way’.
(Possibly /k/.)

/nunun/ ‘eat’: *nūnū's-ītχa* ‘began to eat for a while’, *nūnū's-it'ālīλχ* ‘usually feed it
to him’, N *nōnū's-al-tχ* ‘ate’, *m²-nunu's-īsalīsla* ‘person who never eats’, J
nūnū's-āš'ilautχ ‘act as if eating’; /nuns/ (heavy) *nū'ns-it* ‘eat it!’, *λ-nū'ns-t*
‘finish (eating)’, N *nū'n-s-a* ‘(don't) eat!’, J *nu'nš-aχ* ‘eat!’, *nu'nš-ət* ‘eat it!’;
/nuns/ (short) *nūns-a'a* ‘(will) eat it’, *nūns-aī'nχ* ‘began to eat it’. (Takes
default /a/ vowel in copying suffixes.)

/pitq/ ‘upset, spill’: J *Bī'tG-at* ‘overturn it!’; /ptq/ J *BətG-ī'nχ* ‘(did) upset it’, *BətG-*
a'tā'it ‘overturn them all!’.

/pk^wus/ ‘urinate’: *pkū's* ‘urine’, *pkō's-t* ‘in order to urinate’, N *pqū^us-a* ‘(don't)
urinate!’, J *pkū's-aχ* ‘urinates’; /pk^ws/ *pkus-ūi'* ‘urinated’, J *pkuš-u'im* ‘(will)
urinate’.

/puł/ ‘stick out, be visible’: *mə-pū't-al* ‘(the sun) habitually rises’; /pl/ *pl-ūi'χ* ‘was
sticking out’, J *pl-u'im* ‘(will) stick out’.

/pyaχ/ ‘hide, be absent’: N *pīyā'χ-a²χ* ‘is hiding’, *pīyā'χ-asaltχ* ‘hid’, *pīyā'χ-a^utχ* ‘is
in act of hiding’, *λ-pīā'χ-a^uχ* ‘is in act of hiding it’; /payχ/ *paī^hy-uχ^u* ‘was

absent’, N *pa’iχ-ax* ‘hide!’, *pa’iχ-at* ‘hide it!’; /pyχ/ *pīh-aī’mi* ‘(will) be absent’,
N *pīχ-a’i’nχ* ‘hide it’.

/qlih/ ‘be tired’: *qalī^h-tsχam* ‘(can I not) be tired’, N *qalī^hy-altχ* ‘is tired often’, J
Ḡali’h-tšχ ‘is tired’, *Ḡa’li’hy-autχ* ‘beginning to get tired’; /qilh/ *qē’lhy-a*
‘impatient’, N *qē’lhy-a* ‘(don’t) get tired!’; /qlh/ *qalh-ī’s* ‘tiredness’, *χ-qa’lh-*
īyū ‘became tired’, J *Ḥ-Ḡa’lhy-utə’lχ* ‘is getting tired of it’.

/qlyut/ ‘pierce, prick’: *kfi’ūt-əsal* ‘had pierced’; /qlyut/ N *qlūⁱt-īyusχ* ‘go through’,
J *qlu’iD-ət* ‘prick him!’, *qlu’iD-iušχ* ‘got pricked by himself’; /qlyt/ *qlīt-ū’l’nχ*
‘were pierced’, J *qlīD-u’i’nχ* ‘pricked him’.

/qil/ ‘tie, hang with rope’: *qē’l-təχ* ‘would tie’, *qē’l-nχ* ‘caused it to hang’, J *qil-*
i’(‘)šē’lənχ ‘tied it up’; /qil/ *qal-ī’tsχ* ‘was hanging’, J *qal-i’(‘)i* ‘will tie it up’,
qal-ī’nχ ‘tied it’.

/salasχ/ ‘survive, live’: N *sala’sχ-āl* ‘survived (again)’, *sālā’sχ-āltχ* ‘lived’; /salsχ/
(heavy) *sā’lsχ-a* ‘alive’, N *sā^a’lsχ-ax* ‘live!’, *sā^a’lsχ-aⁱ* ‘(not) live’, J *ša’a’lšχ-a,*
šē’ē’lšχ-a ‘alive’; /salsχ/ (short) *sā’lsχ-aīm* ‘(will) survive’, *sālsχ-a’yaī’* ‘came
back to life’. (Possibly /l/, but see fn. 5.)

/siq^wl/ ‘stand (plur.)’: *sī’qul-təχ* ‘are standing’, *mə-sī’qul-alχa* ‘were standing’, N
sī’qul-tχ ‘are standing’, *sī^w’k^wl-al* ‘stand a long time’, J *šī’Ḡwəl-χ* ‘stand up!’;
/sq^wl/ *sqūl-ē’* ‘they would stand’, N *sq^wl-īⁱm* ‘(will) stand’, J *šḠwl-īⁱm* ‘(will)
stand’.

/sit/ ‘husband’: *sīt* ‘husband’, *a-ts-sīt-əḵ* ‘her husband’, *sīt-əḵ* ‘is (your) husband’, *sīt-əsal* ‘was a husband’, J *ši’t* ‘husband’, *p-ši’D-itḵuš* ‘future husband’, *p-ši’D-a’ḵa* ‘get a husband!’, *mə-ši’D-ət* ‘she has a husband’.

/slaḵ^w/ ‘melt’: N *sīla’ḵw-asanḵ* ‘was melting it’, J *ši’la’ḵw-au* ‘it’s melting’; /salḵ^w/ J *ša’lḵw-ət* ‘melt it!’; /slḵ^w/ *silḵw-aīnḵ* ‘melted it’, N *sīlḵu-tḵ* ‘is melting it’, *sīlḵw-aīnḵ* ‘was melted’, J *šilḵw-a’i* ‘it’s melted’.

/stlak/ ‘slide’: *stila’ḵ-ayust* ‘tongue’, N *stīlā’k-saltḵ* ‘had been sliding’, J *šDə’lE’G-eušṭ* ‘tongue’; /stalk/ *sta’lḵ-īyūsḵam* ‘would quickly slide back’, N *stā’lḵ-əḵ* ‘slide!’, *stā’lḵ-īt* ‘slide it!’; /stlk/ N *stelḵ-a’īnḵ* ‘slide it’, *stīlḵ-a’yuxū* ‘slide it to him’.

/supt/ ‘scrape, slide’: *sū’pḷ-ī* ‘scraped (his feet against the ground)’, N *sū’pḷ-a^u* ‘slid (along)’, *sū’pḷ-īt* ‘slide it!’; J *šū’pḷ-aḵ* ‘rub (your feet to clean them)!’; /spl/ *sipḷ-ū’im* ‘would slide down’, N *sī’pḷ-ū^u* ‘(will) slide it’, J *šəpḷ-u’i* ‘rubbed (his foot to clean it)’.

/swaṭ/ ‘be fresh, new’: *suwa’ṭ* ‘are fresh’; /sawṭ/ *saū’ṭ-a* ‘fresh (adj.)’, *saū’ṭ-īyū* ‘began to get fresher’; /swṭ/ *sūṭ-ā’stəṭī* ‘which is fresh’, J *šūṭ-a’ṭšt* ‘is fresh’.
(Uncertain /ṭ/.)

/tap/ ‘fly, jump’: *tā’p-al* ‘habitually jump’, *tā’p-təḵ* ‘(after) he jumped’, *mə-tā’p-īḵ* ‘jumped (a little ways)’, J *p-Dā’B-aḵ* ‘is ready to jump’; /tp/ *tp-aī* ‘jumped’, J *tB-a’im* ‘(will) fly’.

/tasn/ ‘point at’: *I-tā’sin-χ* ‘would point at him’, *I-ta’sin-χnχ* ‘was repeatedly pointed at’, *I-ta’sin-īyū* ‘point at’, N *tā’sīn-sā^altχ* ‘guessed (at a person)’, J *Dā’sən-š^(’)lənχ* ‘pointed to it’, *Də’sən-t*, *Da’sən-t* ‘point at him!’, *Dā’sən-ənχ* ‘is pointing at him’; /tsn/ *təsin-a’a* ‘(will) point at him’, *təsin-aīnχ* ‘pointed at him’, *təsin-ā’in* ‘was pointed at’, *təsin-a’yəmuχ^u* ‘was pointed out to him’, J *t.sən-a^(’)a* ‘(will) point at him’.

/timix^wm/ ‘make fun of’: *χ-tīmī’χum-au’inχ* ‘was constantly laughed at’, N *tīmī’χ^um-a^u* ‘keep making fun’, *tīmī’χ^um-sāltχ* ‘made fun’, J *I-Dīmī’χum-auχat* ‘keep making fun of him!’; /timχ^wm/ (heavy) N *tī’mχ^um-t* ‘make fun of him!’, *tī’mχ^um-aⁱ* ‘(don’t) make fun of him!’, J *Di’i’mχum-t* ‘make fun of him!’; /timχ^wm/ (short) N *tīmχ^um-ī’* ‘(will) make fun of him’, J *Dīmχam-u^(’)u* ‘(will) make fun of him’.

/tiq^wl/ ‘undress’: J *Dī’q^wəl-t* ‘undress him!’, *I-tī’ī’q^wl-aušχ* ‘is undressing himself’, *tī’q^wəl-a* ‘undressed, naked’; /tq^wl/ J *tq^wəl-i^(’)i* ‘(will) undress him’.
(Possibly /t/.)

/tiwił/ ‘make, work, create, prepare’: *tī’wīł* ‘Creator’, *tīwīł^t-hūn-salyu’χ^u* ‘created you (long ago)’, *χ-tīwīł^t-hwan-t* ‘(in order) to work’, J *tīwīł^t-hwan-ənχ* ‘made it’; /tiwił/ (heavy) J *tīyu’t-hwən-t* ‘fix it!’; /tiwił/ (short) *tīūt^t-hūn-a’inχ* ‘were prepared’, *tīūt^t-hūn-a’a* ‘(will) make it’, J *tīyut-hwan-a^(’)a* ‘(will) fix it’.
(Possibly /tīwił/. Status of /h^wan, h^wn/ element is unclear.)

/t̥kas/ ‘break (sing.)’: N *t̥k̄āⁿs-aⁱ* ‘(don’t) break it!’, J *t̥k̄āš-əšɛl* ‘has been broken’;
 /t̥ks/ *t̥k̄is-a’a* ‘(will) break it’, J *t̥k̄š-a^(’)a* ‘(will) break it’, *t̥k̄š-a’inχ*, *t̥k̄iš-a’inχ*
 ‘broke it’, *t̥k̄š-a’yu* ‘broke (by itself)’

/tluq̄w/ ‘be close to shore’: N *t̄lū’q̄w-əχ* ‘is close to shore’, *t̄lū’q̄^u-sanχ* ‘took it
 close to shore’, J *Dəlū’q̄w-aχ* ‘is anchored close to shore’; /tulq̄w/ J *Du’lq̄w-ət*
 ‘bring it close to shore!’; /tlq̄w/ N *t̄lq̄-ūⁱnχ* ‘takes it close to shore’, J *Dəlq̄-u^(’)u*
 ‘(will) bring it close to shore’.

/tmaq̄w/ ‘quiet down’: J *p-Dəma’q̄w-DJūšā’it* ‘try to quiet him down!’; /tamq̄w/
ta[?]muq̄w-a ‘quiet’ (adj.), J *Da’mGw-aχ* ‘stop! shut up!’, *Dā[?]muGw-a* ‘quiet,
 silence’; /tmq̄w/ not attested.

/tmus/ ‘close (door)’: *t̄mū’s-īyəm* ‘(where) it had closed’, N *təmū’s-əχ* ‘is closed’,
t̄mūs-š̄sānχ ‘closed it’, J *Dimūš-ət* ‘keep the door shut!’, *Dimūš-aχ* ‘is shut’,
Dəmuš-š̄Dənχ ‘is shutting it’; /tums/ *tū[?]ms-a* ‘door’, J *Du’mš-ət* ‘shut the door!’,
š̄-Du’mš-itχ ‘(did) shut it’; /tms/ *š̄-ti[?]ms-īyū* ‘closed up’, *t̄ms-īyū’χ* ‘closed it
 up’, N *t̄ms-ūⁱnχ* ‘closed it’, J *Dimš-u^(’)u* ‘(will) shut it’.

/twih/ ‘pour, spill’: *tuwī^h-īχ* ‘(that) were scattered’, N *tūwī^hy-əχ* ‘poured (into
 one pile)’, J *Duhwi^h-išɛlənχ* ‘has been poured’; /tiwh/ N *tī^uh^y-aⁱ* ‘(don’t) pour
 it!’; /twh/ *tūh-ī[?]χnχ* ‘was spilled out’, *tūh-īⁱ* ‘(will) pour it out’, J *Dū^h-at* ‘pour
 it!’, *Duh-i[?]i* ‘(will) pour it’, *Du^h-atχanχ* ‘is spilling it’.

/tmas/ ‘finish, agree’: N *t̄mā^s-š̄sālχ* ‘agreed to it’, *t̄ma^s-t* ‘finished (adj.)’, J *š̄-*
tamaš-š̄əšɛlχ ‘(not) quite finished’; /tams/ *š̄-tā[?]ms-īyū* ‘is finished’, *š̄-tā[?]ms-itχ*

‘(after he) finished’, J *fa’mš-a* ‘it’s finished’, *fa’mš-əD* ‘finish it!’, *fa’ms-ŷyusx* ‘all agreed’; /fms/ N *fems-ā^a* ‘(will) finish it’, J *Dəməš-ifa’it* ‘finish them!’.

/walc/ ‘persuade (to come)’: *walts-a’lnx* ‘was persuaded (to come)’, N *wā’ltš-ŷtxanx* ‘persuades him to come’, *š-ōa’ltš-ŷtx* ‘have persuaded to come’, *walts-ā^a* ‘(will) persuade him to come’; /awlc/ N *š-aū’ltš-ūt* ‘to persuade to come’.

/was/ ‘spin (a top)’: *wa’s-a* ‘a spinning top’, *wa’s-atxai* ‘would spin tops’, *šo-wa’s-at* ‘spinning tops’, J *waš-a* ‘a spinning top’, *waš-aiGinx* ‘top-spinning season’; /aws/ J *h-āuš-īt* ‘spin the top!’; /ws/ J *wəš-a^(’)a* ‘(will) spin the top’, *tu-wəš-a’idi* ‘(can’t) spin it’.

/wasł/ ‘follow, accompany’: *šo-wa’st-aux* ‘was following’, N *wā’sł-a^utx* ‘is following (him)’, *pu-wāst-ŷtxa’st* ‘(want) to chase him’, J *wāšD-ətxanx* ‘is pursuing him’; /awsł/ N *p-a^ust-alist* ‘(pretend) to track him’, *š-a^ust-ŷtūt* ‘chasing’, *š-a^ust-al-x* ‘is following (him)’, *h-a^ust-īt* ‘track him!’, *h-a^ust-īt* ‘go with him!’, *h-a^ust-īs* ‘go with me!’; /wsł/ *ūst-a’lnx* ‘followed him’, N *w^ust-a’a* ‘(will) track him’, *š-ust-a’su’x* ‘want to go with him’, J *wušD-ida’it* ‘pursue him!’, *wušł-a^(’)a* ‘(will) track him’. (Uncertain whether /t/ or /ł/.)

/xlum/ ‘travel, move’: *xilōm-xa* ‘(did not) move’, *lə-xilu’m-iyū* ‘make a movement’, N *x’lum-altx* ‘is moving’; /xulm/ *xū’lam-īt* ‘road’, *xū’lam-txam* ‘(will) travel’, *xūlam-txai’m* ‘(will) travel’, N *š-xūlam-t* ‘traveling’, J *xū’lam* ‘is traveling’; /xlm/ *p-xilm-īsa’im* ‘will travel’, N *xilm-ū’x* ‘move’.

/xim/ ‘turn back (home)’: *xēm-īsal* ‘had previously turned back’, N *xēⁱm-a^u* ‘be turning back’; /xm/ *xam-ī* ‘turned back’, J *xam-āⁱxā* ‘turn back towards home!’.

/xli/ ‘catch, hook with pole’: N *xīlī^t-sanx* ‘had caught it’; /xilt/ N *xīⁱl^t-aⁱ* ‘(don’t) catch it!’; /xilt/ *xilt-īⁿx* ‘caught it (with a stick)’, J *xə^tl^t-īⁿx* ‘caught it and pulled it near’, *xə^tl^t-ət* ‘get it with the pole!’.

/x^win/ ‘tear down’: *mu-xwīⁿ-alx* ‘(house) kept on coming down’, N *xwīⁿ-təx* ‘is torn down’; /x^wn/ *x^wn-ī^{yū}* ‘tore (the house) in two’, N *xun-īⁿx* ‘tore it down’, *x^wn-ī^{yū}* ‘tore it down’.

/yac/ ‘live, stay’: *yā^ts-x* ‘lived (habitually)’, *lə-yā^ts-it* ‘inhabitant’, J *yāⁱDJ-iDJu* ‘(will) stay with you’, *hiyā^tšt* ‘dwelling’; /yc/ *its-āⁱ* ‘stayed (there), lived’, *its-āⁱs* ‘house’, J *iDJ-aⁱs* ‘house’.

/yalas/ ‘return home’: *yalā^s-au* ‘are returning’, *yalā^s-al* ‘habitually return home’, *mə-yalā^s-aux* ‘as (she) continued home’, N *yalā^s-a^u* ‘keep on going back’, *ya^las-al* ‘going home’; /yals/ (heavy) N *yā^als-ə* ‘(don’t) go home!’, *yāⁱls-əx*, *yā^als-əx* ‘go home!’, J *ya^(^a)lš-a^x* ‘go home!’; /yals/ (short) *yā^als-āⁱ* ‘started home’, J *ye^lš-aⁱm* ‘(will) go back home’. (Possibly /l/, but see fn. 5.)

/yaq/ ‘touch, point at’: N *ya^q-asanx* ‘touched it’, J *yā^q-ayu* ‘needle’; /ayq/ *h-aⁱq-aⁱs* ‘touch me!’.

/yul/ ‘say, speak’: *yū^l*, *yō^l* ‘language, speech’, *lə-yō^l-at* ‘talking’, *lə-yū^l-lnx* ‘was said’, *yō^l-alsxāim* ‘(would) keep talking to each other’, N *xⁱ-yō^l-alsx*

‘talk to themselves’, *ḫ-īuʾl-anḫ* ‘is talked about’; /uyl/ N *ʰ-wīʾl-ḫasḫ* ‘are talking to themselves’.

/yupč/ ‘drive away’: N *yuʾptš-īyū* ‘whip’; /uypc/ J *h-wiʾptš-īt* ‘drive it away!’; /ypc/ N *yīptšūʾnḫ* ‘drove it away’, J *iptš-uʾinḫ* ‘drove it away’, *ʾiptš-úʾu* ‘(will) drive it away’.

/ʔilit/ ‘talk (to)’: *ʰ-īlīʾd-auḫ* ‘was continually talking to him’, N *īlīʾt-īyū* ‘telephone’, *L-īlīʾt-īsanḫ* ‘talked to him’, J *ʰ-iʾlīʾD-auḫ* ‘is talking to him/her’; /ʔilt/ (heavy) *īʾlt-īt* ‘talk to him!’, *īʾlt-aʾi* ‘(don’t) talk to him!’, *īʾlt-a* ‘talking’, *īʾld-istaī* ‘did say’; /ʔilt/ (short) *īld-īʾ* ‘began to say’, *īld-īʾs* ‘words, message, speaking’, *īld-īʾnḫ* ‘told him’, J *ʾild-īʾm* ‘(going to) talk’, *ʾild-īʾ* ‘(will) talk to her’. (Possibly related to /yul, yl/ ‘say, speak’.)

/ʔmist/ ‘do thus’: *imīʾst-al* ‘acted thus’, *imīʾst-əḫ* ‘was thus’, *imīʾst-anḫ* ‘did thus’, J *ʰi-ʾmišD-auḫ* ‘is doing it’; /ʔimst/ *īʾmst-ə*, *īʾmst-a* ‘thus’, N *īʾmst-aʾi* ‘(don’t) do it!’, J *īʾmšD-ət* ‘do it!’, *ʰi-ʾiʾmšD-ətḫ* ‘did it (already)’; /ʔmst/ *imst-īʾnḫ* ‘did so’, J *ʾimšD-iʾ(ʔ)i* ‘(will) do it’.

REFERENCES

- BACH, EMMON. 1975. Long vowels and stress in Kwakiutl. *Texas Linguistic Forum* 2:9–19.
- BAGEMIHL, BRUCE. 1991. Syllable structure in Bella Coola. *Linguistic Inquiry* 22:589–646.
- _____. 1998. Maximality in Bella Coola (Nuxalk). In Czaykowska-Higgins and Kinkade (1998), pp. 71–98.
- BATES, DAWN. 1986. An analysis of Lushootseed diminutive reduplication. *Proceedings of the Twelfth Annual Meeting of the Berkeley Linguistics Society*, pp. 1–12.
- BATES, DAWN, AND BARRY F. CARLSON. 1992. Simple syllables in Spokane Salish. *Linguistic Inquiry* 23:653–659.
- _____. 1998. Spokane (Npoqínišcn) syllable structure and reduplication. In Czaykowska-Higgins and Kinkade (1998), 99–123.
- BLEVINS, JULIETTE. 1994. The bimoraic foot in Rotuman phonology and morphology. *Oceanic Linguistics* 33:491–516.
- _____. 2004. *Evolutionary Phonology: The Emergence of Sound Patterns*. Cambridge: Cambridge University Press.
- BLEVINS, JULIETTE, AND ANDREW GARRETT. 1998. The origins of consonant-vowel metathesis. *Language* 74:508–556.

- BOROWSKY, TONI. 1986. Topics in the Lexical Phonology of English. Dissertation, University of Massachusetts, Amherst.
- BRIGHT, WILLIAM. 1978. Sibilants and naturalness in aboriginal California. *Journal of California Anthropology Papers in Linguistics* 1:39–64.
- BUCKLEY, EUGENE. 1987. Coast Oregon Penutian: A lexical comparison. *Proceedings of the Third Annual Pacific Linguistics Conference*, ed. Scott DeLancey and Russell S. Tomlin, pp. 43–69. Department of Linguistics, University of Oregon.
- _____. 1988. Reconstructing the Sounds of Alsea. Scott DeLancey (ed), *Papers from the 1988 Hokan-Penutian Languages Workshop*. University of Oregon *Papers in Linguistics: Publications of the Center for Amerindian Linguistics and Ethnography* 1:9–30.
- _____. 1989. The structure of the Alsea verb root. *Papers from the 1989 Hokan-Penutian Languages Workshop*, ed. Scott DeLancey. University of Oregon *Papers in Linguistics* 2:1–17.
- _____. 2002. Alsea metathesis and syllable structure. *Meeting of the Society for the Study of the Indigenous Languages of the Americas*, San Francisco, January 4–7.
- CALLAGHAN, CATHERINE A. 2000. Misanalysis of Sierra Miwok. *Meeting of the Society for the Study of the Indigenous Languages of the Americas*, Chicago, January 7–9.

- CHO, YOUNG-MEE AND TRACY KING. 2003. Semisyllables and universal syllabification. *The Syllable in Optimality Theory*, ed. Caroline Fery and Ruben van der Vijver. Cambridge: Cambridge University Press, pp. 183–212.
- CHURCHWARD, C.M. 1940. *Rotuman Grammar and Dictionary*. Sydney: Australasia Medical Publishing Co.
- COOK, EUNG-DO. 1994. Against moraic licensing in Bella Coola. *Linguistic Inquiry* 25:309–326.
- CZAYKOWSKA-HIGGINS, EWA, AND M. DALE KINKADE (eds.). 1998. *Salish Languages and Linguistics: Theoretical and Descriptive Perspectives*. Mouton de Gruyter, Berlin/New York.
- CZAYKOWSKA-HIGGINS, EWA, AND M. L. WILLETT. 1997. Simple syllables in Nxa'amxcín. *IJAL* 63:385–411.
- DELANCEY, SCOTT, AND VICTOR GOLLA. 1997. The Penutian hypothesis: Retrospect and prospect. *IJAL* 63:171–202.
- DEMERS, RICHARD. 1974. Alternating roots in Lummi. *IJAL* 40:15–21.
- FRACHTENBERG, LEO J. 1910; 1913. *Alsea: Notes to Texts*, vol. 1–8. MS 2516, National Anthropological Archives, Smithsonian Institution, Washington, D.C.
- _____. 1917. Myths of the Alsea Indians of Northwestern Oregon. *IJAL* 1:64–75.
- _____. 1918. *Yakonan (Alsea)*. Unpublished typescript with handwritten additions and corrections. Philadelphia: American Philosophical Society Library, Franz Boas Collection.

- _____. 1920. *Alsea Texts and Myths*. Washington: Bureau of American Ethnology, Bulletin 67.
- _____. 1922*a*. Coos. *Handbook of American Indian Languages*, Part 2, ed. Franz Boas, pp. 297–429. Washington: Bureau of American Ethnology, Bulletin 40.
- _____. 1922*b*. Siuslawan (Lower Umpqua). *Handbook of American Indian Languages*, Part 2, ed. Franz Boas, pp. 431–629. Washington: Bureau of American Ethnology, Bulletin 40.
- FREELAND, L.S. 1951. *Language of the Sierra Miwok*. Indiana University Publications in Anthropology and Linguistics, Memoir 6 of the International Journal of American Linguistics. Baltimore: Waverly Press.
- GAFOS, ADAMANTIOS I. 2002. A grammar of gestural coordination. *NLLT* 20:269–337.
- GOLLA, VICTOR. 1997. The Alsea–Wintun connection. *IJAL* 63:157–170.
- GRANT, ANTHONY. 1997. Coast Oregon Penutian: Problems and possibilities. *IJAL* 63:144–157.
- HALE, MARK, AND CHARLES REISS. 2000. Substance abuse and dysfunctionality: Current trends in phonology. *Linguistic Inquiry* 31:157–169.
- HALL, NANCY E. 2003. *Gestures and Segments: Vowel Intrusion as Overlap*. Dissertation, University of Massachusetts, Amherst.
- HARGUS, SHARON, AND VIRGINIA BEAVERT. 2002*a*. Predictable versus underlying vocalism in Yakima Sahaptin. *IJAL* 68:316–340.

- _____. 2002*b*. Yakima Sahaptin clusters and epenthetic [ɨ]. *Anthropological Linguistics* 44:1-47.
- HAYES, BRUCE. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20:253–306.
- _____. 1995. *Metrical Stress Theory: Principles and Case Studies*. University of Chicago Press.
- HOARD, JAMES E. 1978. Syllabification in Northwest Indian languages, with remarks on the nature of syllabic stops and affricates. *Syllables and Segments*, ed. Alan Bell and Joan Bybee Hooper, pp. 59–72. New York: North Holland Publishing.
- HUME, ELIZABETH. 2001. Metathesis: Formal and functional considerations. *Surface Syllable Structure and Segment Sequencing* [HIL Occasional Papers, vol. 4], ed. Elizabeth Hume; Norval Smith; and Jeroen van de Weijer, pp. 1–25. Leiden: Holland Institute of Linguistics.
- _____. 2004. The indeterminacy/attestation model of metathesis. *Language* 80:203–237.
- HYMAN, LARRY M. 1985. *A Theory of Phonological Weight*. *Publications in Language Sciences* 19. Dordrecht: Foris. [Reprinted 2003 by University of Chicago Press.]
- INKELAS, SHARON. 1989. *Prosodic Constituency in the Lexicon*. Dissertation, Stanford University.

- ITÔ, JUNKO. 1986. Syllable Theory in Prosodic Phonology. Dissertation, University of Massachusetts, Amherst.
- JACOBS, MELVILLE. 1935*a*. Alsea slip files. University of Washington Archives (boxes 53, 54; duplicate copies in boxes 55, 56).
- _____. 1935*b*. The phonemes of Alsea. University of Washington Archives (box 101, folder 2).
- _____. 1954. The areal spread of sound features in the languages north of California. Papers from the Symposium on American Indian Linguistics, held at Berkeley, July 7, 1951, ed. Murray Emeneau. UCPL 10:46–56. Berkeley: University of California Press.
- KENDALL, DAYTHAL L. 1997. The Takelma verb: Toward Proto-Takelma-Kalapuyan. *IJAL* 63:1–17.
- KENSTOWICZ, MICHAEL. 1996. Base-identity and uniform exponence: Alternatives to cyclicity. *Current Trends in Phonology: Models and Methods*, ed. Jacques Durand and Bernard Laks. Vol 1:363-393. European Studies Research Institute, University of Salford, Manchester.
- KINKADE, M. DALE. 1998. How much does a schwa weigh? In Czaykowska-Higgins and Kinkade (1998), 197–216.
- LEVIN, JULIETTE. 1987. Between epenthetic and excrescent vowels (or what happens after redundancy rules). *Proceedings of the West Coast Conference on Formal Linguistics* 6, ed. Megan Crowhurst, pp. 187–201. Stanford: Stanford Linguistics Association.

- MATTHEWSON, LISA. 1994. Syllable structure in St'át'imcets. *Proceedings of the 1994 Annual Conference of the Canadian Linguistic Association*, pp. 381–392. Department of Linguistics, University of Toronto.
- MCCARTHY, JOHN. 2000. The prosody of phase in Rotuman. *Natural Language and Linguistic Theory* 18:147–197.
- MCCARTHY, JOHN, AND ALAN PRINCE. 1995. Faithfulness and reduplicative identity. *University of Massachusetts Occasional Papers in Linguistics* 18: Papers in Optimality Theory, ed. Jill Beckman; Laura Walsh Dickey; and Suzanne Urbanczyk, pp. 249–384. Amherst, Mass.: Graduate Linguistics Student Association.
- MONTLER, TIMOTHY R. 1989. Infixation, reduplication, and metathesis in the Saanich actual aspect. *Southwest Journal of Linguistics* 9:92–107.
- NATER, HANK F. 1979. Bella Coola phonology. *Lingua* 49:169–187.
- _____. 1984. *The Bella Coola language*. Ottawa: National Museums of Canada.
- NEWMAN, STANLEY. 1944. *Yokuts Language of California*. Viking Fund Publications in Anthropology 2. New York: The Viking Fund.
- _____. 1947. Bella Coola I: Phonology. *IJAL* 13:129–34.
- POSER, WILLIAM J. 1984. *The phonetics and phonology of tone and intonation in Japanese*. Dissertation, MIT.
- PRINCE, ALAN S. 1983. Relating to the grid. *Linguistic Inquiry* 14:19–100.
- _____, AND PAUL SMOLENSKY. 2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Blackwell.

- RICE, KEREN. 1990. Predicting rule domains in the phrasal phonology. *The Phonology-Syntax Interface*, ed. Sharon Inkelas and Draga Zec, pp. 289–312. Stanford, Calif.: CSLI, and Chicago: University of Chicago Press.
- _____. 1993. A reexamination of the feature [sonorant]: The status of ‘sonorant obstruents’. *Language* 69:308–344.
- RICE, KEREN, AND PETER AVERY. 1989. On the relationship between sonorancy and voicing. *Toronto Working Papers in Linguistics* 10:65–82.
- SAPIR, EDWARD. 1921. A Characteristic Penutian Form of Stem. *IJAL* 2:58–67.
- _____. 1922. The Takelma language of southwestern Oregon. *Handbook of American Indian Languages*, Part 2, ed. Franz Boas, pp. 1–296. Washington: Bureau of American Ethnology, Bulletin 40.
- SHAW, PATRICIA A. 1996. Degenerate syllables. Paper presented at the 8th International Phonology Conference, Vienna.
- _____. 2002. On the edge: Obstruent clusters in Salish. *Proceedings of WSCLA 7: The Workshop on Structure and Constituency in Languages of the Americas*, ed. L. Bar-el; L. Watt; and I. Wilson. University of British Columbia Working Papers in Linguistics 10.
- STERIADE, DONCA. 1995. Underspecification and markedness. *The Handbook of Phonological Theory*, ed. John A. Goldsmith, pp. 114–174. Cambridge, Mass.: Blackwell.

- STONHAM, JOHN T. 1994. *Combinatorial Morphology*. [Current Issues in Linguistic Theory 120.] Amsterdam and Philadelphia: John Benjamins.
- THOMPSON, LAURENCE C., AND M. DALE KINKADE. 1990. *Languages. Handbook of the North American Indians, Volume 7: Northwest Coast*, ed. Wayne Suttles, pp. 30–51. Washington, D.C.: Smithsonian Institution.
- THOMPSON, LAURENCE C. AND M. TERRY THOMPSON. 1969. Metathesis as a grammatical device. *IJAL* 35:213–219.
- WANG, WILLIAM S.-Y. 1969. Competing changes as a cause of residue. *Language* 45:9–25.
- ZEC, DRAGA. 1988. *Sonority constraints on prosodic structure*. Dissertation, Stanford University.
- _____. 1995. Sonority constraints on syllable structure. *Phonology* 12:85–129.