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ABSTRACT

In this paper it will be shown that the concept of syllabification, i.e. the assignment of syllable structure, can account for the at first sight disparate vowel deletion phenomena in a much discussed Amerindian language, viz. Tonkawa. More specifically, it will be shown that the specification of the **direction**, the **domain of application** and the **elements triggering the syllabification** can account for the data in question. The Tonkawa case thus provides a good illustration for the view that certain phonological processes involving syllable structure, like vowel deletion, epenthesis and semivocalization, are typically the result of the assignment of syllabic structure, and need not be stated as independent rules.

INTRODUCTION

Consider the following set of Tonkawa forms:

- (1)
 a. picno? < picena+o? 'he cuts it'
 b. wepceno? < we+picena+o? 'he cuts them'
 c. picnano? < picena+n+o? 'he is cutting it'
 d. wepcenano? < we+picena+n+o? 'he is cutting them'
 e. picen < picena 'steer castrated one'

The following affixes can be identified:

- (2)
 a. we- 3rd person plural, pronominal object
 b. -o? 3rd person singular, declarative, present tense
 c. -n- progressive (continuative)
 d. (unmarked) 3rd person singular, pronominal object

The following phonetic variants are exhibited by the stems:

- (3) c. picn-, -pcen-, pecna-, -pcena-, picen, /picena/ 'cut'

In order to account for these data, Kisseberth [4] posits the following rules:

- (4) a. Word-Final Vowel Deletion

$$V \rightarrow \emptyset / _ \#$$

 b. Vowel Elision

$$V \rightarrow \emptyset / \#CVC_C \begin{bmatrix} V \\ [+stem] \end{bmatrix}$$

c. Vowel Truncation

$$V \rightarrow \emptyset / _ V$$

The derivations are given in (5):

- (5)
- | | | | |
|----------|-----------|--------------|-------------|
| | (a) | (b) | (c) |
| UR | picena+o? | we+picena+o? | picena+n+o? |
| Delete | | | |
| Elide | picna+o? | we+pcena+o? | picna+n+o? |
| Truncate | picn+o? | we+pcen+o? | |
| SR | picno? | wepceno? | picnano? |
-
- | | | |
|----------|----------------|--------|
| | (d) | (e) |
| UR | we+picena+n+o? | picena |
| Delete | | picen |
| Elide | we+pcena+n+o? | |
| Truncate | | |
| SR | wepcenano? | picen |

The specification is [+stem] for the final vowel in the SD of Vowel Elision (4b) is needed in order to prevent Elision to take place in (6c):

- (6) a. pilo? < pile+o? 'he rolls it'
 b. weplo? < we+pile+o? 'he rolls them'
 c. pileno? < pile+n+o? 'he is rolling it'
 d. wepleno? < we+pile+n+o? 'he is rolling them'

In (6c) the second vowel of the word does not elide, although it is in the environment CVC_CV. The final vowel in these forms does not belong to the stem, but to the suffix -o? (see (2b)).

Kisseberth adduces additional paradigms in order to show that the vowel that is to be deleted by Vowel Elision must belong to the stem:

- (7) a. yakpo? < yakapa+o? 'he hits it'
 b. weykapo? < we+yakapa+o? 'he hits them'
 c. wexaykapo? < we+xa+yakapa+o? 'he hits them with force'

In (7c) it is not the second vowel of the form that elides, (which is what rule (4b) would predict), but its third vowel, which is the first stem vowel. Therefore, Kisseberth restricts Vowel Elision further so that only a vowel that is specified as [+stem] is affected by the rule. He observes ([4]:117) that if there is a CV prefix, the first stem vowel deletes and that if there is no prefix, the second vowel of the stem deletes.

Kisseberth reformulates Vowel Elision as:

(8) Kisseberth's reformulation of vowel-elision

$$\left[\begin{array}{c} V \\ +stem \end{array} \right] \rightarrow \emptyset / \left\{ \begin{array}{l} \# \\ \# \\ \# \end{array} \right\} \begin{array}{l} V+C \\ CVC \\ C+ \end{array} \right\} - C \left[\begin{array}{c} V \\ +stem \end{array} \right] \quad \begin{array}{l} (a) \\ (b) \\ (c) \end{array}$$

Subrule (a) accounts for stems preceded by a CV prefix; subrule (b), for stems without a prefix and subrule (c) for stems preceded by a CVC prefix. The three subrules restrict elision to the context VC_CV.

The complexity of rule (8) does not satisfy Kisseberth and he therefore mentions the need for a simpler rule, combined with a derivational constraint.

AN ALTERNATIVE ANALYSIS

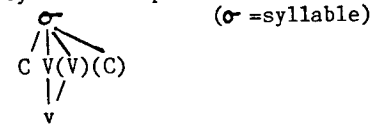
Tonkawa allows the following syllable types:

(9) possible Tonkawa syllables:

- a. CV b. CVC c. CV: (CV₁V₁) d. CV:C

The syllable template in (10) expresses the possible forms a syllable can take. Note that the first C and V are the obligatory elements of the syllable (CV often being referred to as the core syllable).

(10) syllable template:



We propose that the syllabification parameters are set as follows:

(11) Tonkawa syllabification:

- a. first cyclically (lexically), exclusively in derived environments; then postcyclically (postlexically) (cyclicality parameter);
- b. iteratively leftward (directionality parameter);
- c. syllabification is triggered by unsyllabified C's (obligatory incorporation parameter);
- d. measures taken when syllabification fails:
 - i. the direction is reversed (left to right);
 - ii. when this also fails: necessary elements on the left side are extracted from other syllables and incorporated into the newly formed syllable.

The cyclicality parameter given in (11a) is a well-known parameter in phonology, especially with regard to the assignment of prosodic structure. This parameter also exists for the assignment of the lowest prosodic level: the syllable. A consequence of the particular setting of this parameter in Tonkawa is that existing syllable nodes are not erased by a subsequent cycle (an example of strict cyclicality; if syllable nodes could be erased by a syllabification applying at a later cycle, the results of the former syllabification would not be detectable). However, as we will see later, existing links between individual elements can be

broken, if this is necessary for obtaining a permissible syllable structure.

The directionality parameter in (11b) and directionality in syllabification in general have been argued for repeatedly (see Kaye and Lowenstamm [3], ter Mors [5], Noske [6,7]). Here, we will see that the setting of this parameter (from right to left) allows us to explain which vowels are deleted.

The obligatory incorporation parameter in (11c) is crucial in our theory of syllabification. According to this theory, syllabification is triggered by the elements that must be incorporated into syllabic structure. Three situations are possible:

- i. only C's are triggers
- ii. only V's are triggers
- iii. both C's and V's are triggers

The theory entails that the fourth logical possibility, i.e., neither C's nor V's are triggers of syllabification, does not occur. This is because in that situation, syllabification would not be triggered at all, neither C's nor V's would be linked to syllable nodes, and there would be no phonetic outcome.

In the case where only C's are triggers of syllabification, i.e., C's are the elements that must be syllabified, V's will be skipped at a stage of the syllabification process where this process can only incorporate a C. The rightmost V will be skipped if the syllabification is applying from left to right, the leftmost if syllabification applies in the opposite direction. (This latter case can be found in (14a,b) (below)). If in this type of language two contiguous C's are encountered by the syllabification mechanism, the mechanism will project a V in between them (e.g., in the environment CVC_CV). This V will be filled with the neutral vowel value (often a schwa).

The situation is symmetrically opposite if V's are the triggering elements. This may be the case in languages with consonant truncation phenomena. In this type of language, again assuming CV as the only permissible syllable type, in a CVCCV environment, one of the two contiguous C's will be ignored by the syllabification mechanism, the rightmost if the syllabification is applying from left to right, the leftmost if syllabification applies in the opposite direction. In the case of a CVCC environment, a C will be projected between the two contiguous V's, and will be filled with the neutral consonant value (often a glottal stop).

In case iii, in which both C's and V's are triggers, the syllabification mechanism will resort to projection of both C's and V's if it encounters disallowable sequences of elements. The mechanism will project a C in the environment CV_CVCV and a V in the environment CVC_CV.

An interesting consequence of our theory is that it predicts that the reverse situation will not occur: there will be no language where both C's and V's can be skipped during syllabification, hence no C's as well V's will be deleted as a result of the syllabification process. This is precisely because of the fact that there should be at least one type

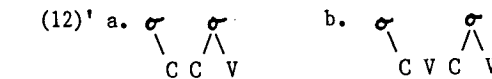
of element, either C or V, that triggers syllabification.

The particular parameter setting for Tonkawa in (11c) has the consequence that V's may be skipped, but not C's.

The measures taken if syllabification of an obligatory element (in the Tonkawa case: a consonant) fails boils down to two basic situations:



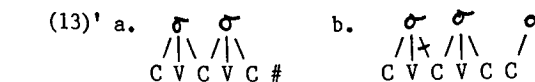
In this case, the rightmost C is not yet syllabified and therefore at a given cycle (or in the case of a C in a nonderived environment: postcyclically) triggers syllabification. Because of the direction parameter setting (right to left), syllabification will proceed leftward. With the material on the left side, however, no legitimate syllable can be formed: there is no free consonant that can function as the beginning of the syllable (note that a Tonkawa syllable always starts with a C). Therefore, the direction will be reversed and the V to the right will be incorporated into the syllable. The thus formed CV syllable is legitimate, and syllabification has succeeded:



In (13), this latter strategy, reversal of the direction of syllabification, will also fail:



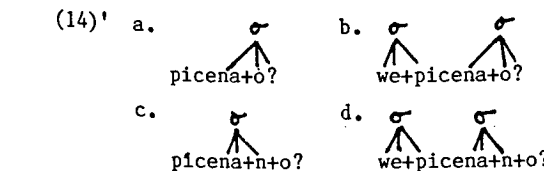
In this situation, there is no V to the right of the unsyllabified C that can be incorporated. Now strategy ii takes effect: the C to the left is detached from the preceding syllable (note that the syllable to the left remains licit (CVC --> CV)), and this C is incorporated into the newly formed syllable:



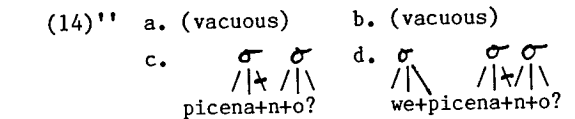
Having outlined our analysis of Tonkawa syllabification, we will provide illustrations for each of the type of cases mentioned in section 1. We will show that in these cases, the correct deletion is forecast by our syllabification algorithm. Let us now look at the cases (1a-d & 5a-d), repeated here as (14):

- (14) a. picena+o? b. we+picena+o?
c. picena+n+o? d. we+picena+n+o?

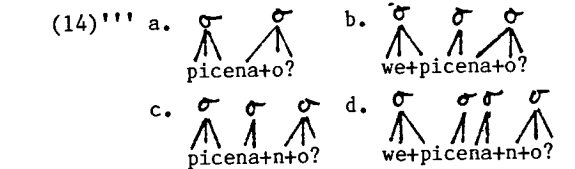
In these forms, during the first cycle the morphemes which are adjacent to the stem will be syllabified:



It is assumed that in these forms, the prefixes and suffixes adjacent to the stem are attached on the same cycle. However, this is not crucial. In (14'a,b), it is the glottal stop that triggers syllabification. Syllabification, in accordance with the directionality setting (11b), now proceeds leftward, and the o is incorporated into the syllable. Next, a is ignored by the syllabification mechanism, because it cannot incorporate this in its syllabic structure (cf. template (10)). It is thus that the data for which Kisseberth has formulated his rule of vowel truncation (6b) are borne out. In (14b,d), the w of the prefix also triggers syllabification. Because there are no elements to the left, the direction of syllabification is reversed by virtue of (11d.i), cf. (12). Note also that on this first cycle, the morphemes of the second cycle are invisible. Let us now look at the second cycle:



Here, we see that in (14''c,d) the syllabification mechanism has delinked the n from the preceding syllable (by virtue of (11d.ii), cf. (18)). We now come to the postcyclic (postlexical) syllabification, in which unassociated consonants belonging to the stem trigger syllabification:

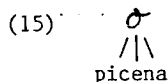


When postcyclic syllabification takes place in (14'''a,c), both p and c are still unsyllabified. Going from right to left (by virtue of (11a)), the syllabification algorithm creates a syllable incorporating the c, i and p. Now, all consonants are incorporated into the syllabic structure. Hence there is no need to incorporate the e and therefore the phonetic outcomes are picno? and picnano? respectively.

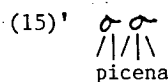
When postcyclic syllabification takes place in (14'''b,d), one stem consonant is still unsyllabified: c. Leftward syllabification fails, because there is no C to its left. Therefore, by virtue of (11d.i), the direction of syllabification is reversed, (cf. (12)). The syllabification mechanism will incorporate the e to the right of the c into the syllabic structure. The subsequent n is already syllabified and therefore will not be incorporated into the syllable just formed. The syllable thus created (ce) has the form CV which, according to template (10), is a permissible structure. The i has been left unsyllabified and is hence not realised. Our model thus correctly predicts that picnano? and wepcenano? are the correct surface forms.

We still have to explain the vowel deletion in example (3e, 7e), for which Kisseberth has formulated his rule of Word Final Vowel Deletion (6a). Our model accounts for this deletion in a straightforward

ward manner. Since there are no morphemes attached to the stems, there is only one, postcyclic, application of syllabification. Syllabification starts from the right in accordance with (11a):



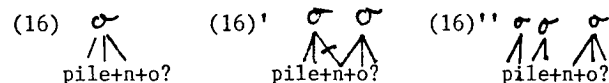
Thus, the syllable *cen* is formed. Arriving at the *p*, no material can be found to the left of this element. Therefore, the direction is reversed by virtue of (11d.i) (cf. (12)):



Now, all consonants, which are the syllabification triggering elements (cf. 11c), have been syllabified. The final *a* has been left unsyllabified, and hence is not realised, which is the correct prediction.

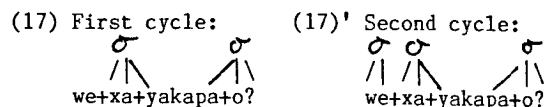
Let us now turn to the example given in (6c) where the second stem vowel is not elided.

first cycle: second cycle: postcyclic syll.:

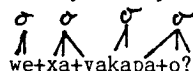


We thus see here that the nonrealisation of the *e* (the vowel which finds itself in the environment VC_CV) is the consequence of the setting of the cyclicity parameter (11a): the *e* had to be incorporated into syllable structure at the first cycle, at which syllabification was triggered by *n* (the progressive morpheme). This example illustrates also the working of (11d.ii): during the postcyclic syllabification, the *n* was extracted from the previous syllable and was incorporated into the final syllable (an instantiation of (13a)).

Finally, let us look at the form in (7c). Here it was the third *V* and not the second one that was deleted.



(17)'' Postcyclic syllabification:



Here, the *k* was the only consonant that had not yet been syllabified during the cycle. Leftward syllabification will fail, because the preceding consonant *y* is already incorporated into a syllable. Therefore, by virtue of (11d.i) (cf. (12)), the direction of the application of syllabification is reversed and the following *a* is incorporated into the syllabic structure. The first stem vowel is left unsyllabified, because all consonants are already syllabified, and there is no need for further syllabification. It is thus correctly predicted that *wexaykapa?* is the phonetic outcome.

We have thus seen that the phenomena for which Kisseberth's word-final vowel deletion rule ((4a),

the truncation rule (4c) as well as his vowel elision rule (8) were formulated are all correctly predicted in our syllabification model. Hence, there is no need for formulating separate rules.

CONCLUSION

In this paper, we have provided an explanation for the different phenomena of vowel deletion taking place in Tonkawa. We have shown that it is possible to account for them by analysing them as a result of the assignment of syllable structure. It has also been shown that, for Tonkawa at least, a lexical and a postlexical stage of syllabification must be assumed. Furthermore, the theoretical relevance of a newly proposed parameter the **obligatory incorporation** parameter has been outlined. Its importance for the account of the Tonkawa fact has subsequently been shown. Finally, it was demonstrated that the concept of directional syllabification can not only explain the correct epenthesis sites in certain languages (as shown in Noske [6,7]) for Yawelmani and Tigrinya), but also the correct sites for vowel deletion in certain other languages, like Tonkawa.

NOTE

* I wish to thank Martha Wright for a valuable discussion on the Tonkawa data and especially for pointing out that the assumption that the order in which syllabification applies in the different morphological domains is of crucial importance. This paper is part of work in progress, where more data of Tonkawa will be treated. The main source on Tonkawa is Hoijer [2].

REFERENCES

- [1] van der Hulst H. & N.S.H. Smith (eds.), *Advances in Nonlinear Phonology*, Dordrecht: Foris, 1985.
- [2] Hoijer, H., "Tonkawa - An Indian Language of Texas", in Boas, F. (ed.), *Handbook of American Indian Languages*, Part 3., 1933.
- [3] Kaye, J.D. & J. Lowenstamm, "Syllable Structure and Markedness Theory", in Belletti, A. et al. (eds.), *Theory of Markedness in Generative Grammar*, Pisa: Scuola Normale Superiore di Pisa, 1982, p. 287-315.
- [4] Kisseberth, C.W., "Vowel Elision in Tonkawa and Derivational Constraints", in Sadock, J.M. & A.L. Vanek, *Studies presented to Robert B. Lees by his students*, Edmonton, AB: Linguistic Research, 1970, p. 109-137.
- [5] ter Mors, C., "Empty V-nodes in Klamath and their Role in Klamath Vowel Alternations", in [1], p. 313-334.
- [6] Noske, R., "Syllabification and Syllable Changing Processes in Yawelmani", in [1], p. 335-361.
- [7] Noske, R., "A Parameter of Syllabification", in *Papers and Studies in Contrastive Linguistics*, to appear.