Theoretical Implications of Piro Syncope

Yen-Hwei Lin
The University of Texas at Austin

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE*

YEN-HWEI LIN

THE UNIVERSITY OF TEXAS AT AUSTIN

The Piro language belongs to the Arawakan family. It is spoken along the Lower Urubamba River in the Montana region of eastern Peru. All the data in this paper are taken from Matteson (1965).

The principal morphological process in the Arawakan languages is affixation. Piro, like most Arawakan languages, is a synthetic language. Words usually consist of long strings of short morphemes. Some combinations of morphemes create the conditions for syncope. In piro. the syncope rule is a cyclic (lexical) rule which deletes the morpheme final vowel whenever the suffixation of a certain group of morphemes occurs, unless deleting the vowel would result in a tri-consonantal cluster.

For example,

```
nika  -    ya    - waka - lu
to eat  locative  place  it

---> nik_ya + waka + lu ---> nikyawaka + lu
---> nikyawak_lu ---> nikyawaklu  'to eat it there'
```

In some cases, the output of the syncope rule may feed degemination and compensatory lengthening:

```
nika  +  ka     ---> nik_ka ---> ni:ka
        passive                  to be eaten
```

In this paper, we aim to examine the interaction of Piro syncope with syllabification, and the behavior of heteromorphemic geminates with respect to the Obligatory Contour Principle and Tier Conflation (McCarthy 1986).

1. Piro Syllable Structure[1]

Piro has no words beginning with vowels, nor any ending with consonants, so the core syllable structure in Piro is the CV type, without any consonants serving as syllable codas, nor any vowels forming syllables by themselves. Matteson maintains that although there exists some degree of phonetic closure of some syllables, all consonants are treated as an onset because first, "The closure of syllable is freely fluctuating;" second, "The consonants invariablly share part of the muscular movement of the syllabic pulse that produces the following vowel"(1965:24). In this paper, we are following Matteson's observation and treat all consonants as an onset.

The distribution of tri-consonantal clusters are limited and predictable. According to our investigation of the available data, only one word, i.e. phya ('vapor'), contains a tri-consonantal cluster which is truly tautomorphemic; the other tri-consonantal clusters are formed by morphological concatenation of monoconsonantal affixes. Since 'phya' can alternate with 'phe', we speculate that 'phya' is historical residue. In fact, Piro historically has a coalescense rule which merges /i/ and /a/ into /e/. Therefore, treating 'phya' as an exception appears to be well-justified. As for those tri-consonantal clusters formed by morphological concatenation, only one particular class of morphemes is involved in creating the surface clusters; i.e., the class of morphemes which consists of only one consonant segment. In Piro, only certain prefixes such as pronominal /n-/ 'my', /p-/ 'your' and

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE

/m-/ 'privative', and the suffix /-m/ 'derivational transitory' belong to this class. Consequently. it is proposed that the basic core syllable of Piro is (C)CV. The extra consonant as in, for instance,

```
n - knoyate ---> nknoyate
my  turtle       my turtle
```

is affiliated to a syllable at the postlexical level.

Piro allows considerable freedom of clustering two consonants with the exception of some continuants that are very similar in place and/or manner of articulation. The non-permissible consonant clusters are: fricative clusters (ex. *šx, *xx), affricate clusters (ex. *tstx), flap clusters (ex. *rl *ll), some affricate plus fricative clusters (ex. *tss), /ħ/[2] plus non-back obstruents (ex. *ħs, *ħp). Selkirk (1984) suggests the use of sonority hierarchy instead of the major class features to classify the natural class and condition the possible consonant clusters. She proposes a tentative sonority hierarchy and the principle of the Sonority Sequencing Generalization.

Sonority Sequencing Generalization (SSG)

> In any syllable, there is a segment consitituting a sonority peak that is preceded and/or followed by a sequence of segments with progressively decreasing sonority values.

However, in Piro, we clearly have a sonority sequencing problem, since we can have, e.g., both /nm/ and /mn/ clusters or both /ws/ and /sw/ clusters. With such freedom of consonant combinations, we cannot find a systematic generalization to base a sonority scale for Piro. The idiosyncratic aspect of Piro consonant clusters makes the differenciation of sonority of consonants unnecessary. No inherent differences of sonority of the consonants is needed to constrain their combinations. All that we appear to need is a set of filters to rule out ill-formed clusters. The approach of syllable parsing rules (Steriade 1982, Levin 1985) clearly defines that the CV rule is the universal core syllable building rule; incorporation rules (onset and coda rules) may be language specific and they have to be subject to sonority restriction; finally, the language specific adjunction rules are not constrained by the SSG but may be specified to adjoin only certain segments (e.g. [+ant]) or conditioned by a set of filters (Levin 1985, ch.2). Since the sonority restriction is supposed to be a universal constraint on onset and coda formation, and researchers do provide a wide range of empirical evidence for this. This leads us to question if Piro really has onset rules at all. Since onset rules are language

specific, we may suggest that Piro does not actually have an onset rule in a regular sense but instead has adjunction rules conditioned by some filters.[3] The proposal for Piro syllabification is then given as follows:

```
Lexical Level --- The CV rule
                  Lexical (cyclic) adjunction rules
                  (Non-iterative)

Postlexical Level --- The stray adjunction rule
```

The adjunction rule at the lexical level is constrained by a set of filters. Besides, it applies cyclically so that the syncope rule at the next cycle can be blocked, but it applies only once so that we do not have tri-consonantal clusters at the lexical level. The stray adjunction rule affiliates the third consonant (ex. p-, w-) to a syllable.

2. Syncope

Syncope is the major phonological rule in Piro. It applies when some kind of suffixation occurs. There are two types of suffixes marked in the lexicon: one group contains those which allow the preceding vowel to delete (Suffix I); the other contains those which do not (Suffix II). For example, the vowel before /-ru/ ('him', Suffix I) deletes, but the vowel before /-Vna/ ('intensifier of action' Suffix II) does not. The V is not a real vowel segment but a device to mark Suffix II. Vowel deletion and its failure to apply is illustrated by the following example.

```
wuylaka - Vna - ru  ---> wuylakan__ru
 we hit                   we hit him
```

The second constraint is that, as mentioned before, syncope does not apply if a tri-consonantal cluster would arise as a result of its application. Some examples are given in (1).

```
(1) a. netni                    - ru
       I saw one who is now dead  him
       ---> netniri    'I saw him who is now dead'

    b. maxnaka     -     ni     - ru
       disobedient  unfortunate  he
       ---> maxnak_ni - ru ---> maxnakniri
            he is unfortunately disobedient

    c. nika   -   ya   -  waka - lu
       to eat  locative  place   it
       ---> nik_ya - waka - lu  ---> nikyawak_lu
            to eat it there
```

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE

The vowels underlined are retained because their deletion would produce tri-consonantal clusters. As a result, only the vowel in a CV - CV sequence can be deleted. The syncope rule can then be stated as:

(I) V ---> ∅ / V C ___ - CV
(Suffix I)

The given examples demonstrate that the syncope rule is cyclic and the direction of cyclic application should be from left to right. According to this rule, in cases like CCV-CV or CV-CCV, syncope does not occur. Here is an example of the failure of vowel deletion in a CV-CCV sequence:

koko - yma - lu - Vne ---> kokoymalune
uncle with entity plural

Therefore, any CCV structure which either exists in the underlying representation or is formed after syncope will block vowel deletion.

Since this syncope rule refers only to the skeleton (CV-tier), it does not seem to be sensitive to syllable structure and syllabification. However, let us look at the following examples:

(2) a. kna - mtaša - xe - kaka
pole hollow lasting stem suffix
---> knamtaš x kaka (---> knamta:xkaka)
lanky

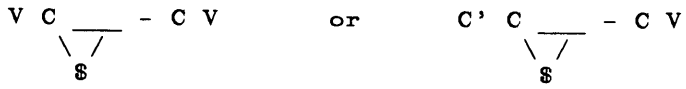
b. ptso - tsotaxi - xi - ñima
a little postpositive small member postpositive
---> ptsotsotax x ñima (---> ptsotsota:xñima)
a little bit

The data show that the CC clusters /šx/ and /xx/ do not block syncope. These counterexamples can be accounted for if we include syllable structure information as a constraint on the syncope rule. We may notice that the only difference between the examples in (1) and those in (2) is that the CC clusters in (1) are permissible consonant clusters in Piro while those in (2) which allow syncope to apply are non-permissible consonant clusters. That is to say, our syllabification rules would not apply to the clusters in (2). As a result, we have to reformulate the syncope rule to show that it is sensitive to syllabification.

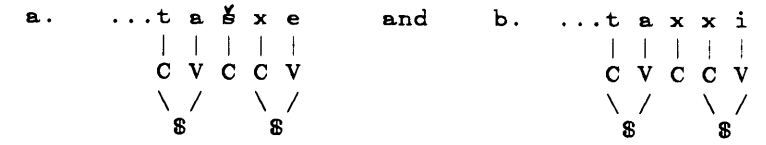
(II) Syncope

V ----> ∅ / C ___ - CV
(suffix I)
$

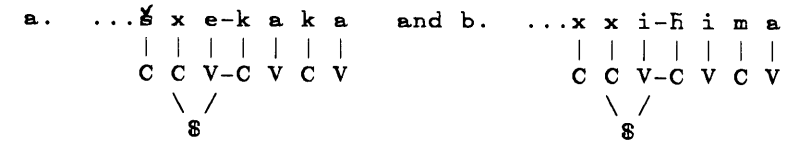
This rule states that the vowel is deleted in the environment of either



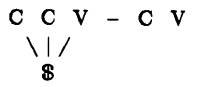
Only the vowel in a simple CV syllable is subject to the rule. Given this syllable-sensitive syncope rule, we can then explain the data in (2). At the end of cycle 3, we will have a structure like:



The /š/ in (2)a. and the /x/ in (2)b. cannot be adjoined to a syllable because /šx/ and /xx/ are not possible clusters, and thus fail to undergo the syllabification rules. On cycle 4., syncope can apply because the structure like



meets the environment of our syncope rule (II). As for the examples in (1), syncope is blocked when there are permissible bi-consonantal clusters because these clusters have a structure like



The data thus show that unlike common syncope rules that refer only to the skeletal tier in their structural description, the Piro syncope rule must refer to details of syllable structure as well.

3. Counterexamples and a Tentative Solution

As mentioned before, Piro has some very few tri-consonantal clusters, and we proposed that the third consonant is left stray at the lexical level and affiliated to a syllable later in the postlexical phonology. The type of tri-consonantal clusters that involves the suffix /-m/ poses a problem for the previous analysis of syncope. The examples are given in (3).

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE

(3) a. reneka - m - Vta - ya - no
he gave transitory theme closure to me
---> renekamta-ya-no ---> renekamtyano
he gave to me

b. rasuka - m - Vta - na ---> rasukamta-na
they ran they
---> rasukamtna 'they ran right away'

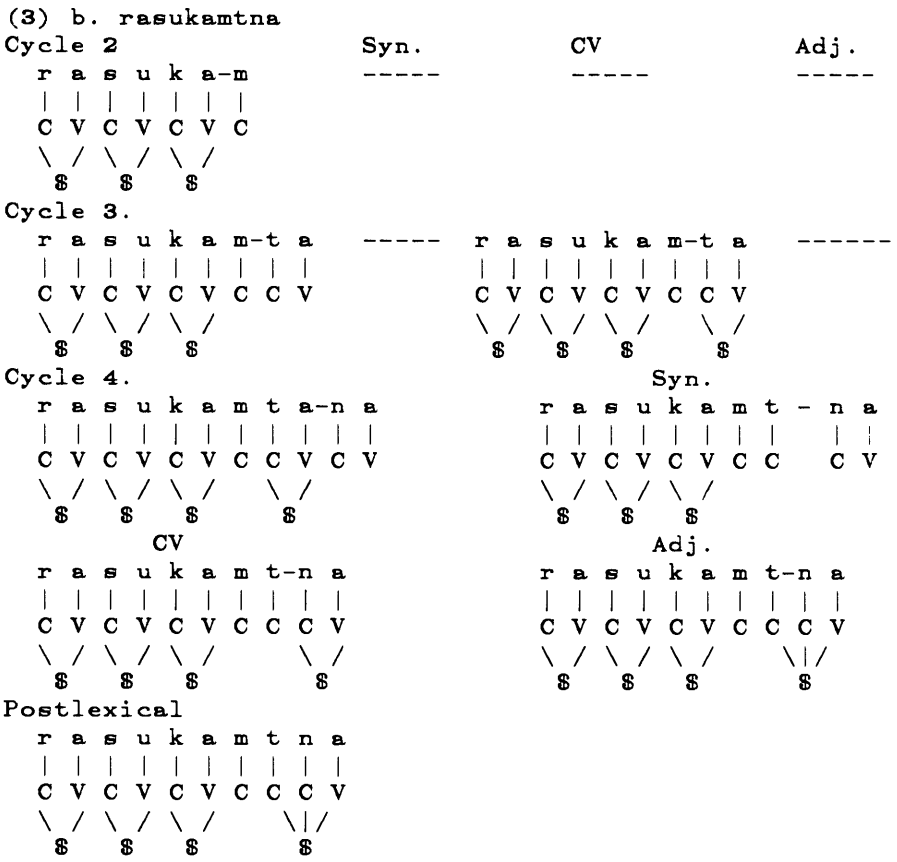
c. ɦasuka - m - Vta - kaka ---> ɦasukamta-kaka
run causative
---> ɦasukamtkaka 'cause to run'

The problem is how the vowel /a/ of /-Vta/ could delete even though the deletion would produce three consonants. Unlike the cases of /šx/ and /xx/ in (2) discussed in the previous section, /mt/ is a permissible cluster in Piro, so it should block syncope. For example,

mta 'skin, surface' mta-ɦa ---> mtaɦa 'shallows'

ɦi - mtu - ɦa
base prefix verb root 'to injure' verb stem suffix
---> himtuha 'to menstruate'

The only counterexamples to the general constraint of avoiding tri-consonantal clusters on syncope are those which involve the suffix /-m/. In Piro, /-m/ is the only suffix that consists of a single consonant. The reason that all examples in question show an /mt/ combination is due to the fact that /-m/ is obligatorily followed by /-Vta/. The behavior of these examples with respect to syncope appears to have something to do with this special suffix. It appears that in order to have the correct output, we cannot syllabify this /-m/ at the lexical level so that the syncope rule can still apply. It seems that this /-m/ possesses some idiocyncratic extrasyllabic property. One possible way to account for this exceptionality is to underlyingly mark /-m/ as an extrasyllabic element which does not belong to any syllable, i.e., remains unsyllabified, at the lexical level. But one may question why it should be the case that only this particular suffix is marked as extrasyllabic. Since based on the available data in Piro, all surface tri-consonantal clusters involve the monoconsonantal vowelless affixes, we can generalize that all monoconsonantal morphemes in Piro are extrasyllabic and have to be affiliated to a syllable postlexically. Our proposal makes an attempt to account for why these affixes behave like an extrasyllabic element. Now let us look at the sample derivation which can yield a correct output for the examples in (3).



We can see that on cycle 2. /m/ is left stray; cycle 3. and 4. show that the lexical adjunction rule takes only the segment left by syncope and the CV rule on the same cycle but not the one left by the previous cycle.[4] On cycle 4, /m/ cannot be syllabified either, since this adjunction rule is non-iterative. It appears that the cycle final segment that cannot be adjoined to a syllable will not be adjoined to any syllable until the postlexical level. Since we have proposed that Piro has only a special lexical adjunction rule but not regular onset and coda rules, we would like to suggest that this language particular adjunction rule is so constrained that it applies only under certain kinds of conditions.

The nature of an adjunction rule is to syllabify the elements left by the core syllable rules (the CV rule, onset/coda rules), and the adjunction rule in Piro appears to take only the element whose status of strayness is created on the same cycle. In other words, this lexical adjunction rule, unlike the postlexical adjunction rule, does not apply to any stray segments but only to those that come to exist on the current cycle. We may then generalize that the environment for this

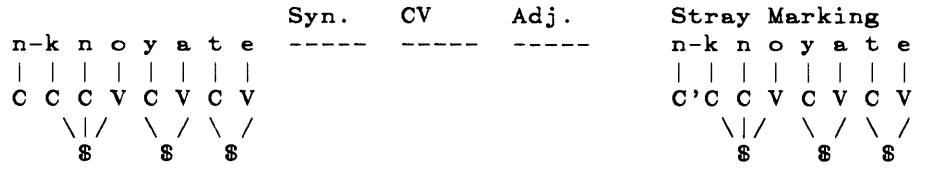
adjunction rule has to be the one in which the status of the stray element is derived by the core CV rule on the same cycle, but not by the CV rule on the previous cycles, nor by any morphological concatenation. We then propose that the lexical adjunction rule in Piro has two properties with respect to the core syllable rules.

Property 1. It applies only when the CV rule applies on a given cycle because it applies only in the environments derived by the CV rule on the same cycle.

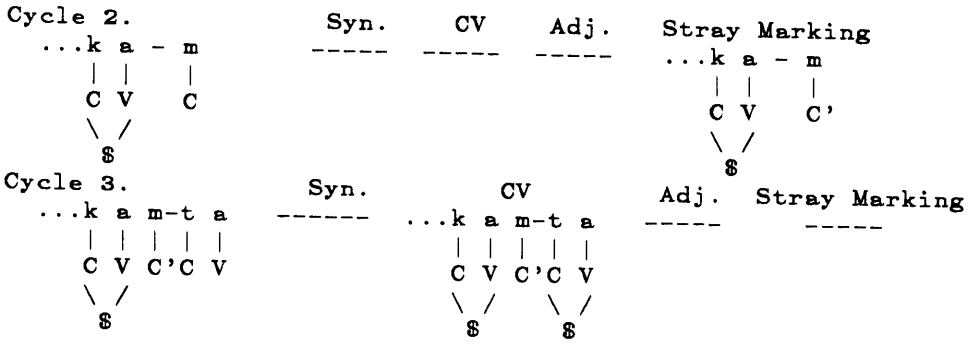
Property 2. The **stray** element in the environment where the adjunction rule may apply has to be the one newly created by the current CV rule. That is, an "old" stray element left by some previous cycle is not subject to the lexical adjunction rule on the current cycle.

These properties will then make all the single-consonant affixes (/-m/, /p-/, /t-/, etc.) stray in the lexical phonology and thus behave like extrasyllabic elements.

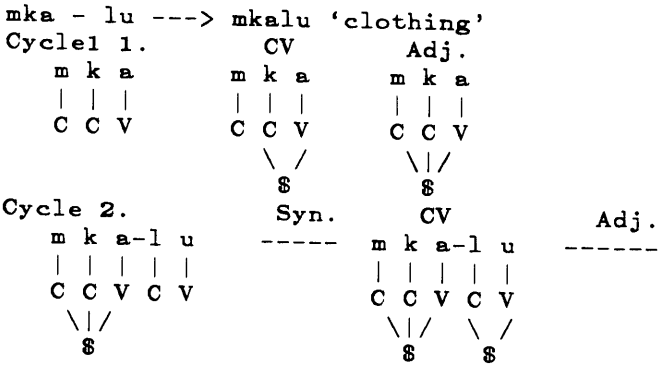
Technically, we can add a lexical stray consonant marking to a consonant whenever it fails to be syllabified by both CV and the lexical adjunction rule in a given cycle. Any segment which is so marked is an old stray element, and cannot be syllabified until the postlexical level. This means that a consonant which cannot be syllabified on a given cycle cannot be syllabified on the following cycles either at the lexical level. Now we can show how our proposal work. First we may see an example of single-consonant prefixes.



Since the CV rule does not apply on that cycle, the adjunction rule cannot apply to the prefix due to its Property 1. Then we can see how /-m/ can escape syllabification at the lexical level.



The adjunction rule fails to apply to /m/ because of its Property 2. On cycle 3, the stray marker thus indicates that the stray status of this marked element was created on some previous cycle. On the other hand. in cases where syncope takes place or the CV rule applies with creation of a new stray element, the adjunction rule can apply.



In this example, the adjunction rule applies to the output of the CV rule and adjoins a consonant which is not marked as C'. Namely, the consonants that undergo adjunction are new stray elements left by the core syllable rule on the current cycle, but not old stray elements created before the current cycle.

If this proposal is accepted, then it presents a way to account for the extrasyllabicity of the monoconsonantal voweless affixes in Piro. Such explanation is based on the nature of the lexical adjunction rule and its cyclic application. The lexical stray marking is thus a natural consequence of these properties. In any case, an adjunction rule takes elements left by the core syllable rules, and the stray status of a given segment is actually decided after core syllabification; as a result, to restrict the Piro lexical adjunction rule to the output of the CV rule on the same cycle should not be too exotic. In fact, another similar proposal has been made for the monoconsonantal affixes in Berguner-Romansh. Kamprath (1986) presents cases where monoconsonantal affixes are extrametrical. She shows a case where the coda rule fails to

apply to the monoconsonantal affixes, and suggests that syllabification rules may apply on every cycle but Nucleus formation feeds Coda formation. . This is very similar to our suggestion that the lexical adjunction rule in Piro has to apply to the output of the CV rule on the same cycle. It will be interesting to study more languages that have such affixes so as to see if monoconsonantal affixes are extrasyllabic due to the nature of their interaction with syllabification.

We have discussed two types of counterexamples to a plain syllable insensitive syncope rule. The first type of counterexamples can be accounted for by reformulating the syncope rule to have access to syllable structure; the second type of counterexamples is explained by appealing to the properties of the lexical adjunction rule based on our proposal for Piro syllabification.

4. Heteromorpohemic Geminates

When two consonants are concatenated by syncope or morphological processes, some will form geminate consonants. Some examples are given in (4), (5), (6).

(4) a. p - pawata ---> ppawata
you make a fire you make a fire
b. n - nika ---> nnika
I eat I eat
c. w -wuñene ---> wwuñene
our child our child

(5) a. Ø - nika - ka ---> nikka ---> ni:ka
he to eat passive he is eaten
b. kose ... Vta - xe ---> kosxeta ---> ko:xeta
to pull always to always pull
c. ñira - re - Vta ---> ñirreta
drink relational theme closure
---> ñi:reta 'to drink'

(6) a. xema - maka ---> xemmaka
he hears subjunctive he would hear
b. ruñi...Vta - ñima ---> ruññimata
he answers it is said
---> ruỹñimata / ru:ñimata
c. rawa - wu ---> rawwu / ra:wu
he takes us he takes us

According to the data given, there is a degemination process effected by a consonant delinking rule (CD). If this rule applies word medially, compensatory lengthening (CL) occurs. The fact that CD and CL may be optional and apply across-the-board, i.e. noncyclic, indicates that they should be postlexical processes. Given the available data,

we make the following generalizations.

A. Obligatory CL:
Geminate stops, non-permissible consonant clusters, flaps.

B. Optional CL: Geminate y, w and ħ.

C. No CL: Geminate m and n.

McCarthy (1986) proposes that the Obligatory Contour Principle (OCP) is a universal principle which prohibits adjacent identical elements on the melodic tier. It is also proposed that different morphemes are represented on different autosegmental tiers; consequently, the result of syncope between heteromorphemic identical consonants does not violate the OCP at the lexical level. At some point of the derivation, however, we have to fold all elements on independent tiers into a single linearized tier. This process is called Tier Conflation (TC). Then the question is: after TC, how should we represent the heteromorphemic geminates. McCarthy suggests that TC automatically fuses the false geminates into a single melodic unit (p.257), and such fusion is a consequence of TC when it folds the tiers together. For instance, However, the Piro data do not favor this suggestion. If the view of melodic fusion by TC is adopted, incorrect surface forms would be derived. Notice that the /ħħ/ cluster becomes [ɣ̃ħ][5] on the surface. This is not a rule that applies only to the /ħħ/ geminate but a part of a general postlexical process:

ħ ---> ŋ / ___ k

ħ ---> ɣ̃ / ___ x

ħ ---> ɣ̃ / ___ ħ

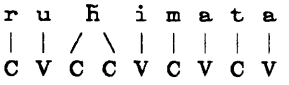
It appears that the [ħ] becomes voiced and assimilated to the following segment in manner of articulation before a voiceless back obstruent. The rule can be formulated as (III).

(III)

$$\begin{bmatrix}+\text{back}\\+\text{nas}\end{bmatrix} \longrightarrow \begin{bmatrix}+\text{voice}\\ \alpha\,\text{cont}\end{bmatrix} \Big/ \underline{\quad} \begin{bmatrix}+\text{back}\\-\text{voice}\\ \alpha\,\text{cont}\end{bmatrix}$$

Now if fusion of the heteromorphemic /ħħ/ occurs at the point of TC, then in the postlexical phonology we would have a true geminate structure: a single matrix is linked to two C slots. For example,

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE



The process of /ɦɦ/ ---> [ɣ̃ɦ] shows that the first member of the geminate is fisrt, independent, and second, independently alterable. We cannot interpret this process as a degemination process which applies only to the /ɦɦ/ geminate, because this is a phonological rule which also applies to non-geminates. One may argue that /ɦk/ and /ɦx/ are so similar that we can consider them as partial geminates and the feature spliting rule thus applies only to "geminates". However, the fact that no CD and CL apply to /ɦk/ and /ɦx/ sequences indicates that they should not be treated as partial geminates in Piro.

The main objection to such TC fusion in Piro is thus that a structure with a single melodic matrix simply cannot undergo rule (III) because this rule requires two adjacent back segments on the melodic tier. It could be argued that rule (III) may apply before TC. There are still problems with this ordering. First, if rule (III) applies before TC, then when two /ɦ/'s are on different tiers as McCarthy has proposes, it is not clear how rule (III) can apply since these two segments are not adjacent. Second, if we adopt the view that lexical rules have to be structure-preserving (Kiparsky 1982), and if we follow McCarthy's suggestion that TC occurs at the last point of lexical phonology, then rule (III) must be a postlexical rule after TC because it is not a structure-preserving rule due to the fact that both [ŋ̃] and [ɣ̃] do not exist in underlying representation in Piro.

In summary, if McCarthy's proposal of melodic fusion of false geminates by TC is adopted, we cannot generate the correct surface forms for the nasal spirant geminates in Piro because the general postlexical rule of /ɦ/ voicing and assimilation before back obstruents cannot apply to a single-matrix structure to yield a correct surface form:[ɣ̃ɦ]. As a result, the behavior of /ɦɦ/ in Piro seriously casts doubts on the proposal of the TC fusion of false geminates.

5. Implications

If the previous analysis is accepted, the Piro data may have some theoretical implications. First, Piro provides a case of a syllable-sensitive syncope rule in which syllable information plays an important role in the phonological processes. Second, monoconsonantal affixes

may be extrasyllabic due to the nature of their interaction with syllabification. Finally, heteromorphemic geminates may not be fused at the point of Tier Conflation.

Footnotes

* This is a condensed version of Lin (1986). I would like to thank Juliette Levin, John Kingston, and Armin Mester for their help at various stages of this paper. All errors of data or analysis are the author's sole responsibility.

1 For a detailed discussion, see Lin (1986).

2 /ɦ/ is a nasal spirant.

3 This is first suggested to me by J. Levin.

4 This fact is first pointed out to me by J. Kingston.

5 [ɣ̃] is a voiced nasal velar fricative.

THEORETICAL IMPLICATIONS OF PIRO SYNCOPE

References

Clements, G. N. and J. Keyser (1983) CV Phonology. Cambridge: MIT Press.

Kamprath, C. (1986) "The Effect of Monoconsonantal Affixes on Syllable-Based Phonological Rules". Paper presented at NELS 17, MIT.

Kiparsky, P. (1982) "Lexical Morphology and Phonology". In I.S. Yange (ed.) Linguistics in the Morning Calm. pp.3-19. Seoul, Korea.

Levin, J. (1985) A Metrical Theory of Syllabification. MIT Ph.D. Dissertation.

Lin, Yen-hwei (1986) "Aspects of Piro Phonology and Morphology: Syllabification and Syncope". The University of Texas at Austin. Unpublished ms.

Matteson, E. (1965) The Piro (Arawakan) Language. University Publications in Linguistics. vol.42. Berkeley: University of California Press.

McCarthy, J. (1986) "OCP Effects: Gemination and Anti-gemination". Linguistic Inquiry 17(2):207-263.

Selkirk, E. (1984) "On the Major Class Features and Syllable Theory". In M. Aronoff and R. Oehrle (eds.) Language Sound Structure. Cambridge: MIT Press.

Steriade, D. (1982) Greek Prosodies and the Nature of Syllabification. MIT Ph.D. Dissertation.