Syllabic-Consonant Formation in Traditional New Mexico Spanish[*]

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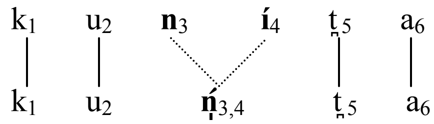
An interesting development in the phonology of Traditional New Mexico Spanish (TNMS)[1] is the formation of syllabic consonants through the absorption of an adjacent vowel (e.g. [bo.**ń̩**.t̪o] < [bo.**ní**.t̪o] 'beautiful'). The effect of this process is that a syllable formerly headed by a vowel is now headed by a consonant. This sound change is quite unexpected given that under any version of the sonority scale, consonants are less sonorous than vowels. Since the nucleus is the peak of sonority within the syllable, one would expect the segment of higher sonority to be preferred in the role of syllable head; yet it is exactly in the opposite direction that the formation of syllabic consonants advances. In TNMS, an additional property of this process is that the nuclear vowels that are replaced by consonants are high vowels bearing primary or secondary stress. Moreover, among stressed high vowels, the ones that yield their syllabicity to an adjacent consonant are those that belong to affixes or function words.

Using the framework of Optimality Theory (Prince and Smolensky 1993/2002), in this paper I develop an analysis of consonant syllabization in which the unexpected substitution of a vowel by a consonant as foot and syllable head is justified by a positional markedness constraint that bars the marked value on the place-of-articulation scale (e.g. Dorsal) from the position of foot DTE (Designated Terminal Element, in the terminology of Liberman 1975). Contrary to previous approaches that assume that vowel deletion is a condition for the syllabization of the consonant (Bell 1970/1979, Lispki 1993), I argue, following Coleman (2001) and Espinosa (1909/1930, 1925), that the vowel that disappears in the process of syllabizing a consonant is not deleted but rather is either overlapped by that consonant or assimilated to it. My proposal, however, differs from Coleman's view in the assumption that the syllabic consonant, which originally occupied a margin position, is promoted to the position of syllable nucleus. Based on the observation that syllabic consonants always occur adjacent to another consonant (Mohanan 1979), I argue that syllabic consonants are subject to two universal alignment constraints that govern their distribution by forcing them to be coarticulated with another consonant. Although languages may vary as to whether the syllabic consonant is coarticulated with a preceding or a following consonant, there are no languages where syllabic consonants appear between two vowels or between a vowel and a pause precisely because in such environments there is no adjacent consonant available for coarticulation. The condition that the syllabic consonants of TNMS be coarticulated not with a preceding, but with a following consonant, is the reason why they do not occur in prevocalic or prepausal position.

2. Syllabic consonants in Traditional New Mexico Spanish[2]

According to Espinosa (1909/1930, 1911/1946, 1925), in TNMS both nasal and liquid consonants can surface as syllable peaks, whereas fricatives, stops, and affricates only occur as syllable margins. That is to say that sonorant, but not obstruent consonants, can become syllabic. The specific sonorant consonants that can function as the nucleus of the syllable are the nasals [n̩] and [m̩] and the liquids [l̩] and [r̩]. These segments arise in casual speech through an optional process of coalescence, whereby a nasal or liquid consonant absorbs an adjacent high vowel that bears either primary or secondary stress, as illustrated by the examples in (1, 2).[3]

(1) Coalescence creates syllabic consonants:[4]



'little cradle'

(2) Coalescence is optional:

/**un** d̪ed̪al/	→	[**ṹ^{n}**.d̪e.ðál][5] ~ [**ń̩**.d̪e.ðál]	'a thimble'
/**mi** mamá/	→	[**mì**.ma.má] ~ [**m̩̀**.ma.má]	'my mom'
/bo**li**t̪a/	→	[bo.**lí**.t̪a] ~ [bo.**ĺ̩**.t̪a]	'little ball'
/ka**ri**t̪o/	→	[ka.**rí**.t̪o] ~ [ka.**ŕ̩**.t̪o]	'little car'

Being sonorant, it is not surprising that the syllabic consonants of TNMS are voiced (Espinosa 1925:110). What is special about the segments [n̩, m̩, l̩, r̩] is that, unlike their non-syllabic counterparts, their oral closure is withheld throughout the syllable for subsequent release during the articulation of the initial segment of the next syllable (Espinosa 1925:111). The prolongation of their oral closure to the entire syllable suggests that although an adjacent stressed high vowel disappears in the process of making these sonorant consonants syllabic, that vowel is not deleted, but eclipsed by the prolonged oral closure. This view is supported by the fact that the syllabic consonants of TNMS are usually as long as the sum of the sonorant consonant + stressed high vowel combination from which they originate (Espinosa 1925:110). Moreover, the segments [n̩, m̩, l̩, r̩] also retain the primary or secondary stress that was originally assigned to the high vowel (Espinosa 1925:110, 114). The latter observation further indicates that syllabic consonants share with vowels the ability to function not only as syllable heads but also as stress-bearing units. In this regard, an important generalization is that syllabic consonants arise in TNMS when they are parsed as the nucleus of a syllable that functions as the head of either a primary or secondary foot (e.g. [bo.(**ĺ̩**.t̪a)] 'little ball', [(**m̩̀**.ma).(má)] 'my mom').[6]

It is also important to note that the syllabic consonants of TNMS are coarticulated with a following consonant. This consonant is typically homorganic or identical, but can also be a non-homorganic stop (Espinosa 1925:111). Coarticulation of the C̩C sequence may take place in two different ways. If the two consonants are homorganic or identical (e.g. [**ḿ̩**.**p**a.pél] ‘a paper’, [**ḿ̩**.**m**an.t̪él] ‘a tablecloth’), they are produced through a single obstruction in the vocal tract, with the closure phase of the articulation corresponding to the syllabic consonant, while the release phase makes up the onset of the following syllable (Espinosa 1925:111, 114). If on the other hand, the two consonants are heterorganic (e.g. [ka.**ḿ̩**.**t̪**a] ‘little bed’), there is a brief period towards the end of the syllabic consonant during which the vocal tract is simultaneously obstructed at two different points because the oral closure of the syllabic consonant is withheld until the oral closure of the following consonant is formed (Espinosa 1925:111, Alonso 1930: 435). In such cases, although the oral closure of the syllabic consonant is released during the articulation of the following consonant (Espinosa 1925:111), only the release of the latter segment is audible. From the detailed phonetic descriptions provided by Espinosa, it is plausible to extrapolate that despite differing in the number of oral closures, homorganic and heterorganic C̩C sequences have in common that the syllabic consonant lacks an audible release of its own. The necessity of coarticulation with a following released consonant is confirmed by the fact that the syllabic consonants of TNMS never occur before a vowel or a pause (Espinosa 1925:111). That is, precisely the contexts where a following consonant is not available for coarticulation, (3).

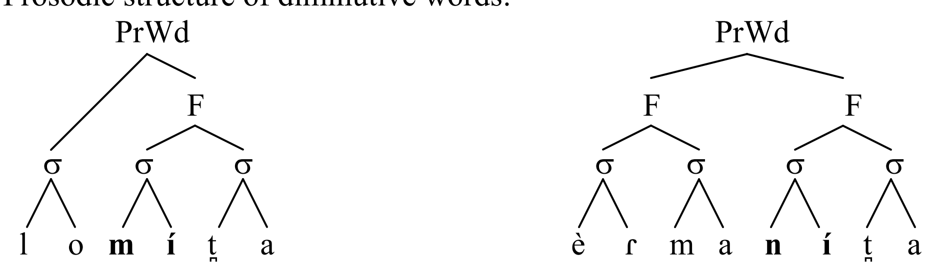
(3) In TNMS, syllabic consonants do not occur before a vowel or a pause:

/be**ni**a/	→	[be.**ní**.a] but *[be.**ń̩**.a]	‘I used to come’
/ko**mi**a/	→	[ko.**mí**.a] but *[ko.**ḿ̩**.a]	‘I used to eat’

/sa**li**/	→	[sa.**lí**||] but *[sa.**ĺ̩**||]	‘I left’
/ko**ri**/	→	[ko.**rí**||] but *[ko.**ŕ̩**||]	‘I ran’

Words containing the diminutive suffix provide a favorable environment for the creation of syllabic consonants because the sound structure of this morpheme contains a stop consonant preceded by a high vowel that receives stress: *–ít–*. As the representations in (4) show, the high vowel of the diminutive morpheme receives primary stress because it is parsed as the nucleus of the syllable that functions as the head of the main-stressed foot of the prosodic word. When the diminutive suffix is attached to a base that ends in a sonorant consonant, a string that meets the conditions necessary for the creation of syllabic consonants is formed. Not surprisingly, therefore, diminutive forms are one of the most common contexts where sonorant consonants can be pronounced as syllabic, (5).

(4) Prosodic structure of diminutive words:



(5) Syllabic consonants are common in diminutive words:

/lo**m** + **i**t̪ + a/	→	[lo.**mí**.t̪a] ~ [lo.**ḿ̩**.t̪a]	‘little hill’
/eɾma**n** + **i**t̪ + a/	→	[èɾ.ma.**ní**.t̪a] ~ [èɾ.ma.**ń̩**.t̪a]	‘little sister’
/pa**l** + **i**t̪ + o/	→	[pa.**lí**.t̪o] ~ [pa.**ĺ̩**.t̪o]	‘little stick’
/pe**r** + **i**t̪ + o/	→	[pe.**rí**.t̪o] ~ [pe.**ŕ̩**.t̪o]	‘little dog’

However, not all words in which a sonorant consonant appears next to the diminutive suffix have an alternative pronunciation with a syllabic consonant. The examples in (6a) show that if immediately preceded by another consonant, sonorants fail to become syllabic despite being adjacent to the diminutive morpheme. Furthermore, although they are also sonorant, the palatal nasal /ɲ/ and the coronal tap /ɾ/ fail to become syllabic, even when they appear in exactly the same context where /n, m, l, r/ undergo this transformation, (6b).

(6) a. A preceding consonant prevents coalescence:

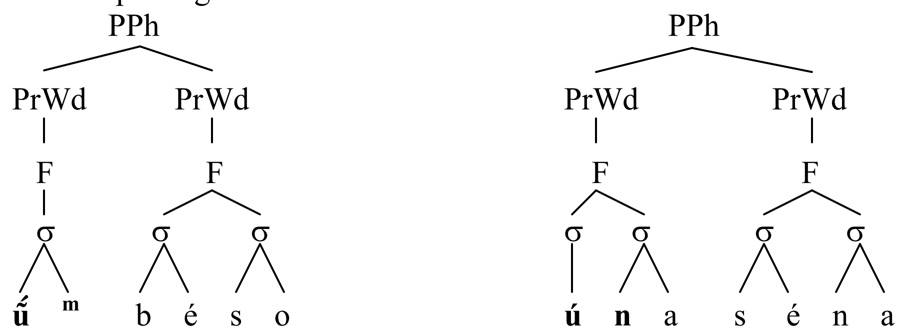
/oɾ**n** + **i**t̪ + o/ → [oɾ.**ní**.t̪o] but *[oɾ.**ń̩**.t̪o] 'little oven'
/pal**m** + **i**t̪ + a/ → [pal.**mí**.t̪a] but *[pal.**ḿ̩**.t̪a] 'little palm'
/peɾ**l** + **i**t̪ + a/ → [peɾ.**lí**.t̪a] but *[peɾ.**ĺ̩**.t̪a] 'little pearl'
/kaɾ**l** + **i**t̪ + os/ → [kaɾ.**lí**.t̪oh] but *[kaɾ.**ĺ̩**.t̪oh] 'little Carlos'

b. Syllabization does not apply to [ɲ] or [ɾ]:

/ni**ɲ** + **i**t̪ + o/ → [ni.**ɲí**.t̪o] but *[ni.**ɲ̩́**.t̪o] 'little child'
/pe**ɾ** + **i**t̪ + a/ → [pe.**ɾí**.t̪a] but *[pe.**ɾ̩́**.t̪a] 'little pear'

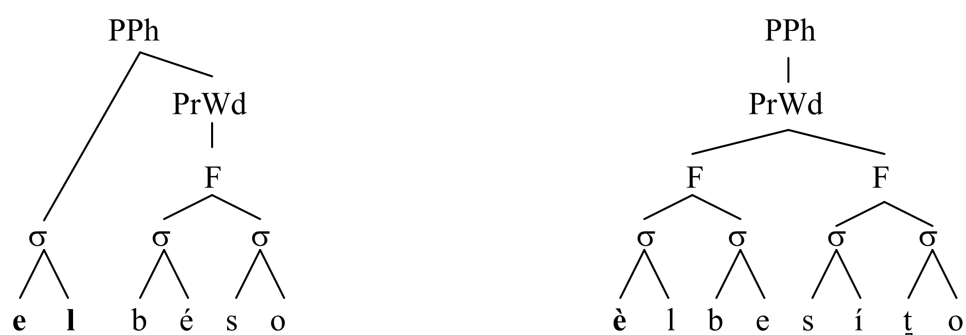
The indefinite article in all of its forms (e.g. /un/, /un + a/, /un + o + s/, /un + a + s/) is another common source of syllabic consonants. This is because the morpheme /un/ contains a sonorant consonant preceded by a high vowel that bears primary stress (e.g. [**ṹ**^{m}.bé.so] < /**un** beso/ 'a kiss', [**ú.n**a.sé.na] < /**un**a sena/ 'a dinner'). In this regard, it is important to emphasize that despite the tendency for function words to be unstressed; the indefinite article normally bears primary stress in Spanish. This unexpected behavior of the indefinite article has been repeatedly noted in descriptive studies of Spanish (Espinosa 1925:115, Rosenblat 1946:113, Navarro Tomás 1967:193-194, Quilis 1996:159, 1999:392, and Quilis et al 1994:121). These authors have observed that except for the case when it is used with the meaning of approximation (e.g. *en* ***unos*** *tres meses* 'in about three months'), the indefinite article is always pronounced with primary stress.[7] This means that the indefinite article projects a primary-stressed foot, which allows it to form a prosodic word of its own (e.g. [(**ṹ**^{m}).(bé.so)], [(**ú.n**a).(sé.na)]). The prosodic word projected by the indefinite article combines with the prosodic word projected by the noun that it modifies to form a larger prosodic unit: a phonological phrase. This is illustrated by the representations in (7), which show the indefinite article is not a clitic in Spanish despite being a function word.

(7) Prosodic parsing of the indefinite article:



In terms of prosodic structure, the definite article contrasts with the indefinite article in that the former does not project a prosodic word of its own, (8). This is evinced by the fact that the definite article is either completely unstressed (e.g. [el.(βé.so)] < /el beso/ 'the kiss') or the stress it bears is only secondary (e.g. [(èl.βe).(sí.t̪o)] < /el besit̪o/ 'the little kiss'). Hence, the reason why the indefinite article is a common source of syllabic consonants but the definite article is not is because the former contains a vowel that is high and always stressed, whereas the vowel of the definite article is not high and receives secondary stress only in certain cases.

(8) Prosodic parsing of the definite article:



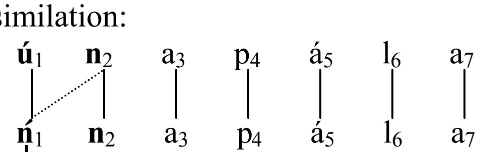
The place of articulation of the syllabic nasal created from the indefinite article varies depending on the syllabic position to which the nasal consonant is assigned prior to its syllabization. Whenever the nasal consonant is followed by a vowel, its parsing as a syllable onset is straightforward. In this syllabic position, the nasal consonant is able to preserve its coronal place of articulation, which can optionally be extended to the preceding stressed high vowel to generate the syllabic nasal [n̩], (9).

(9) Nasal consonant in pre-vocalic position:

/**un** ameɾikano/	→	[**ú**.**n**a.mè.ɾi.ká.no] ~ [**ń̩**.**n**a.mè.ɾi.ká.no]	‘an American’
/**un**a fond̪a/	→	[**ú**.**n**a.fṍ^{n}.d̪a] ~ [**ń̩**.**n**a.fṍ^{n}.d̪a]	‘an inn’
/**un**os t̪ont̪os/	→	[**ú**.**n**oh.t̪ṍ^{n}.t̪oh] ~ [**ń̩**.**n**oh.t̪ṍ^{n}.t̪oh]	‘some fools’
/**un**as kaɾt̪as/	→	[**ú**.**n**ah.káɾ.t̪ah] ~ [**ń̩**.**n**ah.káɾ.t̪ah]	‘some letters’

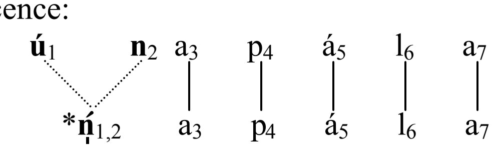
It is important to point out that in this case the syllabic consonant is not created through coalescence, but through total assimilation. This is evinced by the fact that although the syllabic nasal shares all of the features of the following consonant, it has its own correspondent in the output form, (10). Also note from the comparison of the correspondence relationships illustrated in (10) and (11) that the reason why the syllabic consonant is created through total assimilation rather than coalescence in this context is because if the stressed high vowel and the nasal consonant fused into a single segment, the requirement that the syllabic consonant be coarticulated with a following consonant could not be met.

(10) Total assimilation:



‘a shovel’

(11) Coalescence:



‘a shovel’

When followed by another consonant, the nasal consonant of the indefinite article must be parsed as a syllable coda, where it cannot always retain its coronal articulation because it is subject to place assimilation, (12). The examples in (12a) show that if the following word begins with a coronal consonant the nasal is able to remain coronal, although the effect of place assimilation is still discernible because the articulation of the nasal is adjusted from alveolar to dental before the dental stops [t̪] and [d̪] (Espinosa 1909:126, 1925:112). The important point is that since this minor adjustment does not change the major place articulator, the alternative pronunciation of the indefinite article is still [n̩]. In contrast, whenever the following word begins with a labial consonant, the effect of place assimilation is that the Coronal articulator of the nasal is replaced by Labial; therefore, the alternative pronunciation of the indefinite article is the syllabic nasal [m̩], (12b). Interestingly, the velar nasal that results from nasal place assimilation before a velar consonant never becomes syllabic, (12c). This shows that the syllabic consonants of TNMS can be coronal or labial, but not dorsal.

(12) a. Before a coronal consonant

/**un** t̪amboɾ/	→	[**ṹ**$^{\mathbf{n}}$.t̪ã^{m}.bóɾ] ~ [**ń̩**.t̪ã^{m}.bóɾ]	‘a drum’
/**un** d̪ed̪al/	→	[**ṹ**$^{\mathbf{n}}$.d̪e.ðál] ~ [**ń̩**.d̪e.ðál]	‘a nimble’
/**un** niɲo/	→	[**ṹ**$^{\mathbf{n}}$.ní.ɲo] ~ [**ń̩**.ní.ɲo]	‘a child’

b. Before a labial consonant

/**un** palo/	→	[**ṹ**$^{\mathbf{m}}$.pá.lo] ~ [**ḿ̩**.pá.lo]	‘a stick’
/**un** buro/	→	[**ṹ**$^{\mathbf{m}}$.bú.ro] ~ [**ḿ̩**.bú.ro]	‘a donkey’
/**un** mant̪el/	→	[**ṹ**$^{\mathbf{m}}$.mã^{n}.t̪él] ~ [**ḿ̩**.mã^{n}.t̪él]	‘a tablecloth’

c. Before a velar consonant

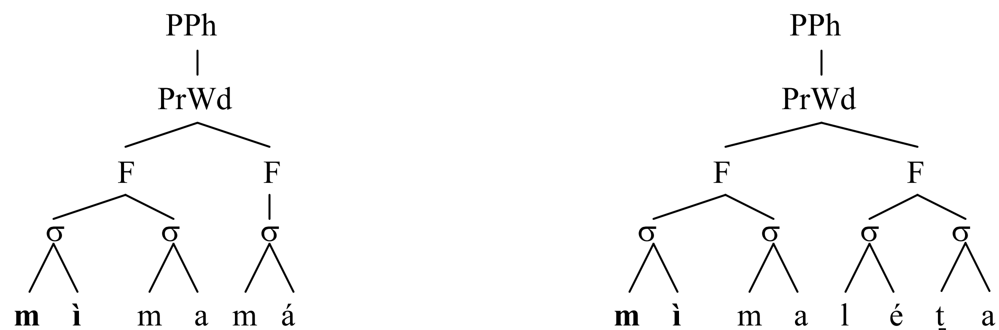
/**un** gat̪o/	→	[**ṹ**$^{\mathbf{ŋ}}$.gá.t̪o]	‘a cat’
/**un** kamino/	→	[**ṹ**$^{\mathbf{ŋ}}$.ka.mí.no]	‘a path’
/**un** xefe/	→	[**ṹ**$^{\mathbf{ŋ}}$.xé.fe]	‘a chief’

The resistance of syllabic consonants to post-consonantal position is corroborated by data with the indefinite article. As the examples below show, the nasal consonant of the indefinite article may become syllabic when it is preceded by a pause or a word ending in a vowel, (13a,b); but it fails to do so when preceded by a word ending in a consonant, (13c). In this regard, it is interesting to note that if the final consonant of the preceding word happens to be nasal, the possibility of pronouncing the indefinite article as a syllabic nasal is not precluded. This is because the first of the two nasals flanking the stressed high vowel is absorbed by the preceding vowel so that the syllabic consonant does not surface in post-consonantal position (13d).

(13) a.	After a pause:			
	/**un** pero/	→	[‖**ṹ**^{m}.pé.ro] ~ [‖**ḿ̩**.pé.ro]	‘a dog’
	/**un** d̪ed̪al/	→	[‖**ṹ**^{n}.d̪e.ðál] ~ [‖**ń̩**.d̪e.ðál]	‘a thimble’
b.	After a vowel:			
	/pa **un** mant̪el/	→	[pa.**ṹm**.man.t̪él] ~ [pa.**ḿ̩**.man.t̪él]	‘for a tablecloth’
	/a **un**a muxeɾ/	→	[a.**ṹ**.**na**.mu.xéɾ] ~ [a.**ń̩**.na.mu.xéɾ]	‘to a woman’
c.	After an oral consonant:			
	/d̪aɾ **un** beso/	→	[d̪á.ɾ**ṹ**^{m}.bé.so] but *[d̪á.ɾ**ḿ̩**.bé.so]	‘to give a kiss’
	/solo **un** pero/	→	[só.l**ṹ**^{m}.pé.ro][8] but *[só.l**ḿ̩**.pé.ro]	‘only one dog’
d.	After a nasal consonant:			
	/sin **un** buro/	→	[si.n**ṹ**^{m}.bú.ro] ~ [sĩ.**ḿ̩**.bú.ro]	‘without a donkey’
	/dan **un**a sena/	→	[d̪á.n**ṹ**.**n**a.sé.na] ~ [d̪ã́.**ń̩**.**n**a.sé.na]	‘they give a dinner’

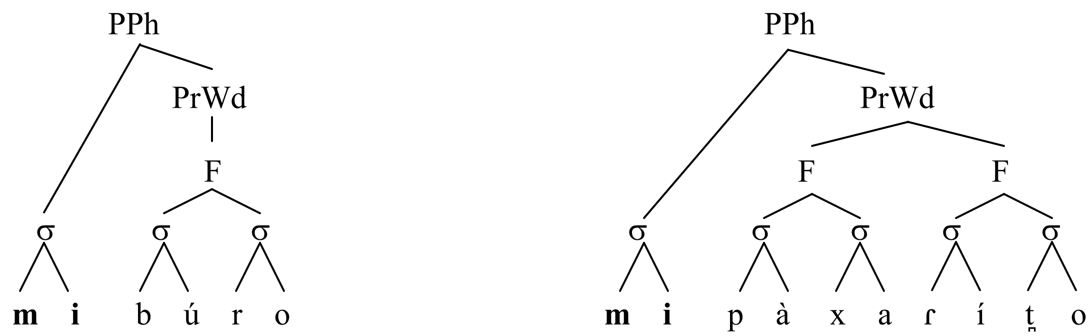
Syllabic consonants may also emerge in the context of the first person possessive adjective /mi/. In this case, however, the application of the process is contingent upon the parsing of the syllable projected by this morpheme as the head of a secondary foot (e.g. [(**mì**.ma).(lé.t̪a)] < /**mi** malet̪a/ ‘my purse’). This is because the first person possessive adjective is a clitic, as evinced by the fact that it never bears primary stress. That is to say that unlike the indefinite article, which regularly bears primary stress, the first person possessive adjective does not project its own prosodic word (cf. (15) and (7)). Moreover, the strict requirement that secondary feet have the form of a disyllabic trochee limits the chances of the first person possessive adjective being parsed as the head of a secondary foot to those instances where the initial syllable of its host word is left unfooted (e.g. [ma.(má)] < /mama/ 'mom', [ma.(lé.t̪a)] < /malet̪a/ 'purse'). In such cases, the syllable projected by the first person possessive adjective can combine with the initial syllable of the host word to create a well-formed secondary foot, as illustrated by the representations in (15).

(15) One possible prosodic parsing of the possessive adjective:



When assigned secondary stress by virtue of being the head of a secondary foot, the first person possessive adjective may be pronounced either as [mì] or as the syllabic nasal [m̩̀] (e.g. [(**mì**.ma).(má)] ~ [(**m̩̀**.ma).(má)] 'my mom', [(**mì**.ma).(lé.t̪a)] ~ [(**m̩̀**.ma).(lé.t̪a)] 'my purse'). Note, by contrast, that when the initial syllable of the host word happens to be parsed as the head of a foot (e.g. [(bú.ro)] < /búro/ 'donkey', [(pà.xa).(ɾí.t̪o)] < /paxaɾit̪o/ 'little bird'), it is impossible to parse the syllable projected by the first person possessive adjective as a foot head because that would require projecting a secondary foot that is not a disyllabic trochee (e.g. *[(**mì**).(βú.ro)]). In such a case, the first person possessive adjective must be left unfooted and consequently unstressed (16). The two different ways in which the first person possessive adjective can be incorporated into prosodic structure give rise to the contrast illustrated by the examples in (17). As the examples in (17b) show, the pronunciation of the first person possessive adjective with a syllabic consonant is impossible when deprived of stress.

(16) Alternative prosodic parsing of the possessive adjective:



(17) a. Before an unstressed syllable

/**mi** papa/	→	[(**mì**.pa).(pá)] ~ [(**m̩̀**.pa).(pá)]	‘my dad’
/**mi** mama/	→	[(**mì**.ma).(má)] ~ [(**m̩̀**.ma).(má)]	‘my mom’
/**mi** paket̪e/	→	[(**mì**.pa).(ké.t̪e)] ~ [(**m̩̀**.pa).(ké.t̪e)]	‘my package’

b. Before a stressed syllable

/**mi** pad̪ɾe/	→	[**mi**.(pá.ðɾe)] but *[**m̩**.(pá.ðɾe)]	‘my father’
/**mi** mad̪ɾe/	→	[**mi**.(má.ðɾe)] but *[**m̩**.(má.ðɾe)]	‘my mother’
/**mi** pala/	→	[**mi**.(pá.la)] but *[**m̩**.(pá.la)]	‘my shovel’

Rigorous scrutiny of Espinosa’s studies (1909/1930, 1911/1946, 1925) reveals that the only other morphemes where syllabic consonants are found are: (a) the first person prepositional object pronoun *mí*, which although segmentally identical to the first person possessive adjective, differs from it in that it always bears primary stress (e.g. [a.**mí**.méh.mo] ~ [a.**ḿ̩**.méh.mo] ‘to myself’); (b) the ending for the second person singular of the preterite tense in the second and third conjugations –*i*+*tes* (e.g. [ko.**mí**.t̪eh] ~ [ko.**ḿ̩**.t̪eh] 'you ate'); and (c) the words [**ín**.t̪i.ko] ~ [**ń̩**.t̪i.ko] 'identical' and [m**ù**.**r**e] ~ [m**r̩̀**.re] 'extremely'.[9]

The small number of morphemes where syllabic consonants can arise is a good indication that this process does not have scope over the entire sound system of the language. Instead, the syllabization of sonorant consonants must be circumscribed to a morphological domain that includes only affixes and function words, because it is almost exclusively in the context of such morphemes that syllabic consonants occur. Roots must have a special status because – except for the words [**ín**.t̪i.ko] 'identical' and [m**ù**.**r**e] 'extremely' – the high vowel that disappears in the proces of syllabizing a sonorant consonant is always one that belongs to either an affix or a function word. Moreover, even the words [**ín**.t̪i.ko] and [m**ù**.**r**e] are special in that they are reduced forms of [i.ðén.t̪i.ko] and [múi̯], the latter in combination with the intensive morpheme *re*-, which is normally a prefix. Viewing these two words as irregular allows us to generalize that the syllabization of sonorant consonants in TNMS is possible at the expense of being unfaithful to the segmental string of affixes and function words, but not to the segmental string of roots.

Some of the properties of syllabic consonants described by Espinosa also suggest that they are not generated at the lexical, but at the post-lexical level. Note for instance that since a sonorant consonant can only become syllabic when adjacent to a stressed high vowel, this process requires that the input form be endowed with foot structure so that those high vowels that bear stress may be identified. Although it is still a matter of controversy whether Spanish primary stress is present in the lexicon or assigned in the course of the phonological derivation (Eddington 2000, Harris 1983, Roca 1988), it has been well established that secondary stress is assigned at the post-lexical level (Roca 1986). Robust evidence for the post-lexical status of secondary stress comes from the fact that secondary feet are not confined to the word domain, but may straddle across words (e.g. [(**mì**.ma).(lé.t̪a)] < /**mi** malet̪a/ 'my purse'). The fact that the formation of syllabic consonants is sensitive to the stress assigned through the projection of such feet forces us to assume that the input for this process is a full-fledged form in which both primary and secondary feet have been projected.

Further evidence that the syllabization of sonorant consonants takes place at the post-lexical level is provided by syllabic nasals, which inherit the place of articulation that their non-syllabic counterparts acquire through place assimilation across words (e.g. [(**ḿ̩**).(bé.so)] < [(**úm**).(bé.so)] < /**un** beso/ 'a kiss'). Moreover, since syllabic consonants cannot occur before a pause, the process that generates them must also be sensitive to the presence of a following word. In light of these facts, it seems reasonable to conclude that the syllabic consonants of TNMS are generated at the post-lexical level from a derived output form, as illustrated in (18). The assumption that the post-lexical phonology of TNMS includes an optional derivational stage where syllabic consonants are generated is in accord with the fact that vowels are normally the segments that function as the nucleus of the syllable, and it is only as an option that a sonorant consonant + stressed high vowel combination can be pronounced as a syllabic consonant.

(18) Syllabic consonants are created through an optional post-lexical derivation:

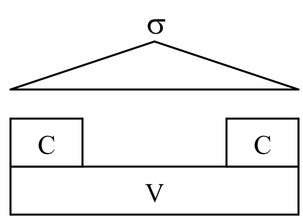
Post-lexical output: [**ṹ** **ᵐ** b é s o]

Alternative output: [**ḿ̩** b é s o]

2. The origin of syllabic consonants

In a cross-linguistic study that included 85 languages, Bell (1970/1979) found that the most common source of syllabic consonants is the disappearance of a vowel with concomitant shift of syllabicity to an adjacent consonant: [C̩] < [CV]. Although Bell acknowledges that syllabic consonants are often accompanied by a vocalic transition, he assumes that this process involves vowel syncope (i.e. $[\text{C̩}_1\varnothing_2] < [C_1V_2]$, because the syllabicity of the vowel is not transferred to the consonant unless the vowel loses its segmental status. In a recent study, however, Coleman (2001:34) argues that the vowel that disappears in the process of creating a syllabic consonant is not deleted, but reduced, and possibly eclipsed by an adjacent consonant (i.e. $[\text{C̩}_1v_2] < [C_1V_2]$). To support this view, it can be noted that consonants and vowels are not produced in sequence. Instead, the findings of numerous phonetic studies indicate that consonants and vowels are co-produced, with vowels serving as the articulatory substrate upon which consonants are overlapped (Kozhevnikov and Chistovich 1965, Öhman 1966, 1967; Perkell 1969, Fowler 1980, 1983; Coleman 1992, 2001).

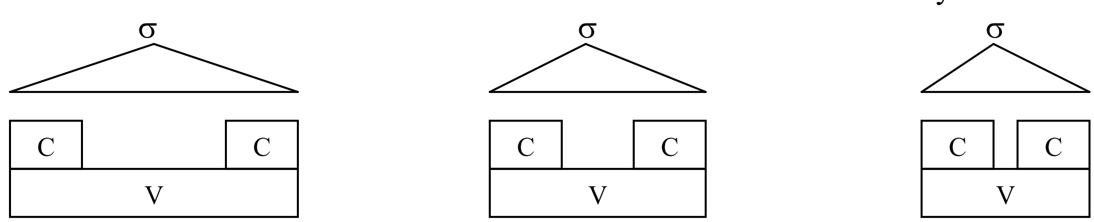
(19) Co-production of consonants and vowels:



In this representation of a CVC syllable, the box that represents the articulatory gestures of the vowel extends throughout the domain of the syllable because the global shape of the vocal tract typical of vocalic articulations is present even while the constriction of each consonant is being formed (Kozhevnikov and Chistovich 1965, Öhman 1966, 1967; Perkell

1969). Although there is a period at the beginning and at the end of a CVC syllable during which the vowel cannot be heard, this is not because the articulatory gestures of the vowel are absent, but rather because the narrowest constriction in the vocal tract dominates the acoustic signal (Gafos 1999). Based on the finding that consonants and vowels are co-produced, Coleman (2001) extrapolates that syllabic consonants may be created thorough syllable compression, which is a fast-speech phenomenon that targets unstressed syllables. He observes that as a syllable is compressed, it is mainly the duration of the vowel that is shortened. This is due to the fact that consonants, being produced through a rapid obstruction in a local area of the vocal tract, are typically much shorter than vowels, which are produced through a relatively slow change in the overall shape of the vocal tract (Fowler 1980, 1983). Because the compression of the syllable is obtained by reducing mainly the duration of the vowel, this process has the effect of shortening the interval between the consonants that sit at the margins of a CVC syllable. The representations in (20) illustrate the contrast between an uncompressed CVC syllable and two different degrees of compression.

(20) Syllable compression: (Coleman 2001)
a. Full vowel b. Somewhat reduced c. Very reduced



As the duration of the vowel is reduced, its articulatory and acoustic targets may be missed (e.g. the vowel becomes centralized), and only a fragment of it remains audible. Furthermore, in cases of drastic syllable compression the vowel may be completely overlapped by the flanking consonants. That is to say that the coda consonant starts as soon as the onset consonant is released. In such a case, not even a fragment of the vowel will be heard, not because the vowel has been deleted, but rather because it has been totally eclipsed by the oral closures of the abutting consonants. It is important to note that this interpretation of the formation of syllabic consonants forces the analyst to assume that they do not occupy the nucleus of the syllable. It is the overlapped vowel that continues to fill the position of syllable nucleus, despite being masked by the abutting consonants (Coleman 2001). Based on this reasoning, Coleman proposes that the appropriate phonological representation of syllabic consonants should be as a consonant + vowel combination. That is to say, the perception of certain consonants as syllabic is purely a phonetic phenomenon arising from the fact that the members of the consonant + vowel combination are co-produced.

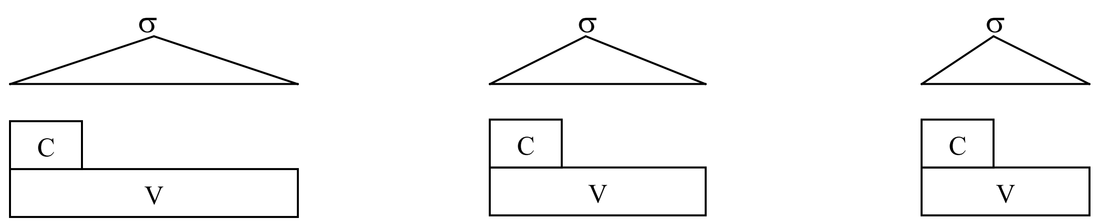
Viewing the creation of syllabic consonants as the partial or total occultation of a vowel has the advantage of providing a principled explanation for the observation that consonant syllabicity is often in a complementary, variable, and gradient relationship with vowel reduction. As Coleman (2001:32) points out, “if the vowel is unreduced, the consonant will not be syllabic, whereas when the consonant is syllabic, the vowel is always reduced.” This is precisely what one expects if the syllabicity of the consonant is due to its extensive overlapping over an adjacent vowel. Syllabicity correlates with vowel reduction because as the eclipsed portion of the vowel increases, it is more likely that the consonant will be perceived as the nucleus of the syllable. Moreover, on the assumption that the vowel remains present in the background, the fact that syllabic consonants tend to be accompanied by a vocalic transition is not a mystery, as it is on the assumption that the vowel is deleted.

Despite the advantages of this account, there are several facts regarding the creation of syllabic consonants that do not follow from syllable compression. If syllabic consonants were simply an epiphenomenon of syllable compression, one would expect them to occur exclusively in unstressed syllables in fast speech. Notwithstanding, there are languages like English, where consonants may be pronounced as syllabic even in slow speech (e.g. [bɒtl̩] < /bɒtəl/ 'bottle'), and there are also languages like TNMS, where syllabic consonants occur only in stressed syllables, which are certainly not compressed (e.g. [àɾ.βo.ĺ̩.t̪o] < [àɾ.βo.lí.t̪o] 'little tree'). Moreover, contrary to what the syllable-compression hypothesis suggests, CVC syllables are not the only source of syllabic consonants. They may also be created from CV and VC syllables, which are in fact more common sources than CVC. As a matter of fact, Bell (1970/1979) found that the creation of syllabic consonants from syllables of CVC or greater complexity is disfavored across languages.

As a third possibility for analyzing the formation of syllabic consonants one can consider coalescence: [C̩$_{1,2}$] < [C_1V_2]. On this view, the stressed high vowel is not deleted but rather merged with the syllabic consonant into a single segment. This makes it possible to assume that the syllabic consonant does fill the position of syllable nucleus. Within this approach, the fact that syllabic consonants are frequently accompanied by a vocalic element is to be expected because a vowel is part of the structure of every syllabic consonant. It follows, moreover, that this vocalic element can only surface as a transition given that the vowel loses its segmental status upon merging with the consonant. Furthermore, by assuming that syllabic consonants occupy the position of syllable nucleus, the coalescence approach is in accord with the fact that syllabic consonants have several important properties in common with vocalic syllable peaks. For instance, as in the articulation of vowels, the function of the vocal tract in the articulation of syllabic consonants is solely to filter the glottal source (Keyser and Stevens 1994). Additionally, syllabic consonants share with vowels the ability to bear primary or secondary stress and to function as the articulatory substrate of the entire syllable. It is clear that if instead of syllable nuclei they were parsed as syllable margins, these defining properties of syllabic consonants would not follow naturally.

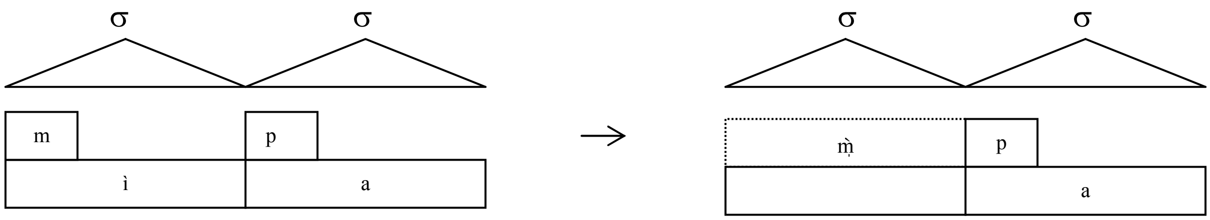
Rather than syllable compression, I propose that the condition that must always be met for a consonant + vowel combination to give rise to a syllabic consonant is that there be another consonant available for coarticulation. As the representations in (21) illustrate, the presence of two consonants is absolutely necessary because, since the duration of consonants is much shorter than that of vowels, a single consonant could not absorb a vowel even if the syllable were compressed.

(21) A vowel cannot be absorbed by a single consonant:
a. Full vowel b. Somewhat reduced c. Very reduced



It is important to underscore that the need that they be coarticulated is as important as the need that there be a minimum of two consonants. Coarticulation is crucial because there must be a smooth transition from one consonant to the other so that the interval during which the vowel may be audible becomes minimal. This does not mean, however, that the two consonants must be tautosyllabic. If that were the case, CVC syllables would be the only source of syllabic consonants, as the syllable-compression approach wrongly predicts. Rather than tautosyllabicity, what is required of the two consonants is that they be coarticulated. This is confirmed by the fact that not only are there languages where syllabic consonants are coarticulated with a preceding tautosyllabic consonant (e.g. English), but also languages where syllabic consonants are coarticulated with a following heterosyllabic consonant (TNMS).

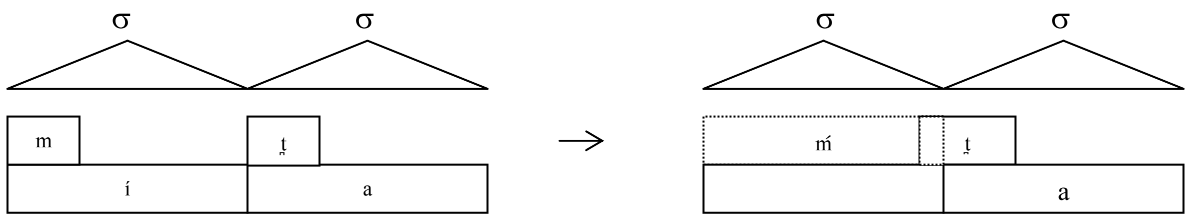
(22) Vowel absorption through coarticulation with a heterosyllabic C:



[mì.pa] → [m̩̀.pa]

The importance of a smooth consonant-to-consonant transition is confirmed by the fact that the context C_1VC_2, where C_1 and C_2 are identical or at least homorganic, is a favored crosslinguistic source of syllabic consonants (Bell 1979:166).[10] In Norwegian, for example, syllabic consonants only arise in this context (e.g. *kattene* [kat.n̩.nə] 'the cats' vs. *skjeggene* [ʃeg.gə.nə] 'the beards'), and the same is true for the syllabic consonants of languages such as French, Russian, Tswana, and Nrbele. Although this context is also the main source of syllabic consonants in TNMS (e.g. [kõ^{n}.**ń̩**.ní.xo] < [ko.**nú**.**n**í.xo] 'with a son', [a.**ĺ̩**.t̪a] < [a.**lí**.**t̪**a] 'little wing'), this Spanish dialect also shows that it is not absolutely necessary that the two consonants be homorganic (e.g. [lo.**ḿ̩**.**t̪**a] < [lo.mí.t̪a] 'little hill). A smooth transition between heterorganic consonants is also possible provided that the oral closure of the first consonant is withheld until the oral closure of the second consonant is formed, (23). As a result of overlapping the onset of the second consonant with the offset of the first one, the two consonants become a continuous consonantal articulation that begins at one place of articulation but ends at a different one. Since this type of coarticulation renders the release of the first consonant inaudible, the articulation of a heterorganic C̩C sequence becomes largely equivalent to that of a homorganic C̩C sequence: they both consist of a prolonged oral closure with only one audible release, (22, 23). Of these components, the closure phase is associated with the syllabic consonant, while the single audible release is associated with the onset of the following syllable (Espinosa 1925:111).

(23) Vowel absorption through coarticulation with a heterorganic C:



[mí.t̪a] → [ḿ̩.t̪a]

Although he failed to acknowledge that the two consonants must be coarticulated, Mohanan (1979) was the first to observe that syllabic consonants always occur in the context of an adjacent consonant. Mohanan noted that with regard to this property, languages break down into two groups: those that require that the syllabic consonant be preceded by another consonant, (24), and those that require that it be followed by another consonant, (25). While both language types may also allow that the syllabic consonant be abutted by consonants at both sides (e.g. [CC̩C]); there are no languages where syllabic consonants occur between two vowels (e.g. *[VC̩V]), or between a vowel and a pause (e.g. *[VC̩||] or *[||C̩V]). These universal restrictions are summarized in table (26) after Mohanan (1979).

(24) CC̩ Language Type

V___V	C___C	C___||	||___C	V___||	||___V	C___V	V___C
✘			✘	✘	✘		✘

(25) C̩C Language Type

V___V	C___C	C___||	||___C	V___||	||___V	C___V	V___C
✘		✘		✘	✘	✘	

(26) Universal restrictions on the distribution of syllabic C’s:

<table>
<tr><th>V___V</th><th>C___C</th><th>C___||</th><th>||___C</th><th>V___||</th><th>||___V</th><th>C___V</th><th>V___C</th></tr>
<tr><td>✗</td><td></td><td></td><td></td><td>✗</td><td>✗</td><td></td><td></td></tr>
</table>

Considering that syllabic consonants must be not only adjacent to another consonant but also coarticulated with it, I propose to account for the universal restrictions in (26) through the alignment constraints in (27) and (28). By requiring that every syllabic consonant be aligned with the release phase of another consonant, ALIGNC̩-L and ALIGNC̩-R guarantee that there will be a smooth transition between the two consonants. On this view, languages where syllabic consonants are always coarticulated with a preceding consonant abide by the ranking ALIGNC̩-L >> ALIGNC̩-R, whereas those grammars in which syllabic consonants are always coarticulated with a following consonant result from the reversal of this ranking. Given that the syllabic consonants of TNMS never occur before a vowel or a pause, this language is clearly an instance of the C̩C language type.

(27) ALIGNC̩-L: The left edge of a syllabic consonant must be aligned with the release phase of another consonant.

(28) ALIGNC̩-R: The right edge of a syllabic consonant must be aligned with the release phase of another consonant.

Tableaux (29) and (30) illustrate how these alignment constraints correctly derive the two attested language types. When ALIGNC̩-R takes precedence over ALIGNC̩-L, the contexts in (29a,c,e,f,h) are ruled out due to the lack of a preceding consonant. By contrast, when ALIGNC̩-L is dominant, the contexts in (30a,d,e,f,g) are discarded for lack of a following consonant.

(29) Ranking for CC̩ language type:

			ALIGNC̩-L	ALIGNC̩-R
✘	a.	[VC̩V]	*!	*
	b.	[CC̩C]		
✘	c.	[‖C̩C]	*!	
	d.	[CC̩‖]		*
✘	e.	[‖C̩V]	*!	*
✘	f.	[VC̩‖]	*!	*
	g.	[CC̩V]		*
✘	h.	[VC̩C]	*!	

(30) Ranking for C̩C language type:

			ALIGNC̩-R	ALIGNC̩-L
✘	a.	[VC̩V]	*!	*
	b.	[CC̩C]		
	c.	[‖C̩C]		*
✘	d.	[CC̩‖]	*!	
✘	e.	[‖C̩V]	*!	*
✘	f.	[VC̩‖]	*!	*
✘	g.	[CC̩V]	*!	
	h.	[VC̩C]		*

Tableaux (29) and (30) also show how the proposed constraints account for the universal lack of syllabic consonants in the contexts V___V, V___‖, and ‖___V. Note that regardless which of the two alignment constraints is dominant, candidates (a,e,f) could never be optimal because they fall in violation of both ALIGNC̩-L and ALIGNC̩-R. It is also important to highlight that the reason why neither language type rules out syllabic consonants in the context C___C is because the proposed constraints are formalized as positive rather than as negative conditions. A candidate that meets the demands of the dominant constraint without violating the dominated constraint is evidently not ruled out by either one of them, (29b, 30b). By contrast, if instead of ALIGNC̩-L and ALIGNC̩-R we relied on negative constraints such as *C̩C and *CC̩, we would predict that neither language type would allow syllabic consonants in the context C___C because both of these negative constraints would be violated by an interconsonantal syllabic consonant. Since syllabic consonants do indeed occur flanked by consonants in both language types, it must be that ALIGNC̩-L and ALIGNC̩-R are the right principles.

3. Coercible peaks

A remarkable property of the process that generates syllabic consonants in TNMS is that the syllabicity and stress of a high vowel are transferred to an adjacent sonorant consonant despite the fact that consonants are less suitable than vowels to function as prosodic heads (e.g. [bo.(**ń̩**.t̪o)] < [bo.(**ní**.t̪o)] < /bonit̪o/ ‘beautiful’). Considering that the prototypical prosodic heads are highly sonorous segments, the emergence of syllabic consonants to the detriment of vowels is contrary to expectations based on the sonority scale, (31). If sonority were the leading force in this process, one would expect a sound change in the direction of the maximal sonority value, such as the transformation of the stressed high vowel into a mid or low vowel so that it would become a more prominent head. Nonetheless, it is exactly in the opposite direction that the generation of syllabic consonants advances, for it is unquestionable that all consonants are less sonorous than any vowel.

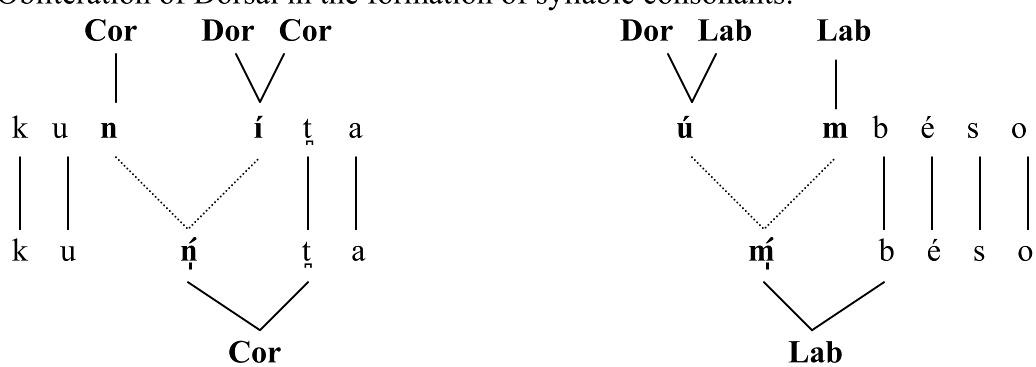
(31) Sonority scale:

low vowel 〉 mid vowel 〉 high vowel 〉 liquid 〉 nasal 〉 fricative 〉 stop

+ ————————————————→ –

Despite the possibility of creating syllabic consonants to the detriment of high vowels, the cross-linguistic generalization that vowels make better prosodic heads than consonants also holds in TNMS. This is confirmed by the fact that the combination of a sonorant consonant + stressed high vowel is not always pronounced as a syllabic consonant. Recall that it is normally the vowel that is syllabic, and it is only as an option that the sonorant consonant may absorb the stressed high vowel in the post-lexical phonology. This means that although in TNMS sonorant consonants are margin-preferring segments, they may be coerced at the post-lexical level to function as syllable peaks. I argue that the factor that leads to the syllabization of sonorant consonants is the presence of a marked place specification in the structure of vowels. To motivate this view, consider the representations in (32), which show that of the three major place features associated with the members of a sonorant consonant + stressed high vowel combination only one remains after the two segments coalesce into a syllabic consonant. Importantly, the articulator that is consistently obliterated is Dorsal.

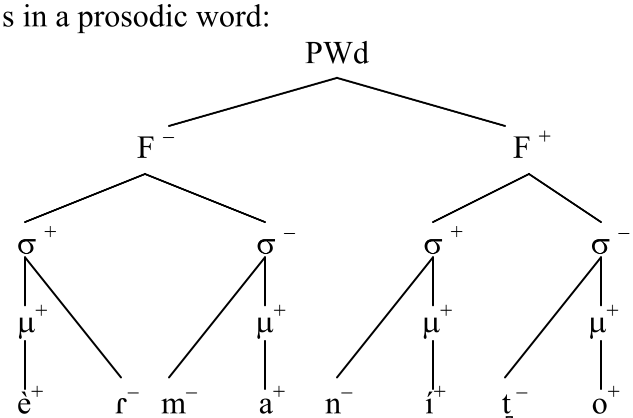
(32) Obliteration of Dorsal in the formation of syllabic consonants:



Here, I am assuming after Paradis and Prunet (1990, 1993) that vowels are doubly articulated segments in which an articulator such as the lips (Labial), the tongue blade/tip (Coronal), or the tongue root (Radical), aids the tongue body (Dorsal) to transform the vocal tract into a resonance chamber.[11] This assumption is consistent with the fact that unlike consonants, which are locally articulated, the articulation of vowels involves a global change in the vocal tract, which could not be obtained by the action of only one articulator.

To capture the fact that it is only when a high vowel bears stress that it may be absorbed by an adjacent sonorant consonant, I rely on the notion of ‘Designated Terminal Element’ (DTE, or Δ), developed by Liberman (1975), and Liberman and Prince (1977), and recently extended by De Lacy (2002). A DTE is a structural notion that relates prosodic heads to prosodic categories. For every prosodic category α, there is a DTE of α (Δ_α), which is a terminal element on the prosodic plane that is (i) a head and (ii) associated with α via a continuous path of prosodic heads (De Lacy 2002). All terminal elements on the prosodic plane that are dominated by α but fail to meet both of these conditions are non-DTE’s of α, or $-\Delta_\alpha$. As an example, consider how the notion of DTE applies to the Spanish word [èɾ.ma.ní.t̪o] ‘little brother’ represented in (33). The symbols + and − signal heads and non-heads, respectively.

(33) DTE’s in a prosodic word:



‘little brother’

DTE’s:		Non-DTE’s:	
Δ_σ:	{è, a, í, o}	$-\Delta_\sigma$:	{ɾ, m, n, t̪}
Δ_{Ft}:	{è, í}	$-\Delta_{Ft}$:	{ɾ, m, a, n, t̪, o}
Δ_{PWd}:	{í}	$-\Delta_{PWd}$:	{e, ɾ, m, a, n, t̪, o}

In (33), the segments {è, o, í, a} are syllable DTE's (Δ_{σ}) because they are all heads, and they are connected to a syllable through an unbroken chain of prosodic heads. Likewise, the segments {è, í} are foot DTE's (Δ_{Ft}) because they are heads linked to a foot through a continuous path of prosodic heads. Only the segment {í} is a prosodic-word DTE (Δ_{PWd}) because it is the only terminal element that is a head and can be traced up to the prosodic word through an uninterrupted line of prosodic heads.

Among the various types of DTE contained within the prosodic word, it is the foot DTE that plays a key role in the formation of syllabic consonants in TNMS. This is evinced by the fact that unless the high vowel functions as the DTE of a primary or secondary foot, it cannot be absorbed by an adjacent sonorant consonant (e.g. *[**m**.(pá.la)] < [**mi**.(pá.la)] 'my shovel', but [(**m̩̀**.pa).(ké.te)] < [(**mì**.pa).(ke.te)] 'my package'). The tendency of TNMS to remove stressed high vowels from the role of foot DTE and replace them with coronal or labial sonorant consonants can then be attributed to the positional markedness constraint *Δ_{Ft}/Dorsal, whose role is to bar the marked value on the place-of-articulation scale from the position of foot DTE.

(34) Place-of-articulation scale: (DeLacy 2002)

Dorsal 〉 Labial 〉 Coronal 〉 Glottal

(35) *Δ_{Ft}/Dorsal: Dorsal segments are prohibited in the role of foot DTE.

Given that the articulation of all vowels involves a tongue-body position, *Δ_{Ft}/Dorsal is violated by all output forms in which a vowel is parsed as the DTE of a foot (e.g. [pi.(l**í**.t̪a)] < /pilit̪a/ 'little battery'). One logical way to avoid conflict with *Δ_{Ft}/Dorsal is to shift stress to a consonant whose articulation does not engage the tongue body (e.g. [pi.(**ĺ̩**.t̪a)]). This is precisely the option used in the post-lexical phonology of TNMS, where certain violations of $*\Delta_{Ft}$/Dorsal can be prevented at the expense of violating the anti-associational constraint that bans segments of equal or lower sonority than nasal consonants from the position of syllable DTE: $*\Delta_{\sigma}\leq N$ (DeLacy 2002)

(36) $*\Delta_{\sigma}\leq N$: Segments of equal or lower sonority than nasal consonants are prohibited in the role of syllable DTE.

$*\Delta_{\sigma}\leq N$ is part of a family of anti-associational constraints that penalize the parsing of segments as syllable DTEs, (37). These constraints are similar to the Peak Hierarchy proposed by Prince and Smolensky (1993, 2002); but they differ in that instead of referring to a specific category on the sonority scale (e.g. *P/nasal), they refer to ranges of elements on the scale (stringent formulation). For instance, $*\Delta_{\sigma}\leq N$ does not penalize exclusively nasals parsed as syllable DTE's, but all segments of equal or lesser sonority than nasals (e.g. nasals, fricatives, and stops) parsed in that structural position. The stringent formulation of scale-referring constraints has the advantage that it captures the hierarchical relations among the categories on the scale without having to impose a fixed ranking among them. Freedom of ranking among scale-referring constraints has been shown to be crucial in accounting for processes that involve category conflation (Prince 1997, 1999, DeLacy 2002). With regard to syllabic consonants, the conflation of sonority categories seems to be necessary in order to explain the occurrence of syllabic obstruents in languages such as Acoma, Ahi, Chipaya, and Garo, which do not allow sonorant consonants to become syllabic despite the fact that they are more sonorous than obstruents (Bell 1970/1979). A similar situation arises in Mexico City Spanish (MCS), where /s/ is the only consonant that may become syllabic upon causing the devoicing and reduction of an adjacent vowel (Lope Blanch 1966). An account of syllabic /s/ in MCS would require category conflation, but since that is a completely different pattern of consonant syllabization, it will not be discussed here.[12]

(37) Anti-syllable-DTE constraints:

$*\Delta_\sigma \leq T$, $*\Delta_\sigma \leq S$, $*\Delta_\sigma \leq N$, $*\Delta_\sigma \leq L$, $*\Delta_\sigma \leq I$, $*\Delta_\sigma \leq E$, $*\Delta_\sigma \leq A$

(T= stop, S = fricative, N = nasal, L = Liquid, I = high v., E = mid v., A = low v.)

Tableau (37) shows that when $*\Delta_{Ft}$/Dorsal dominates $*\Delta_\sigma \leq N$, it is better to parse a sonorant consonant rather than a vowel in the roles of syllable and foot DTE because this serves to prevent a violation of $*\Delta_{Ft}$/Dorsal, (36b,d). In other words, the reason why syllabicity and stress are transferred from a vowel to an adjacent sonorant consonant is to avoid having a segment that bears the most marked value on the place-of-articulation scale surface in a prominent structural role. Bear in mind that in this and all subsequent tableaux the input form is a full-fledged output form because the creation of syllabic consonants takes place at the post-lexical level.

(38) Stress must shift to a consonant

Input: [bo.(**ní**.t̪a)]	$*\Delta_{Ft}$/Dorsal	$*\Delta_\sigma \leq N$
a. [bo.(**ní**.t̪a)]	*!	
☞ b. [bo.(**ǹ̩**.t̪a)]		*
Input: [bo.(**lí**.t̪a)]		
c. [bo.(**lí**.t̪a)]	*!	
☞ d. [bo.(**ĺ̩**.t̪a)]		*

In TNMS, the option to transfer stress and syllabicity to an adjacent consonant is limited to the natural class of sonorants because $*\Delta_\sigma \leq S$, the anti-associational constraint that penalizes the parsing of segments of equal or lesser sonority than fricative consonants in the role of syllable DTE, outranks *Δ_{Ft}/Dorsal. As a result of this ranking, it is more costly to parse an obstruent consonant in the role of syllable DTE than to allow a vowel to be the DTE of a foot. Note that despite appearing in the same context as the syllabic sonorants of candidates (38b,d), the syllabic obstruents of candidates (39b,d) are disallowed because their sonority is below the threshold that TNMS tolerates for the sake of avoiding a dorsal segment in the role of foot DTE.

(39) In TNMS, obstruents may not become syllabic

Input: [bo.(**t̪í**.t̪a)]	*$\Delta_{\sigma}\leq$S	*Δ_{Ft}/Dorsal	*$\Delta_{\sigma}\leq$N
☞ a. [bo.(**t̪í**.t̪a)]		*	
b. [bo.(t̩́.t̪a)]	*!		*
Input: [ko.(**sí**.t̪a)]			
☞ c. [ko.(**sí**.t̪a)]		*	
d. [ko.(ś̩.t̪a)]	*!		*

Besides sonority, the property of bearing stress is also a critical factor in the creation of syllabic consonants in TNMS. When a vowel is deprived of stress, transferring its syllabicity to an adjacent sonorant consonant is unjustified because that vowel is not in violation of *Δ_{Ft}/Dorsal. This is illustrated through the parallel evaluations in (40).

(40) In TNMS, only stressed vowels are absorbed

Input: [(**mì**.ma).(má)]	*$\Delta_{\sigma}\leq$S	*Δ_{Ft}/Dorsal	*$\Delta_{\sigma}\leq$N
a. [(**mì**.ma).(má)]		**!	
☞ b. [(m̩̀.ma).(má)]		*	*
Input: [**mi**.(má.ðɾe)]			
☞ c. [**mi**.(má.ðɾe)]		*	
d. [m̩.(má.ðɾe)]		*	*!

4. Unfaithfulness to vowels

The creation of syllabic consonants through the absorption of an adjacent vowel reflects a disregard for vowels, which in the case of TNMS I have attributed to the positional markedness constraint $*\Delta_{Ft}$/Dorsal. However, one must take into account that although $*\Delta_{Ft}$/Dorsal prohibits all vowels in the role of foot DTE, it is only certain stressed vowels that yield their syllabicity to an adjacent sonorant consonant. Recall, for instance, that while stressed vowels that belong to affixes and function words exhibit a proclivity to be absorbed, those stressed vowels that belong to root morphemes regularly retain their syllabicity. Furthermore, among affixes and function words, the only stressed vowels that consistently yield their syllabicity to sonorant consonants are those that bear the feature [+high].

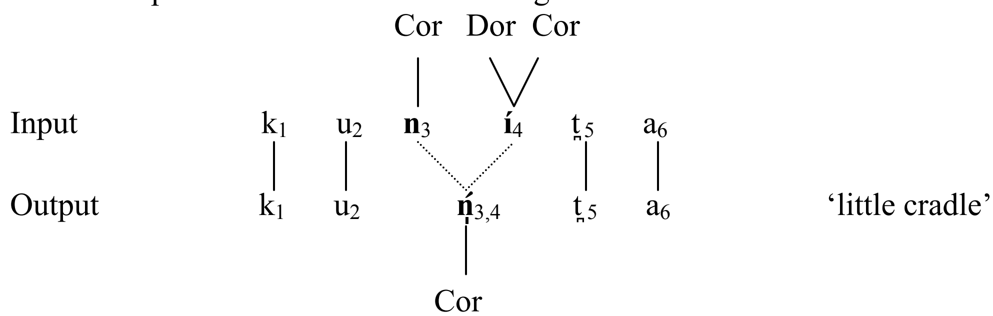
The reluctance of root vowels to yield their syllabicity to an adjacent sonorant consonant indicates that their morphological affiliation grants them a greater degree of faithfulness than that given to non-root vowels. Following Beckman (1999), I assume that IDENT, the faithfulness constraint that requires correspondent segments to agree in feature specifications, breaks down into a context-free and a positional constraint, (41, 42). These two types of faithfulness constraint can be independently ranked with respect to conflictive constraints such as $*\Delta_{Ft}$/Dorsal.

(41) IDENT: An input segment and its output correspondent must agree in their feature specifications.

(42) IDENT-ROOT: A root input segment and its output correspondent must agree in their feature specifications.

The ranking of IDENT-ROOT above $*\Delta_{Ft}$/Dorsal guarantees that any root vowel will be preserved intact if it happens to be parsed as a foot DTE. However, with IDENT dominated by *Δ$_{Ft}$/Dorsal, it is possible to prevent non-root vowels from acting as the DTE of a foot by failing to preserve all of their feature specifications. In particular, the Dorsal feature of the vowel is not preserved by the output consonant that stands for the sonorant consonant + vowel combination in the input form, (43).

(43) Unfaithful preservation of the stressed high vowel:



In tableau (44), two candidates that are similar in segmental and prosodic structure but which differ in morphological structure are under scrutiny. One is the verb [ko.(ḿ̩.t̪eh)] < [ko.(m**í**.t̪eh)] < /kom + **i** + t̪es/ 'you ate', where the stressed high vowel is the theme vowel morpheme. The other one is the verb [o.(m**í**.t̪eh)] < /o + m**i**t̪ + e + s/ 'you omit', where the stressed high vowel is part of the root /m**i**t̪ /. To facilitate their identification, root segments appear in bold in this tableau.

(44) Greater faithfulness to root segments

Input: [**ko**.(**m**í.t̪eh)] 'you ate'	IDENT-ROOT	*Δ$_{Ft}$/Dorsal	IDENT
a. [**ko**.(**m**í.t̪eh)]		*!	
☞ b. [**ko**.(**ḿ̩**.t̪eh)]			*
Input: [o.(**mí**.**t̪**eh)] 'you omit'			
☞ c. [o.(**mí**.**t̪**eh)]		*	
d. [o.(**ḿ̩**.**t̪**eh)]	*!		*

The violation of $*\Delta_{Ft}$/Dorsal that candidate (44a) incurs can be avoided through the absorption of the stressed high vowel because this segment belongs to an affix morpheme. It is the prevention of this violation that makes candidate (44b) optimal. On the other hand, although candidate (44c) incurs a similar violation of $*\Delta_{Ft}$/Dorsal, the absorption of the offending vowel is not allowed because its affiliation to the root morpheme protects its feature values.

As Bell (1970:B7/1979:159) points out, this type of morphological control is not unsusual among languages that exhibit syllabic consonants. In Navaho and Gaoxiong, for example, syllabic consonants occur exclusively in affixes and grammatical particles, and in Swahili, it is largely in these types of morpheme that syllabic consonants arise. Nevertheless, the fact that there are also languages like Czech and Egyptian Arabic, where syllabic consonants occur without restriction to morphological categories, means that some grammars do not make a distinction between faithfulness to roots and faithfulness to non-root morphemes. Since in TNMS the words [ń̩.t̪i.ko] < [ín.t̪i.ko] 'identical' and [mr̩̀.re] < [mú.re] 'extremely' are the only ones where a syllabic consonant is created through the absorption of a root vowel, it seems reasonable to surmise that although the process might have begun to generalize (by failing to distinguish between root and non-root segments), syllabic consonants were still under severe morphological control at the time that Espinosa conducted his studies.[13]

Another important aspect of the process that generates a syllabic consonant from a sonorant consonant + stressed high vowel combination is that most of the features of the vowel are lost while all of the features of the consonant are preserved (e.g. [(kã̀ᵐ.pa).(**ń̩**.t̪a)] < [(kã̀ᵐ.pa).(**ní.**t̪a)] 'little bell'). This suggests that feature faithfulness to consonants is more highly valued than feature faithfulness to vowels, (45, 46). According to this, the constraint that triggers the syllabization of consonants, *Δ_{Ft}/Dorsal, takes precedence over IDENT-V, but it is dominated by IDENT-C. At the segmental level, however, vowels are not given lesser priority than consonants, as evinced by the fact that the vowel is not deleted, but absorbed. That is to say that since neither the consonant nor the vowel is lost in the process of shifting stress and syllabicity, the constraint MAX(seg) must take precedence over *Δ_{Ft}/Dorsal. Furthermore, because the sonorant consonant merges with the stressed high vowel into a single segment, the constraint that prohibits output segments from having multiple input correspondents, (48), must be outranked by *Δ_{Ft}/Dorsal. The interaction of these faithfulness constraints with *Δ_{Ft}/Dorsal is illustrated in tableau (49). Coindexation is used in subsequent tableaux to facilitate the identification of segments with multiple correspondents.

(45) IDENT-C: Correspondent consonants must agree in feature specifications.

(46) IDENT-V: Correspondent vowels must agree in feature specifications.

(47) MAX(seg): Every segment in the input must have a correspondent in the output.

(48) UNIFORMITY: No output segment has multiple correspondents in the input.

(49) Avoidance of vowels as stress-bearing units

Input: [p$_1$a$_2$.(**l**$_3$**í**$_4$.t̪$_5$a$_6$)]	MAX (seg)	IDENT-C	*Δ_{Ft}/Dorsal	IDENT-V	UNIFORM
a. [p$_1$a$_2$.(**l**$_3$**í**$_4$.t̪$_5$a$_6$)]			*!		
☞ b. [p$_1$a$_2$.(**ĺ̩**$_{3,4}$.t̪$_5$a$_6$)]				*	*
c. [(p$_1$á$_2$.**l**$_3$**i**$_4$).t̪$_5$a$_6$][14]			*!		
d. [(p$_1$á$_2$**l**$_3$.t̪$_5$a$_6$)]	*!		*		

In this evaluation, the faithful candidate, (49a), incurs a violation of *Δ_{Ft}/Dorsal because it contains a foot whose DTE is a segment articulated with the tongue body. Given that the articulation of all vowels involves a tongue-body position, transferring stress from one vowel to another is of no avail to comply with $*\Delta_{F}$/Dorsal, (49c,d). As a matter of fact, such a change results in an additional violation of MAX(seg) when the vowel that was originally stressed is deleted (49d). A more effective action is to transfer stress to a segment that uses either the Coronal or Labial articulator to the exclusion of Dorsal, but only consonants can be articulated in this way. By forcing a coronal consonant to stand for both a consonant and a vowel in the input form, candidate (49b) manages to satisfy the top-ranking constraints at the expense of violating bottom-ranking IDENT-V and UNIFORMITY.

With $*\Delta_{Ft}$/Dorsal as the principle that triggers the syllabization of sonorant consonants in TNMS, this analysis predicts that only non-dorsal sonorant consonants should become syllabic. Liquids are of little interest in this respect because all Spanish liquids are coronal, but nasals are a good test ground for this prediction because they may be articulated with the lips, tongue tip/blade, or tongue body. The fact that coronal and labial nasals can become syllabic, (12a,b), whereas palatal and velar nasals cannot, (6b, 12c), follows naturally from the analysis proposed here.

(50) Syllabic consonants may not be dorsal

Input: [n$_1$i$_2$.(**ɲ**$_3$**í**$_4$.t̪$_5$a$_6$)]	MAX (seg)	IDENT-C	$*\Delta_{Ft}$/Dorsal	IDENT-V	UNIFORM
☞ a. [n$_1$i$_2$.(**ɲ**$_3$**í**$_4$.t̪$_5$a$_6$)]			*		
b. [n$_1$i$_2$.(**ɲ̩́**$_{3,4}$.t̪$_5$a$_6$)]			*	*!	*
c. [n$_1$i$_2$.(**ń̩**$_{3,4}$.t̪$_5$a$_6$)]		*!		*	*
Input: [(**ù**$_1^{ŋ}_2$).(g$_3$á$_4$.t̪$_5$o$_6$)]					
☞ d. [(**ù**$_1^{ŋ}_2$).(g$_3$á$_4$.t̪$_5$o$_6$)]			**		
e. [(**ŋ̩́**$_{1,2}$).(g$_3$á$_4$.t̪$_5$o$_6$)]			**	*!	*
f. [(**ń̩**$_{1,2}$).(g$_3$á$_4$.t̪$_5$o$_6$)]		*!		*	*

In an effort to avoid a violation of $*\Delta_{Ft}$/Dorsal, candidates (50b,e) use coalescence to transfer stress and syllabicity from a vowel to a nasal consonant. However, transferring the suprasegmental features of a stressed vowel to a palatal or velar nasal does not prevent a violation of *Δ_{Ft}/Dorsal because consonants produced at these places of articulation share with vowels the property of being dorsal: velars are plain dorsals, while palatals are corono-dorsal (Keating 1988). The violations of IDENT-V and UNIFORMITY that candidates (50b,e) incur are therefore unjustified. Furthermore, because IDENT-C precludes the possibility of ridding the offending consonant of the feature that makes it an undesirable foot DTE, (50c,f), the best solution is to accept a violation of *Δ_{Ft}/Dorsal without making any changes to the input form, (50a,d).

It should be stressed that although this analysis rules out syllabic consonants with a palatal or velar point of articulation, this does not mean that such segments are impossible. Bell (1970/1979) reports the existence of syllabic velar nasals in languages such as Yoruba and Dan, and although they are rare, syllabic palatal nasals also occur in Trondheim Norwegian. Nevertheless, the existence of syllabic consonants with a palatal or velar point of articulation in those languages does not invalidate the analysis proposed here for TNMS, because it is not being claimed that *Δ_{Ft}/Dorsal is the principle responsible for the emergence of syllabic consonants in all languages. Besides *Δ_{Ft}/Dorsal, there are other markedness constraints that may cause the syllabization of consonants. Morelli (1998), for example, has demonstrated that the reason why obstruent consonants become syllabic in Lushootseed-Nisqually is to prevent an illformed consonant cluster from surfacing as a complex onset, and Wells (1995) has argued that English syllabic-consonant formation is also dependent on syllable structure because it is required that the consonant + vowel combination be tautosyllabic. The argument, then, is that since *Δ_{Ft}/Dorsal is only one of the factors that may cause the syllabization of consonants in the languages of the world, there is no reason to expect that syllabic consonants will obey identical restrictions in every language.

The only other sonorant consonant of TNMS that fails to become syllabic is the coronal tap [ɾ]. In this case, what prevents the syllabization of the consonant is not its place, but its manner of articulation. Taps are articulated through a rapid upward and downward movement of the tip of the tongue, which creates a brief closure against a point in the dento-alveolar region (Laver 1993, Ladefoged and Maddieson 1996). Catford (1977) reports that the duration of the oral closure of taps ranges between 1-3 centiseconds (10-30 ms), and this was confirmed for Spanish by Quilis (1981), who found a mean of 20 ms. Such brief closure duration poses a serious problem for the perception of taps as syllabic segments because duration is the main phonetic correlate of syllabicity (Price 1980, Tokuma 1989a,b, 1992). Since the property that distinguishes syllabic consonants from their non-syllabic counterparts is that in the former class of sounds the oral closure of the consonant is held throughout the syllable, it is crucial that the brief oral closure of taps be lengthened. There are two ways in which this could be accomplished. The oral closure could be prolonged, or it could be repeated. The problem is that if either of these articulatory adjustments were used, the tap would turn into a different kind of consonant. If the contact of the tongue tip against the dento-alveolar region were prolonged, the result would be a dento-alveolar stop (e.g. [d̪̺]), and if the brief oral closure were repeated, the consonant would be a trill (e.g. [r]), not a tap.

Tableau (51) shows that in TNMS the syllabization of taps is ruled out by IDENT-C because the violation of $*\Delta_F$/Dorsal that would be prevented by lengthening the oral closure of the tap so that it could be perceived as standing for a consonant + vowel combination causes it to become a sound of a different class, (51b,c). It should also be noted that since the briefness of their oral closure is the property that defines taps as a class, the existence of syllabic taps seems highly improbable. This view is supported by the crosslinguistic study conducted by Bell (1970/1979), who found that among r-sounds, the dento-alveolar trill is the most common syllabic consonant, and although there are several languages reported to have rhotic approximants, only Piro is said to have a syllabic tap. It turns out, however, that this report is not completely reliable because the source for Piro (Matteson 1965) failed to provide any phonetic description of the syllabic consonants.

(51) Taps may not undergo syllabization

Input: [pe.(**ɾí**.t̪a)]	MAX (seg)	IDENT-C	$*\Delta_{Ft}$/Dorsal	IDENT-V	UNIFORM
☞ a. [pe.(**ɾí**.t̪a)]			*		
b. [pe.(ɾ̩́.t̪a)]		*!		*	*
c. [pe.(d̩́. t̪a)]		*!		*	*

I end this section with a discussion of the fact that despite the tendency of TNMS to avoid vowels in the role of foot DTE, mid and low vowels do not lose their syllabicity to an adjacent sonorant consonant. In this regard, it is important to note that the reluctance of mid and low vowels to undergo absorption is by no means universal. Bell (1979:165-166, 175) found that although the syllabization of consonants at the expense of vowels normally begins by affecting high or lax central vowels, there are languages in which the process advances to include mid, and even low vowels. The fact that in TNMS the crucial distinction is between high and non-high vowels indicates that despite the disregard for the features of vowels, faithfulness to the feature [−high] is still paramount. In order to capture the priority given to the preservation of non-high vowels, it is necessary to extract the constraint IDENT(−high) from the compound constraint IDENT-V. With IDENT(−high) ranked above $*\Delta_{Ft}$/Dorsal, stressed mid and low vowels are relieved from the pressure that the positional markedness constraint places on them. This is illustrated in tableau (52). Of the two violations of *Δ_{Ft}/Dorsal that candidate (52a) incurs, only one may be prevented by shifting stress and syllabicity from a vowel to an adjacent sonorant consonant, (52b), because the identity of the stressed mid vowel is protected by IDENT(−high).

(52) Non-high vowels cannot be absorbed

Input: [(m$_1$ì$_2$.m$_3$a$_4$).(l$_5$é$_6$.t̪$_7$a$_8$)]	MAX (seg)	ID-C	ID (−hi)	*Δ_{Ft} /Dorsal	ID-V	UNIFORM
a. [(m$_1$ì$_2$.m$_3$a$_4$).(l$_5$é$_6$.t̪$_7$a$_8$)]				**!		
☞ b. [(m̩̀$_{1,2}$.m$_3$a$_4$).(l$_5$é$_6$.t̪$_7$a$_8$)]				*	*	*
c. [(m̩̀$_{1,2}$.m$_3$a$_4$).(ĺ̩$_{5,6}$.t̪$_7$a$_8$)]			*!		**	**

5. Surrounding segments

Besides being limited to the prosodic role of foot DTE, the syllabic consonants of TNMS are also subject to phonotactic constraints, which further screen out the contexts where they can arise. An instance of this is the lack of syllabic consonants before a vowel or a pause. To account for the type of language where syllabic consonants do not occur in these positions, the constraint ALIGNC̩-R was proposed in Section 2. It can now be demonstrated that the ranking of ALIGNC̩-R over *Δ_{Ft}/Dorsal effectively limits the distribution of syllabic consonants in TNMS to preconsonantal position.

In tableau (53), the formation of syllabic consonants is favored, (53b,d), because when the stressed high vowel in the input form is followed by a consonant, it is possible to remove that vowel from the role of foot DTE without running afoul of ALIGNC̩-R. It should be observed, however, that this is accomplished in two different ways. While candidate (53b) derives the syllabic consonant through coalescence, candidate (53d) does so through total assimilation. The use of different processes is due to the fact that whereas the stressed high vowel of the input [a$_1$.(**n**$_2$**í**$_3$.t̪$_4$a$_5$)] is flanked by consonants, the stressed high vowel of the input [(**ú**$_1$.n$_2$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)] is not. It turns out then that when the stressed high vowel of [a$_1$.(**n**$_2$**í**$_3$.t̪$_4$a$_5$)] coalesces with the preceding nasal, there is a following consonant available with which to coarticulate the resulting syllabic consonant, (53b). But if the stressed high vowel of the input [(**ú**$_1$.n$_2$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)] merged with the following nasal consonant, there would be no following consonant to coarticulate the resulting syllabic consonant with, (53e). Such a problem can be avoided by assimilating the stressed high vowel to the following nasal consonant, (53d). This move is advantageous because it not only allows the syllabic consonant to use the following nasal consonant for coarticulation, but also makes it possible to maintain a separate output correspondent for every input segment. Hence, candidate (53d) not only spares a violation of *Δ_{Ft}/Dorsal, but also avoids falling in violation of ALIGNC̩-R and UNIFORMITY.

(53) Syllabic C's must be followed by a consonant:

Input: [a$_1$.(**n**$_2$**í**$_3$.t̪$_4$a$_5$)]	ALIGNC̩-R	*Δ_{Ft}/Dorsal	IDENT-V	UNIFOR
a. [a$_1$.(**n**$_2$**í**$_3$.t̪$_4$a$_5$)]		*!		
☞ b. [a$_1$.(**ń̩**$_{2,3}$.t̪$_4$a$_5$)]			*	*
Input: [(**ú**$_1$.**n**$_2$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)]				
c. [(**ú**$_1$.**n**$_2$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)]		**!		
☞ d. [(**ń̩**$_1$.**n**$_2$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)]		*	*	
e. [(**ń̩**$_{1,2}$a$_3$).(s$_4$é$_5$.n$_6$a$_7$)]	*!	*	*	*

The results from tableau (53) contrast sharply with those obtained in (54). When the stressed high vowel in the input form is followed not by a consonant but by a vowel or a pause, neither assimilation to the preceding consonant, (54c,e), nor coalescence with it, (54b,d), can remedy the fact that the right edge of the resulting syllabic consonant would not be in contact with another consonant. It is then safe to conclude that ALIGNC̩-R is the sole culprit for the lack of syllabic consonants in prevocalic and prepausal positions.

(54) Syllabic C's are disallowed before a vowel or a pause:

Input: [b$_1$e$_2$.(**n**$_3$**í**$_4$.a$_5$)]	ALIGNC̩-R	*Δ_{Ft}/Dorsal	IDENT-V	UNIFOR
☞ a. [b$_1$e$_2$.(**n**$_3$**í**$_4$.a$_5$)]		*		
b. [b$_1$e$_2$.(**ń̩**$_{3,4}$.a$_5$)]	*!		*	*
c. [b$_1$e$_2$.(**n**$_3$**ń̩**$_4$.a$_5$)]	*!		*	
Input: [k$_1$o$_2$.(**m**$_3$**í**$_4$)‖]				
☞ c. [k$_1$o$_2$.(**m**$_3$**í**$_4$)‖]		*		
d. [k$_1$o$_2$.(**ḿ̩**$_{3,4}$)‖]	*!		*	*
e. [k$_1$o$_2$.(**m**$_3$**ḿ̩**$_4$)‖]	*!		*	

Given the finding that the syllabic consonants of TNMS must be followed by another consonant, one must wonder why only certain consonants are found after them. Recall that typically, the consonant that appears after the syllabic consonant is homorganic or identical, although it can also be a non-homorganic stop. ALIGNC̩-R also lies at the heart of this phonotactic restriction. This constraint is implicated because in order to obtain the alignment that it demands, it is necessary that there be some overlapping of the first member of the C̩C sequence with the second one. Otherwise, the right edge of the first consonant would be aligned with the oral closure rather than with the release of the second consonant. An important consequence of the overlapping of one consonant with the other is that their place specifications are combined. Place linkage is obvious in the case of homorganic C̩C clusters because all place values are identical, (55a), but it also occurs in heterorganic C̩C clusters when the constriction of the second consonant is overlapped by that of the first consonant, (55b). In both cases, the two segments are part of a single articulation as evinced by the presence of a single audible release. The difference is that when the two coarticulated consonants are homorganic, the oral closure involves a single constriction; whereas when the two coarticulated consonants are heterorganic, the oral closure consists of a contour, (55b).

(55) a. Homorganic C̩C cluster b. Heterorganic C̩C cluster

Besides the fact that the members of the C̩C sequence need to be coarticulated, one must also take into account that certain coarticulations are more natural than others. Sonorant consonants, for instance, are more likely to be coarticulated with stops than with fricatives. Wells (1995:407) has observed this preference in the formation of syllabic consonants in English Received Pronunciation. In this variety of English, sonorant consonants are more likely to be pronounced as syllabic when they can be coarticulated with a stop (e.g. [bɒdl̩i] *bodily*, [pɹɪtl̩i] *prettily*), than with a fricative consonant (e.g. [helθl̩i] *healthily*, [mesl̩i] *messily*).[15] Wells points out that although the coarticulation of a syllabic sonorant consonant with a fricative is indeed possible, it is less frequent and less obvious to the ear than its coarticulation with a stop. The preference for sonorant consonants to be coarticulated with stops is evident in TNMS, where nasals and liquids fail to become syllabic when they would have to be coarticulated with a following fricative consonant (e.g. *[**ń̩**.sa.pá.t̪o] < [**ún**.sa.pá.t̪o] ‘a shoe’). Such a possibility, however, should not be universally precluded since the English RP data show that the coarticulation of a syllabic sonorant consonant with a fricative is not impossible. It is simply less favored. With this in mind, I propose the constraints *SON&PLO and *SON&FR to assess the difference in markedness between sonorant & stop and sonorant & fricative coarticulations.

(56) *SON&PLO: Sonorant + plosive contours are prohibited.

(57) *SON&FR: Sonorant + fricative contours are prohibited.

In TNMS, a syllabic sonorant consonant can be coarticulated with a stop because the constraint *SON&PLO is dominated by *Δ_{Ft}/Dorsal. By contrast, the coarticulation of a syllabic sonorant consonant with a fricative is disallowed because *SON&FR dominates *Δ_{Ft}/Dorsal. This is illustrated by the parallel evaluations in (58).

(58) Coarticulation is allowed with a stop but not with a fricative:

Input: [(ma.(**lí**.t̪o)]	*SON &FR	ALIGN C̩-R	*Δ_{Ft}/ Dorsal	*SON &PLO	IDENT-V	UNIFOR
a. [(ma.(**lí**.t̪o)]			*!			
☞ b. [(ma.(**ĺ̩**.t̪o)]				*	*	*
Input: [(ma.(**lí**.si.mo)]						
☞ c. [(ma.(**lí**.si.mo)]			*			
d. [(ma.(**ĺ̩**.si.mo)]	*!				*	*

The proposed ranking offers a plausible explanation for the difference in pronunciation between words that contain a sonorant consonant adjacent to the diminutive morpheme *–ít–* (e.g. [ma.(lí.t̪o)] < /mal + it̪+o/ ‘a little bad’), and words where the sonorant consonant is adjacent to the superlative morpheme *–ísim–* (e.g. [ma.(lí.si.mo)] < /mal + isim + o/ ‘extremely bad’). Although in both cases a root-final sonorant consonant ends up adjacent to a stressed high vowel supplied by an affix, only words containing the diminutive suffix are granted an alternative pronunciation with a syllabic consonant, (58b). The reason for this is that since the stressed high vowel of the superlative morpheme is followed by a fricative rather than a stop, the syllabization of the preceding sonorant consonant would give rise to a violation of *SON&FR, (58d).

This analysis also accounts for the fact that although Spanish has other diminutive suffixes whose segmental structure includes a high vowel that is assigned primary stress (i.e.–*ij̞*– and –*ik*–), the only diminutive morpheme that triggers the formation of syllabic consonants is –*it*–. For instance, while the words [bu.rí.t̪o], [bu.rí.j̞o], and [bu.rí.ko] are all possible diminutive forms of [bú.ro] 'donkey', only [bu.rí.t̪o] has an alternative pronunciation with a syllabic trill (e.g. [bu.ŕ̩.t̪o] 'little donkey'). Similarly, although the words [pa.lí.t̪o], [pa.lí.j̞o], and [pa.lí.ko] are all possible diminutive forms of [pá.lo] 'stick', only [pa.lí.t̪o] can be alternatively pronounced with a syllabic lateral (e.g. [pa.ĺ̩.t̪o] 'little stick'). Words that contain a root-final nasal (e.g. [má.no] < /man + o/ 'hand', and [ló.mo] < /lom + o/ 'back of an animal') follow the same pattern.

Tableau (59) shows that the syllabization of the root-final consonant is allowed for the input [(bu.(**rí**.t̪o)] because it prevents a violation of *Δ_{Ft}/Dorsal without running afoul of *SON&FR or ALIGNÇ̩-R, (59b). This contrasts with the evaluation for the input [(bu.(**rí**.j̞o)], for which syllabization is not allowed because it causes a fatal violation of *SON&FR, (59d). Also note that an additional flaw of candidate (59d) is that despite promoting a sonorant consonant to the role of foot DTE, it fails to prevent a violation of *Δ_{Ft}/Dorsal. The reason for this is that since the formation of a syllabic consonant requires that it be coarticulated with a following consonant, the syllabic trill ends up linked to the Dorsal specification of [j̞]. A similar situation arises in the case of the word [(bu.(**rí**.ko)], which cannot have an alternative pronunciation with a syllabic trill because although the coarticulation of the sequence [ŕ̩.k] does not run counter to *SON&FR, the syllabic trill is rejected by *Δ_{Ft}/Dorsal due to its link to the Dorsal specification of [k] upon coarticulation, (59f). That is to say that when the following consonant happens to be either palatal or velar, coarticulation defeats the purpose of making the sonorant consonant syllabic since the segment promoted to the role of foot DTE ends up being linked to a Dorsal specification anyway, (59d,f). This analysis thereby accounts for the fact that the syllabic consonants of TNMS occur only before coronal or labial consonants.

(56) *–it–* is the only diminutive suffix that triggers syllabization:

Input: [(bu.(**rí**.t̪o)]	*SON &FR	ALIGN C̩-R	*Δ_{Ft}/ Dorsal	*SON &PLO	IDENT-V	UNIFOR
a. [(bu.(**rí**.t̪o)]			*!			
☞ b. [(bu.(**ŕ̩**.t̪o)]				*	*	*
Input: [(bu.(**rí**.j̞o)]						
☞ c. [(bu.(**rí**.j̞o)]			*			
d. [(bu.(**ŕ̩**.j̞o)]	*!		*		*	*
Input: [(bu.(**rí**.ko)]						
☞ e. [(bu.(**rí**.ko)]			*			
f. [(bu.(**ŕ̩**.ko)]			*!	*	*	*

Not only the structure that appears to their right, but also the material that appears to their left plays an important role in the distribution of syllabic consonants. In this regard, it is interesting to observe that while it is absolutely necessary that there be a following consonant, the presence of a preceding consonant is disfavored. This is related to the tendency for the syllabic consonants of TNMS to occur in syllables without onsets or codas.

In fact, if it were not for the form [m**r̩̀**.re] < [m**ù**.**r**e] 'extremely', it could be said that the syllabic consonants of TNMS always occur as the only segment parsed by the syllable that they head. In this regard, Bell (1970/1979) remarks that there is a crosslinguistic preference for syllabic consonants to occur in syllables that are either deprived of margins, or have margins that are simpler in comparison to those of syllables with vocalic nuclei. An obvious reason for this is that since prior to its syllabization a consonant sits at the margin of a syllable, transferring that segment into the syllable nucleus has the effect of freeing a syllable-margin position. This argument, however, does not explain why the maximum number of margin segments for syllables with consonantal nuclei is often more than one segment less than the maximum number of margin segments for syllables with vocalic nuclei (Bell 1979:164). In the case of TNMS, for example, the maximum number of margin segments for syllables with vocalic nuclei is $[C^2VC^1]_\sigma$, whereas the maximum number of margin segments for syllables with consonantal nuclei is $[C^1\text{C̩}]_\sigma$. It must be then that additional constraints are at large.

The fact that TNMS allows the promotion of a non-dorsal consonant to the role of foot DTE at the expense of creating an onsetless syllable (i.e. $[\text{Ć̩}]_\sigma$ < $[\text{CV́}]_\sigma$) means that the constraint $*\Delta_{Ft}$/Dorsal takes precedence over the syllable wellformedness constraint ONSET (Prince and Smolensky 1993, 2002).

(60) ONSET: Syllables must have onsets.

(61) A syllable onset may be lost in the process of syllabizing the consonant:

Input: [a.(**ní**.t̪a)]	$*\Delta_{Ft}$/Dorsal	ONSET
a. [a.(**ní**.t̪a)]	*!	*
☞ b. [a.(**ń̩**.t̪a)]		**

In tableau (61), candidate (61b) is optimal because despite incurring more violations of ONSET than its competitor, it avoids having the DTE of the foot be a segment linked to a Dorsal place specification.

Although a preceding consonant would help prevent a violation of ONSET if it were parsed as the onset of the consonant-headed syllable (e.g. $[\mathrm{C}\text{C̩}]_\sigma$), the chances that a sonorant consonant will become syllabic in postconsonantal position are rather slim. If the two consonants were parsed by the same syllable, they would have to abide by the SONORITY SEQUENCING PRINCIPLE, (Selkirk 1984). If, on the other hand, they were parsed by separate syllables, a sequence of two unreleased consonants, which I propose is prohibited by the markedness constraint *C˺C˺, would arise. Moreover, any pair of adjacent consonants that belong to separate syllables is subject to the SYLLABLE CONTACT constraint (Alderete 1995, Rose 2000).

(62) SSP: Sonority must rise from the left syllable margin to the nucleus and drop from the nucleus to the right syllable margin.

(63) *C˺C˺ Sequences of two unreleased consonants are prohibited.

(64) SYLLCON: The initial segment of a syllable may not be of greater sonority than the final segment of the preceding syllable.

(65) Syllabic C's are optimal after a vowel or a pause:

Input: [pa.(**lí**.t̪a)]	SSP	*C˺C˺	SYLL CON	*Δ_{Ft}/ Dorsal	ONSET	IDENT-V	UNIFOR
a. [pa.(**lí**.t̪a)]				*!			
☞ b. [pa.(**ĺ̩**.t̪a)]					*	*	*
Input: [per.(**lí**.t̪a)]							
c. [pa.(**lí**.t̪a)]				*!			
☞ d. [pa.(**ĺ̩**.t̪a)]					*	*	*

Tableau (65) demonstrates that the ranking of these constraints over *Δ_{Ft}/Dorsal poses no impediment to the syllabization of sonorant consonants after a vowel or a pause. Candidates (65b,d) are superior to their competitors because despite the violations of ONSET, IDENT-V, and UNIFORMITY that they incur, they comply with *Δ_{Ft}/Dorsal.

A quite different situation arises when the sonorant consonant + stressed high vowel combination is preceded by another consonant. Tableau (66) shows that in such case, the formation of a syllabic consonant to prevent a violation of *Δ_{Ft}/Dorsal may cause a clash with one of the higher-ranking constraints SSP, *C˺C˺, or SYLLCON.

(66) Avoidance of syllabic C's in post-consonantal position

Input: [peɾ.(**lí**.t̪a)]	SSP	*C˺C˺	SYLL CON	*Δ_{Ft}/ Dorsal	ONSET	IDENT-V	UNIFOR
☞ a. [peɾ.(**lí**.t̪a)]				*			
b. [peɾ.(**ĺ̩**.t̪a)]		*!			*	*	*
c. [pe.(ɾ**ĺ̩**.t̪a)]	*!					*	*
Input: [pal.(**mí**.t̪a)]							
☞ d. [pal.(**mí**.t̪a)]				*			
e. [pal.(**ḿ̩**.t̪a)]		*!			*	*	*
f. [pa.(l**ḿ̩**.t̪a)]	*!					*	*

Candidates (66c,f) are ruled out by SSP because by parsing both members of the consonant cluster within the same syllable (e.g. [ɾ**l̩**]$_\sigma$ and [l**m̩**]$_\sigma$), they create a drop rather than the required rise in sonority from the left syllable margin to the nucleus. This result follows from the standard assumption that rhotics are more sonorous than laterals, which in turn are more sonorous than nasals. Candidates (66b,e) show that although parsing the two adjacent consonants in separate syllables helps avoid a violation of SSP, this move is also rejected because it creates a sequence of two unreleased consonants. The assumption made in this regard is that both syllabic consonants and consonants assigned to the syllable coda (implosive position) are segments deprived of an audible release. With this state of affairs, the best action is to leave the input form unchanged and resign to an unavoidable violation of *Δ_{Ft}/Dorsal, (66a,d).

The ranking in (66) does not mean, however, that syllabic consonants are impossible in postconsonantal position. If the segmental structure of the input form is such that the syllabic consonant would be preceded by a consonant of lower sonority, the parsing of both consonants within the same syllable should be possible because it does not run counter to SSP (e.g. [**mr̩̀**.re.ɣɾã́ⁿ.d̪e] < [mù.re.ɣɾã́ⁿ.d̪e], where the syllable [mr̩̀] does have a rise in sonority from the margin to the nucleus).

In tableau (67), candidate (67b) gets away with having a syllabic consonant in postconsonantal position because it is able to remove a stressed high vowel from the role of foot DTE without running afoul of the dominant constraints SSP, C˺C˺, or SYLLCON. Note, in particular, that the CC̩C sequence that candidate (67b) contains does not run afoul of the constraint *C˺C˺ because the first and last consonants of the triconsonantal cluster are released by virtue of their parsing as syllable onsets (plosive position). Another point that is worth highlighting is that although the stressed high vowel in the input form is flanked by sonorant consonants (a nasal and a liquid), it is the consonant of higher sonority (the liquid) that is chosen to act as the nucleus of the syllable. This is necessary in order to comply with SYLLCON because if it were the consonant of lower sonority that became syllabic, then the following syllable would start with a segment of greater sonority than the last segment of the preceding syllable, (67c).

(67) A consonant of lower sonority may precede a syllabic C

Input: [(**mù**.**r**e).(ɣɾã́ⁿ.d̪e)]	SSP	*C˺C˺	SYLL CON	*Δ_{Ft}/ Dorsal	ONSET	IDENT-V	UNIFOR
a. [(**mù**.**r**e).(ɣɾã́ⁿ.d̪e)]				**!			
☞ b. [(**mr̩̀**.re).(ɣɾã́ⁿ.d̪e)]				*		*	*
c. [(**m̩̀**.**r**e).(ɣɾã́ⁿ.d̪e)]			*!	*	*	*	*

An interesting twist that the evaluation in (67) presents is that the input [(**mù**.**r**e).(ɣɾã́ⁿ.d̪e)] could be said to contain not one, but two root morphemes. One of them is certainly the sequence [ɣɾã́ⁿd] < /gɾand/ 'big', and the other one would be the sequence [mú] < /mui/ 'very'.[16] Notice that it is the latter morpheme that provides the high vowel that receives stress. If the sequence [mu] is indeed part of a root, then candidate (67b) should be ruled out by IDENT-ROOT, which by virtue of dominating *Δ_{Ft}/Dorsal, was shown to preclude the syllabization of consonants at the expense of root vowels (Section 4). It appears that the reason why IDENT-ROOT does not block the formation of a syllabic consonant in the expression [(**mù**.**r**e).(ɣɾã́ⁿ.d̪e)] 'extremely big' is because the adverb [mú] has combined with the intensive prefix [re] to form a new prefix that denotes greater intensity. A change in morphological status from root to prefix would account for the exceptionality of the adverb [mú]. It would explain why the stress of this form is reduced from primary to secondary, and why despite containing both a sonorant consonant and a stressed high vowel, the formation of a syllabic consonant from the segmental string of this morpheme is only possible when it is in combination with the prefix [re] (Espinosa 1925:117).

Despite playing no crucial role in the evaluation in (67), IDENT-ROOT is responsible for the fact that except for suffixed forms (e.g. diminutives), words with the structure [...CV́.CV] or [...CV́C.CV], where the penultimate syllable contains a stressed high vowel next to a sonorant consonant, do not have an alternative pronunciation with a syllabic consonant (e.g. *[pṇ̍.t̪a] < [pṹⁿ.t̪a] 'tip', *[mŗ́.**r**a] < [m**í**.**r**a] 'myrth', *[a.nḷ́.lo] < [a.n**ú**.**l**o] 'I anull', *[se.pḷ́.t̪o] < [se.p**úl**.t̪o] 'I bury', etc.). It is clear from the evaluation in (68) that although the CC̩C cluster that would result from forming a syllabic consonant in such words does not run afoul of SSP, *C˺C˺, or SYLLCON, the coalescence of the sonorant consonant + stressed high vowel combination is not permitted because it would be detrimental to the identity of a vowel that belongs to a root morpheme, (68b,d).

(68) IDENT-ROOT also limits the occurrence of postconsonantal syllabic C's:

Input: [a.(n**ú**.**l**o)]	IDENT-ROOT	SSP	*C˺C˺	SYLLCONT	*Δ_{Ft}/Dorsal	ONSET
a. [a.(n**ú**.**l**o)]					*	
b. [a.(nḷ́.lo)]	*!					
Input: [(p**ṹⁿ**.t̪a)]						
a. [(p**ṹⁿ**.t̪a)]					*	
☞ b. [(pṇ̍.t̪a)]	*!					

Lastly, with the constraint UNIFORMITY being bottom-ranking, it is possible to create a syllabic nasal in postnasal position because the problem of creating a CC̩C cluster where the first two consonants are nasal can be solved through coalescence, (69). This happens when the indefinite article is preceded by a word ending in a nasal consonant, in which case a sequence of a stressed high vowel flanked by nasal consonants is created (e.g. [ko.**nṹᵐ**.pá.lo] < /ko**n un** palo/ 'with a stick'). Forming a syllabic consonant in this context involves two violations of UNIFORMITY, because the first of the two nasal consonants coalesces with the preceding vowel to form a nasal vowel while the second nasal consonant coalesces with the stressed high vowel to form the syllabic nasal, (69d). Both instances of coalescence are absolutely necessary because the removal of the high vowel from the role of foot DTE must take place without giving rise to an illformed consonant cluster, (69b,c).

(69) Nasal absorption facilitates the creation of a syllabic nasal:

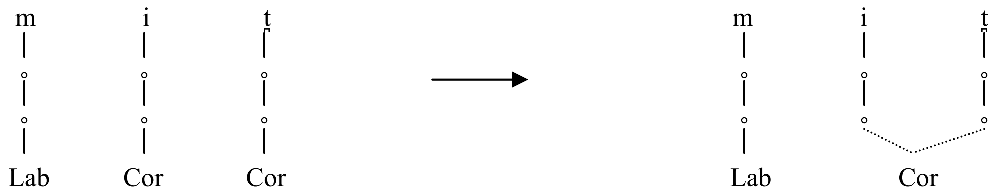
	Input: $[k_1o_2.(n_3\mathbf{\acute{u}}_4{}^{\mathbf{m}}{}_5).(p_6\acute{a}_7.l_8o_9)]$	SSP	*C˺C˺	SYLL CON	*Δ_{Ft}/ Dor	ONS	ID-V	UNIF
	a. $[k_1o_2.(n_3\mathbf{\acute{u}}_4{}^{\mathbf{m}}{}_5).(p_6\acute{a}_7.l_8o_9)]$				**!			
	b. $[k_1o_2.(n_3\mathbf{\text{ḿ̩}}_{4,5}).(p_6\acute{a}_7.l_8o_9)]$	*!			*		*	*
	c. $[k_1\tilde{o}_2{}^{m}{}_3.(\mathbf{\text{ḿ̩}}_{4,5}).(p_6\acute{a}_7.l_8o_9)]$		*!				*	*
☞	d. $[k_1\tilde{o}_{2,3}.(\mathbf{\text{ḿ̩}}_{4,5}).(p_6\acute{a}_7.l_8o_9)]$				*	*	*	**

5. An alternative account

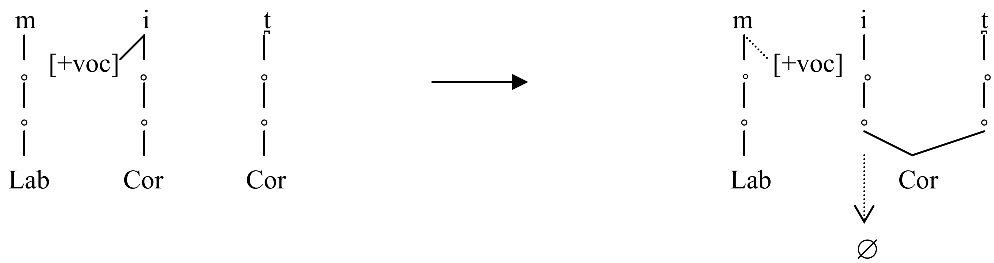
The analysis presented above differs substantially from the only previous proposal to account for the formation of syllabic consonants in TNMS (Lipski 1993). A crucial difference is that whereas Lipski (1993) claims that in the process of creating a syllabic consonant one of the members of the sonorant consonant + stressed high vowel combination is deleted, the view defended here is that these segments coalesce. I will refer to these proposals as the deletion and the coalescence approach, respectively.

Within the deletion approach, which is couched within the framework of Autosegmental Phonology, the OCP is the factor that leads to the creation of syllabic consonants. To invoke the OCP, it is stipulated that the high front vowel, [i], and the high back vowel, [u], are deprived of a Dorsal node. According to this, [i] is represented with a bare Coronal node, while [u] is represented with a bare Labial node. Furthermore, it is stipulated that coronal and labial consonants have no articulator-dependent features. That is to say, they also have a bare Coronal or Labial node, respectively. With such representations, the OCP can be called on to induce linking of identical articulator nodes whenever [i] is adjacent to a coronal consonant or [u] is adjacent to a labial consonant. For reasons of space, only the coronal environment is illustrated in the sample derivation below.

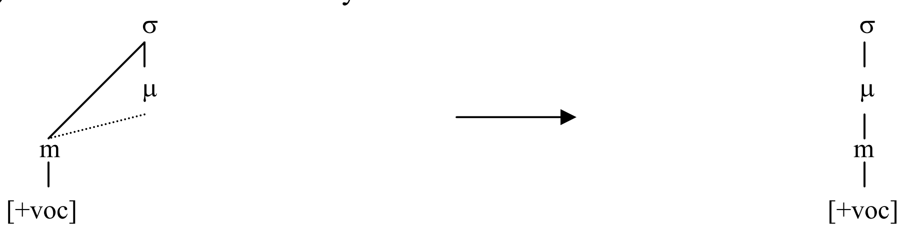
(70) Coronal-node linking is induced by the OCP:



(71) The feature [+vocalic] spreads and the vowel is deleted:



(72) The mora left behind by the deleted vowel is reassociated:



As the representations above illustrate, once the identical nodes are merged, the [+vocalic] specification of the vowel spreads to an adjacent sonorant consonant, (71). This is said to leave the root node of the vowel depleted of all features and calls for Stray Erasure to delete the empty root node (Lipski 1993:118). Lastly, the mora left behind by the deleted vowel links to the sonorant consonant that took its [+vocalic] specification. This allows the reconstitution of the syllable with the sonorant consonant as its nucleus.

There are several serious problems that make this analysis untenable. One of them has to do with the motivation for the deletion of the high vowel. Although the OCP is known to be the trigger of a variety of phonological processes including deletion, its involvement in the creation of syllabic consonants in TNMS is spurious. The only reason why the deletion approach can call on the OCP to undermine high vowels is because it conveniently manipulates the phonological representations of both consonants and vowels. For instance, it is questionable to represent vowels without a Dorsal node, because the essential articulatory gesture of vowels is precisely a tongue-body position (Fowler 1980, 1983). Furthermore, although the same articulators that produce consonants are involved in the production of vowels, this does not mean that consonants and vowels have the same articulator-dependent features. Labial consonants, for instance, are normally [−round], wheras labial vowels are usually [+round]. Similarly, [+anterior] is the unmaked specification for coronal consonants, whereas coronal vowels are normally [−anterior]. When consonants and vowels are given accurate representations, no vowel could be place-linked to an adjacent consonant because even if the vowel had one of its articulators in common with the consonant, the two segments would still not have the same content under their place nodes. Notice for example that the segments of the sequence [it̪] could not be linked at the level of the Coronal node as they appear in (70); whereas the Coronal node of [i] dominates the feature [−anterior], the Coronal node of [t̪] dominates the feature [+anterior]. Neither could these segments be linked at the level of the Place node because while the Place node of [i] dominates both a Coronal and a Dorsal node, the Place node of [t̪] dominates a Coronal node only.

The arbitrariness of the representations employed by the deletion approach is even more evident in the account of the syllabic nasal created from the first person possessive adjective *mi* (e.g. [(**m̩̀**.pa).(ké.t̪e)] < [(**mì**.pa).(ké.t̪e)] ‘my package’). Given that there is no coronal consonant next to the high vowel, the deletion approach is forced to alter its original stipulation that [i] has a bare Coronal node. Instead, it is claimed that in this particular case [i] does not even have a Coronal node, as it is completely underspecified for place features (Lipski 1993:124). Such manipulation of the representations is only a convenient way to set up the OCP as the culprit for vowel deletion. Even under a principled theory of underspecification, it is highly unlikely that the input for the formation of syllabic consonants will have any underspecified segments. If we were to assume that at the underlying level segments are underspecified for predictable features, the missing specifications would still be supplied via redundancy rules by the end of the lexical level. Therefore, since it is clear that the formation of syllabic consonants takes place at the post-lexical level, the input for this process must be a fully specified form.

Besides its theoretical shortcomings, the deletion approach is flawed because it fails to capture the key generalizations in the process of forming syllabic consonants in TNMS. Lispki (1993:111) explicitly denies that syllabic-consonant formation is sensitive to morphological conditions such as the presence of the diminutive morpheme. However, through a careful examination of the morphemes that contribute to create the contexts where syllabic consonants arise, I have demonstrated that the process is morphologically conditioned. This is evinced by the fact that among the many examples provided by Espinosa (1909/190, 1911/1946 1925), there are only two words where the vowel that is absorbed does not belong to an affix or a function word. The important role that the morphology plays in the formation of syllabic consonants in TNMS is not surprising in the context of crosslinguistic studies such as Bell (1970/1979), who found that it is not uncommon for syllabic consonant formation to respect the identity of root morphemes. Moreover, although Lipski (1993) acknowledges that the formation of syllabic consonants takes place after all metrical structure has been projected, his analysis misses the generalization that only high vowels that bear stress may be absorbed by an adjacent sonorant consonant. Failure to recognize the important role of both morphological and metrical structure causes the deletion approach to overgenerate. It is predicted that vowels that belong to root morphemes as well as vowels deprived of stress could be absorbed in order to generate syllabic consonants. Nonetheless, careful scrutiny of the facts described by Espinosa reveals that this is not true.

The deletion approach also falls short in accounting for the phonotactic restrictions that limit the distribution of syllabic consonants in TNMS. It does not explain why the syllabic consonants of this language never occur before a vowel or a pause, or why the presence of a preceding consonant should diminish the chances that the sonorant consonant + stressed high vowel combination will be pronounced as a syllabic consonant. Furthermore, since it fails to connect the formation of syllabic consonants with the fact that Dorsal is the most marked value on the place-of-articulation scale, the deletion approach has no explanation for the lack of palatal and velar syllabic consonants, or for the lack of syllabic consonants before a palatal or velar consonant.

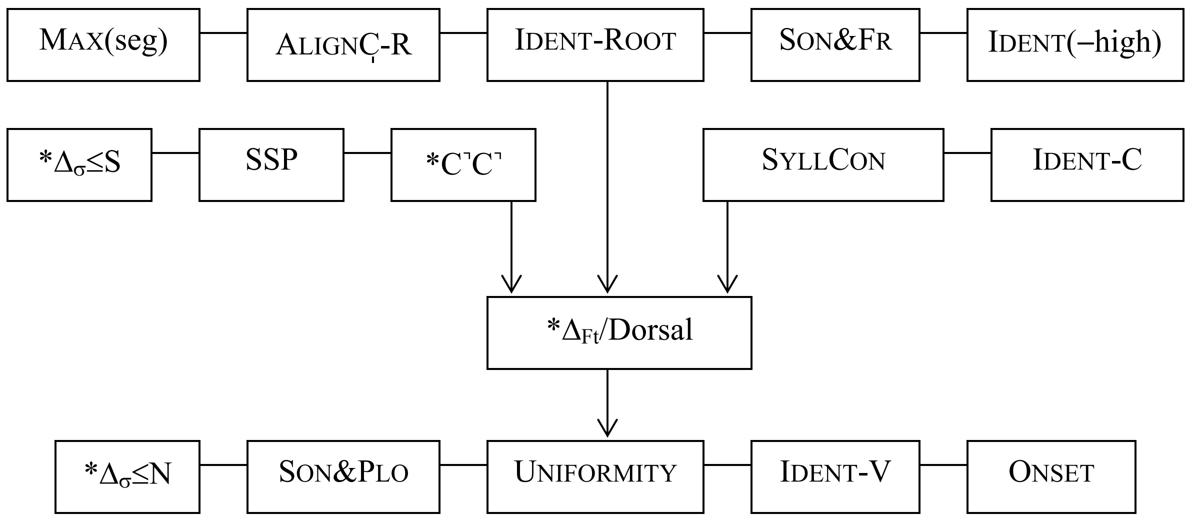
6. Conclusion

The formation of syllabic consonants with the concomitant disappearance of an adjacent vowel is a puzzling phonological phenomenon given that under any version of the sonority scale, vowels are more sonorous than consonants. Since the nucleus constitutes the sonority peak within the syllable, it is surprising that a segment of lower sonority should be used to replace a vowel in the role of syllable head. In TNMS, the peculiarity of this process is accentuated by the fact that the syllable heads that are replaced by consonants are high vowels bearing either primary or secondary stress. The connection between the disappearance of the vowel and its role as a prosodic head has been captured through the constraint *Δ_{Ft}/Dorsal, which prohibits the marked value on the place-of-articulation scale from occuring in the position of foot DTE. The only aspect in which the syllabic consonants of TNMS make better prosodic heads than vowels is their ability to be produced without engaging the tongue body. While all vowels require the action of the tongue body in order to create the global shape of the vocal tract typical of vocalic articulations, labial and coronal consonants may be produced through a localized constriction formed independently of the tongue body. Given that the reason why sonorant consonants become syllabic in TNMS is to replace a segment that bears a Dorsal specification in the position of foot DTE, it would be pointless to use a palatal or velar consonant to substitute the offending segment. This provides a principled explanation for the fact that the syllabic consonants of TNMS may be coronal or labial (e.g. [n̩, m̩, l̩, r̩]), but never palatal or velar.

Contrary to previous approaches that assume that vowel deletion is a condition for the syllabization of a consonant, I have argued, following Coleman (2001) and Espinosa (1909/1930, 1925), that the vowel that disappears in the process of syllabizing a consonant is not deleted but either absorbed by that consonant or assimilated to it. My proposal, however, differs from Coleman's view in the assumption that the syllabic consonant, which originally occupied a margin position, is promoted to the position of syllable nucleus. One of the advantages of this approach is that it explains why syllabic consonants share with vowels the ability to bear stress and function as the articulatory substrate of the entire syllable. That these properties indicate nuclear status is confirmed by the fact that only those vowels that occupy the syllable nucleus bear stress and serve as the articulatory background for the syllable (e.g. glides are always unstressed and their articulation is transitional). Furthermore, the view that the vowel is not deleted but is either absorbed or assimilated is congruent with the observation that syllabic consonants are often accompanied by a vocalic transition. Since it is argued that consonant syllabization is not due simply to the phonetic coproduction of consonants and vowels, but to a phonological process of coalescence or assimilation, the emergence of syllabic consonants is in no way limited to fast speech or to the CVC syllable type, as Coleman's proposal wrongly predicts. Moreover, the assumption that the syllabic consonant occupies the nucleus of the syllable is also crucial to account for the fact that in TNMS sonorant but not obstruent consonants can become syllabic. The reason why obstruents are crosslinguistically less desirable syllabic peaks than sonorants is evidently because of their lower sonority. But if we were to assume that syllabic consonants are not peaks but margins, there would be no criterion one could use to reject the syllabization of obstruent consonants given that languages require peaks but not margins to have a minimum degree of sonority.

Another advantage of the analysis proposed here is that it captures universal phonotactic restrictions that govern the distribution of syllabic consonants. Based on the observation that syllabic consonants always occur adjacent to another consonant (Mohanan 1979), I argued that syllabic consonants are subject to two alignment constraints that require the presence of an adjacent consonant. To obtain the alignment that ALIGNC̩-L and ALIGNC̩-R require, it is necessary that the syllabic consonant be coarticulated with the other consonant. Languages may vary as to whether the syllabic consonant is coarticulated with a preceding or with a following consonant, but there are no languages where syllabic consonants appear between two vowels or between a vowel and a pause precisely because in such environments there is not an adjacent consonant available for coarticulation. The complete constraint ranking obtained from the analysis developed above is as follows.

(73) Complete ranking for consonant syllabization in TNMS:



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Notes

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1 The specific variety of New Mexico Spanish studied here is the one described by Espinosa (1909, 1911, 1925, 1930, 1946). Although Espinosa refers to this dialect as New Mexican Spanish, he acknowledges that his studies did not cover all of the state of New Mexico. The area studied by Espinosa stretches from the city of Socorro as far north as the Valle de San Luis in Southern Colorado. Following Lope Blanch (1987), Bills and Vigil (1999) refer to the dialect spoken in this area as the Traditional Spanish of New Mexico, which dates back to the sixteenth century, when the first Spanish settlements and missions were established in the region. Bills and Vigil emphasize the importance of distinguishing the Traditional Spanish of New Mexico from the more prestigious variety of Spanish spoken in Southern New Mexico and the main metropolitan areas of the state, which is closely related to the Spanish of Northern Mexico. I follow these authors in adopting the term Traditional New Mexico Spanish (TNMS) to refer to the Spanish spoken in Northern New Mexico and Southern Colorado.

2 Although syllabic consonants were quite common in TNMS during the first half of the 20th century (Espinosa 1925, 1930), recent studies suggest that they have fallen in disuse. Lipski (1993:110) reports that "syllabic consonants are infrequent in contemporary New Mexico, except among the oldest speakers whose lives overlap with the informants studied by Espinosa". The low frequency of syllabic consonants in contemporary TNMS is also apparent from preliminary publications related to the *Linguistic Atlas and Archive of the Spanish of New Mexico and Southern Colorado* (Bills 1997, Bills and Vigil 1999, 2000, 2002), where no reference to syllabic consonants is made in the discussion of the phonological traits of this dialect. Fortunately, Espinosa's works contain meticulous descriptions of both the articulation and distribution of syllabic consonants, which allow us to analyze this phenomenon despite its seeming extinction.

3 In only one of the many examples provided by Espinosa, the sonorant consonant that becomes syllabic is not adjacent to a high vowel (e.g. [nò.**m̩**.pú.ðo.βéɾ] < [nò.**me**.pú.ðo.βéɾ] '(s)he could not see me'). This

example, however, is listed under the category *formas raras* ‘uncommon forms’ (Espinosa 1946:22), and it further differs from the regular instances of syllabic consonants in that the syllable that parses the syllabic consonant is not stressed. Given that this is the only counter-example, it poses no actual challenge to the generalization that for sonorant consonants to become syllabic they must be adjacent to a stressed high vowel. The validity of this generalization is confirmed by the overwhelming majority of examples provided by Espinosa (1909/1930 1911/1946, 1925) and his explicit observation that whereas words such as /un/ ‘a’ and /mi/ ‘my’ can systematically be pronounced with a syllabic consonant, words such as /no/ ‘no’ and /me/ ‘me’ cannot (Espinosa 1925:115). Clearly, the reason for this is that only in the former set of words the sonorant consonant is adjacent to a high vowel that bears either primary or secondary stress (e.g. [**ű̃**$^{\mathbf{n}}$.t̪a^{m}.bóɾ] ~ [**ń̩**.t̪a^{m}.bóɾ] < /**un** t̪amboɾ/ ‘a drum’; [**mì**.pa.pá] ~ [**m̩̀**.pa.pá] < /**mi** papa/ ‘my dad’).

4 All of my examples containing syllabic consonants have been extracted from Espinosa (1909/1930, 1911/1946, 1925). In other words, all words with syllabic consonants have been attested.

5 Nasal consonants in syllable-final position are weakly articulated and they cause the preceding vowel to become nasalized (Hills 1906, Espinosa 1909/1930).

6 Espinosa (1909/1930, 1925) mentions the pronunciation of /kl/ and /gl/ clusters with an unstressed lateral consonant preceding the fully consonantal articulation of /l/ (e.g. [k**l̩**líma] < /klima/ ‘weather’, [ĩ^{ŋ}g**l̩**lat̪éra] ~ /inglat̪era/ ‘England’). Although he transcribes this sound as syllabic and groups it with the rest of syllabic consonants, it seems more appropriate to view it as a vocalic transition that results in switching from the velar to the dento-alveolar points of articulation (Gafos 1999:36). This view is supported by the fact that a more common development in the pronunciation of such onset clusters is to separate the two consonants through the insertion of a full vowel, which is a copy of the vowel with which the two consonants were originally syllabified (e.g. [k**i**.li.ma] < [kli.ma] ‘weather’, [ĩ^{ŋ}.g**a**.la.t̪é.ra] < [i^{ŋ}.gla.t̪e.ra] ‘England’). Because it is not clear that the intrusive lateral consonant increases the number of syllables of the word, Alonso (1930) questions the segmental and syllabic status of this segment. Furthermore, since the appearance of the intrusive lateral consonant never involves the absorption of a vowel, it seems reasonable to conclude that it is not created through the same process that gives rise to stressed syllabic consonants.

7 The indefinite article patterns with nouns, adjectives, verbs, adverbs, demonstratives, subject pronouns, and possessive pronouns as words that are regularly pronounced with primary stress in Spanish. That is to say that the stress of the indefinite article has the same degree of prominence as the stress of other primarily-stressed words. The greater prominence of primarily-stressed syllables is phonetically realized as the combined effect of fundamental frequency, duration, and amplitude.

8 Whether stressed or unstressed, word-final /o/ is regularly deleted before another vowel that agrees in backness (e.g. /o/ and /u/)

9 This form occurs in the expression [m**r̩̀**.re.ɣɾá^{n}.d̪e] ~ [m**ù**.**r**e.ɣɾá^{n}.d̪e] ‘extremely big’, where [mú] < /mui/ ‘very’ combines with the intensive morpheme [re] to denote a greater degree of intensity. In other Spanish

dialects, this type of intensification is obtained by combining [re] with the sequence [t̪e], or for even more intensity with the sequence [ket̪e] (e.g. [**ret̪e**ɣɾã́ⁿd̪e] or [**reket̪e**ɣɾã́ⁿd̪e] 'extremely big').

10 Keep in mind that the notation C_1VC_2 does not mean that the two consonants are tautosyllabic

11 This approach differs from theories that represent vowels with a Dorsal node, to which the features [high], [low], and [back] are linked (Keyser and Stevens 1994, Halle 1995, among many others), and those that represent front vowels with a Coronal node, round vowels with a Labial node, and back vowels with a Dorsal node (Clements and Hume 1995).

12 Espinosa (1925:109) clearly states that the syllabic consonants of TNMS are only nasals, laterals, and rhotics, and none of the examples he provides include syllabic obstruents.

13 A reviewer comments that the root vs. non-root distinction may be simply an artifact of the data that Espinosa chose to include. I disagree with this interpretation because the many examples of syllabic consonants provided by Espinosa come not only from his general studies on the phonology and morphology of TNMS, but also from a detailed study dedicated exclusively to syllabic consonants (Espinosa 1925). In that article, Espinosa describes in ample detail the origin and development of each syllabic consonant starting each section with a statement such as "Syllabic [m̩] may normally develop from the following sources", after which he discusses each source (Espinosa 1925:114). It could then not be simply an accident that except for [**ín**.t̪i.ko] ~ [**ń̩**.t̪i.ko] 'identical' and [m**ù**.**r**e] ~ [m**r̩̀**.re] 'extremely', the sources listed are all affixes or function words. Furthermore, the fact that Bell (1979:159) found a greater number of languages where syllabic consonants occur exclusively or largely in grammatical particles and affixes (a total of 37), than the number of languages where they occur largely independently (a total of 34) confirms that morphological affiliation is a strong conditioning factor in syllabic consonant formation.

14 This candidate also violates one of the constraints that govern the projection of metrical feet; namely, ALIGN(Ft, Right), which requires the main-stressed foot to be aligned with the right edge of the prosodic word.

15 English is clearly an instance of the CC̩ language type.

16 To avoid forming a diphthong with two vowels of equal sonority, the second vowel of /mui/ is normally deleted.