

## The audibility and visibility of Mohawk ghosts\*

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Proper Government (PG) is generally assumed to be the basic mechanism which controls the phonetic realisation of empty nuclei. According to the Empty Category Principle (ECP) of standard Government Phonology (see, e.g. Kaye *et al.* 1990), an empty nucleus can remain phonetically inaudible if it is properly governed by an audible nucleus in a neighbouring syllable. Otherwise it must receive phonetic realisation. Phonetic presence vs. phonetic absence has been considered the essential difference between properly governed and ungoverned nuclei.

In this paper I will argue that PG does not simply concern the phonetic realisation of a nucleus, but its *phonological relevance*, which can be manifested in ways other than phonetic presence. Apart from *internuclear* phonotactic conditions of the PG type, empty nuclei can materialise phonetically as a result of *intersegmental* phonotactic conditions.

I will discuss the behaviour of empty nuclei in Mohawk. In this language properly governed nuclei may in certain contexts become *audible*, i.e. phonetically realised, *without* at the same time acquiring the status of ungoverned nuclei. Their proper governee status is manifested in their *invisibility* to stress. Intersegmental phonotactic conditions can determine the audibility of nuclei, but not their prosodic status and visibility to stress.

The discussion will also add support to the approach assuming trochaic PG and the revised ECP, as developed in Rowicka (in press) and van der Hulst and Rowicka (1997).

### 1. Data

#### 1.1. Ghost vowels in Mohawk

Mohawk is a Northern Iroquoian language, still spoken on reserves in Quebec, Ontario and New York State. The basic sources for Mohawk phonology are studies by Michelson (1981, 1983, 1988 and 1989), which is where all the examples below come from.<sup>1</sup> There are three vowels in Mohawk traditionally analysed as epenthetic

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<sup>1</sup> Other sources and studies on Mohawk include Alderete (1995), Beatty (1974), Bonvillain (1973), Chafe (1977), Hagstrom (1997), Mithun (1979), Piggot (1995), Postal (1968) and Potter (1994). For a discussion of some of the analyses see Rowicka (in prep.).

which are phonetically identical to their non-epenthetic counterparts. The vowel [i] is added initially in subminimal words to satisfy a prosodic minimality condition on Mohawk verb forms. A well-formed verb form must minimally contain one branching foot (for a discussion see Piggott 1995). The vowel [a] appears between specific morphemes (as a "stem joiner"). These vowels will not be considered in this paper. I will focus on the epenthetic vowel [e] since only [e] exhibits the special prosodic behaviour to be discussed below.<sup>2</sup> I will refer to it as the "ghost vowel".

The ghost vowel [e] materialises, i.e. becomes phonetically *audible*, to break up consonantal clusters. It shows up after the first member of a triconsonantal cluster or to split up a biconsonantal cluster if its second member is a sonorant ([n, r, w]) or word-final [ʔ]. No [e] appears if [h] or [ʔ] occupies the first place in a cluster or if [s] or [h] occupies the second place.

Consider the examples in (1) where ghost vowels are capitalised.

- (1) a. *between C and word-final [ʔ]*
- |               |            |                             |
|---------------|------------|-----------------------------|
| /ʌ-k-arət-ʔ/  | ʌká:ratEʔ  | 'I lay myself down'         |
| /ro-kut-ot-ʔ/ | rokú:totEʔ | 'he has a bump on his nose' |
- b. *between C and sonorant*
- |            |         |                                  |
|------------|---------|----------------------------------|
| /ʌ-k-r-ʌʔ/ | ʌkEʔʌʔ  | 'I will put it into a container' |
| /w-akra-s/ | wákEras | 'it smells'                      |
- c. *to break up clusters*
- |              |          |                              |
|--------------|----------|------------------------------|
| /s-rho-s/    | sÉrhos   | 'you coat it with something' |
| /s-k-ahkt-s/ | skáhkEts | 'I got back'                 |

The acute accent indicates main stress. There is no secondary stress in Mohawk.

### 1.2. Ghost appearance versus stress

In words with no ghost vowels the main stress falls on the penultimate syllable. The stressed vowel is subject to lengthening (cf. (2a)). Tonic lengthening fails to take place in two types of contexts. The first one is when a consonantal cluster follows (cf. (2b)).

- (2) a. *with tonic lengthening*
- |               |            |                     |
|---------------|------------|---------------------|
| /s-atorat/    | sató:rat   | 'hunt, imper.'      |
| /wak-ashet-u/ | wakashé:tu | 'I have counted it' |

<sup>2</sup> As a matter of fact, stress placement is avoided on the stem joiner (although not quite consistently), which made Michelson and others following her treat the stem joiner as epenthetic, on a par with the ghost vowel [e]. For a different approach see Rowicka (in prep.).

- b. *without tonic lengthening*
- |                |            |                |
|----------------|------------|----------------|
| /k-atirut-haʔ/ | katirúthaʔ | 'I pull it'    |
| /s-ho-ahkt-u/  | shóhktu    | 'he went back' |

The second context where lengthening is blocked involves the occurrence of the ghost vowel [e] in the next syllable and will be discussed later.

Ghost [e] is sometimes visible to stress and sometimes it is not. Consider the examples in (3).

- (3) a. *ghost [e] before a single consonant*
- |               |           |                                    |
|---------------|-----------|------------------------------------|
| /ʌ-k-arət-ʔ/  | ʌká:ratEʔ | 'I lay myself down'                |
| /t-ʌ-k-rik-ʔ/ | tʌkErikEʔ | 'I will put together side by side' |
- b. *ghost [e] before a consonantal cluster*
- |              |            |                 |
|--------------|------------|-----------------|
| /wak-nyak-s/ | wakÉnyaks  | 'I get married' |
| /s-k-ahkt-s/ | skáhkEts   | 'I got back'    |
|              | *ÍskahkEts |                 |

Roughly speaking, ghost [e] in a closed syllable is *visible* to stress, whereas in an open syllable it is *invisible*. Syllables ending in word-final [ʔ] do not count as closed and ghost vowels preceding such [ʔ]'s are invisible. Compare, for instance, the pre-antipenultimate stress in [tʌkErikEʔ] 'I will put together side by side', where none of the ghosts contributes to the metrical structure, and the penultimate stress in [skáhkEts] 'I got back', where the ghost vowel is included in the foot. If it were not, [i] would be added word-initially and stress would fall on the prothetic vowel. This hypothetical but non-existent form is also given in (3b). An example where prothesis does actually take place is given in (4a).

### 1.3. Adjacent ghosts

Sequences of ghost [e]'s complicate the situation. The presence of such vowels in adjacent syllables has different consequences for stress assignment than in non-adjacent syllables. Ghost [e]'s in non-neighbouring syllables are invisible for stress. This is illustrated by the words in (4a) which have pre-antipenultimate stress. On the other hand, in a sequence of two contiguous syllables with ghost [e] one is visible and the other is invisible for stress. This is evidenced by the antipenultimate stress in (4b).

- (4) a. *ghost [e] in non-adjacent syllables*
- |             |           |                  |
|-------------|-----------|------------------|
| /t-n-ehr-ʔ/ | ÍtEnehrEʔ | 'you and I want' |
| /o-nraht-ʔ/ | ónErahtEʔ | 'leaf'           |

b. *ghost [e] in adjacent syllables*

/te-wak-ahsutr-ʔ/	tewakahsú:tErEʔ	'I have spliced it'
	*tewakáhsutErEʔ	
	*tewakahsutÉ:rEʔ	
/yo-t-r-ʔ/	yó:tErEʔ	'it's in the dish/glass'
	*Í.yotErEʔ	
	*yotÉ:rEʔ	

In the first example in (4a) *i*-prothesis takes place. This indicates that none of the non-adjacent epenthetic vowels are visible to stress and so they may not contribute to the minimally required word size. On the other hand, no prothesis takes place in the last example in (4b), which shows that the condition for word minimality is fulfilled by one of the adjacent ghost [e]'s.

Visible and invisible ghost vowels have a different effect on tonic lengthening in the preceding syllable. Tonic lengthening is blocked before invisible ghost vowels in the following syllable, again as in [ÍtEnehrEʔ] 'you and I want' in (4a). On the other hand, visible ghosts, just like contentful vowels, do allow for tonic lengthening in the preceding syllable, for instance, as in [yó:tErEʔ] 'it's in the dish' in (4b).

1.4. *Evidence for the non-underlying status of ghosts*

Evidence for the non-underlying status of ghost [e] involves vowel – zero alternations (not always available), invisibility to stress and the prosodic minimality condition just mentioned, and a comparison with earlier sources on Mohawk where epenthesis was more restricted contextually (see Michelson 1981, 1988). The examples in (5) illustrate:

- the alternation between an audible visible vowel and phonetic zero within the root /ahkt/ 'go back',
- the alternation within the root /ahsutr/ 'splice' where the ghost vowel is alternately stress-invisible and stress-visible, and
- the alternation between zero, an invisible ghost vowel and a visible one at the end of the 1st. person agent. prefix /k/.

(5) a. *Visible [e] vs. ∅*

/s-k-ahkt-s/	skáhkEts	'I got back'
/s-ho-ahkt-u/	shóhkту	'he went back'

b. *Visible [e] vs. invisible [e]*

/te-k-ahsutr-haʔ/	tekahsutÉrhaʔ	'I am splicing'
/te-ʌ-k-ahsutr-ʌʔ/	tʌkahsútErʌʔ	'I shall splice'

c. *Visible [e] vs. invisible [e] vs. ∅*

/k-r-haʔ/	kÉrhaʔ	'I fill it in'
/ʌ-k-r-ʌʔ/	ʌkErʌʔ	'I will put it into a container'
/k-hninu-s/	khní:nus	'I buy'

## 2. Mohawk under trochaic PG

2.1. *Trochaic PG and the revised ECP*

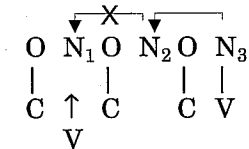
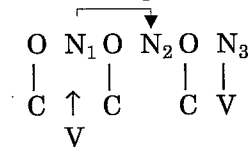
In GP epenthesis is interpreted as filling an empty nuclear position which is present underlyingly. In my view, Mohawk ghost vowels qualify to be interpreted as empty nuclei. However, in Mohawk – unlike in other languages – vowel – zero alternations do not only involve the phonetic presence of the vowels, but also their presence in metrical structure. For the analysis I adopt trochaic PG and the Revised ECP, as stated in (6) (cf. Rowicka, in press, and van der Hulst and Rowicka 1997).

## (6) THE REVISED ECP

*An empty nucleus is phonetically realised if it properly governs another empty nucleus.*

The revised definition of the ECP maintains the original idea that empty positions are either audible or inaudible. A proper governor is required to be audible. However, it is left open whether or not a properly governed position can also be phonetically realised. Indeed, as I will argue here, the relevant distinction between unlicensed and licensed nuclei is not *just* that of phonetic audibility, but also that of prosodic status.

The operation of standard iambic PG and trochaic PG is compared in (7).

(7) a. *Iambic Proper Government*b. *Trochaic Proper Government*

Notice that under trochaic PG a nucleus must be realised not just because it is not properly governed, but because it must properly govern another nucleus. This line of analysis boils down to a fairly uncontroversial requirement that a governing head must be phonetically present.

Notice also that the assumed headedness of PG relations (iambic or trochaic) is independent from the direction of analysis (starting at the end of the word or at its beginning). In most cases the traditionally adopted right-to-left analysis can be preserved.<sup>3</sup>

## 2.2. Mohawk as a strict CV language

I propose that Mohawk is best analysed as a Strict CV type of language. The large majority of its clusters do not qualify either as well-formed branching onsets or coda-onset sequences. There are no underlying long vowels either.

An obvious problem for a Strict CV analysis, but *also for any other analysis of Mohawk constituent structure*, is the occurrence of clusters of up to five consonants, since domain-internally, PG can basically only account for clusters of up to two consonants. The problem seems to be due to the special status of [s, h, ?] in Mohawk. Ghost vowels often fail to break up clusters with these consonants. Almost all surface clusters of more than two consonants contain one (or more) of these consonants. Several factors seem to be involved here. For one thing, no ghost vowels appear after [h, ?] because these consonants are generally avoided intervocally. I suggest that this is due to the prohibition against vowel hiatus. [h, ?] are in a sense “empty” (i.e. maximally unspecified) consonants. They do not differ sufficiently from an entirely empty onset. That is why the restriction against hiatus rules out sequences of vowels separated either by no consonant or only by [h, ?]. Second, no ghost vowels appear before preconsonantal [s, h] which shows that empty nuclei following these consonants do not need to be properly governed. I propose that they are licensed “by magic”.<sup>4</sup> Third, word-final empty nuclei preceded by [s, ?] do not need to be properly governed either. For the purposes of this paper I propose tentatively to relate this fact to Magic Licensing as well (for more discussion see Rowicka in prep.). Magic Licensing will be denoted by the little “sun” symbol “☼” in the representations.

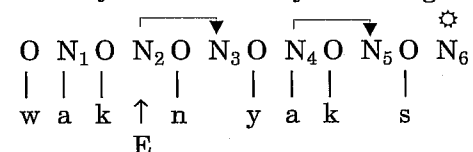
## 2.3. Trochaic PG and stress

Ghost vowels in Mohawk count for stress when followed by a consonantal cluster or by another ghost vowel. Under a Strict CV analysis, both of these contexts involve sequences of empty nuclei. Compare the representations in (8).

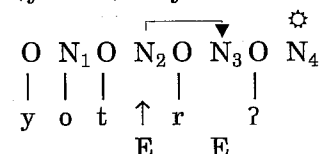
<sup>3</sup> However, as argued by Rowicka (in press), the direction of analysis is not really crucial. Various independent well-formedness considerations can always be shown to be of relevance and interfere in determining the final output form.

<sup>4</sup> Alternatively, one can say that they behave like syllabic consonants, i.e. segments which are linked to the onset position and spread to the following nucleus, like the Japanese moraic nasal in Yoshida's (1990) analysis.

(8) a. /wak-nyak-s/ → wakÉnyaks ‘I get married’



b. /yo-t-r-?/ → yó:tErE? ‘it’s in the dish/glass’



“☼” indicates Magic [s, h, ?] Licensing

In (8a) there are two sequences of empty nuclei in adjacent syllables. In the left-most sequence  $N_2$  must properly govern  $N_3$  and therefore it surfaces. It is visible and receives stress. Magic Licensing affects the final empty nucleus  $N_6$  so that the preceding empty  $N_5$  has no proper governing function. It can therefore be governed itself by contentful  $N_4$  and remains silent.

In (8b) there is a sequence of three empty nuclei. The word-final  $N_4$  is licensed by Magic and does not need to be properly governed. Empty  $N_2$  has a governing role to fulfil with respect to  $N_3$  and therefore becomes audible and visible.

In both representations the ghost vowel which is visible to stress is followed by another ghost vowel which is invisible to stress. In terms of the present model, the visible ghost vowel has in each case a trochaic proper governing function to fulfil. The problem is that the invisible and hence supposedly properly governed  $N_3$  in (8b) is for some reason phonetically realised. I will argue that the reason why it is audible is independent of PG.

Leaving aside for the moment the issue of the phonetic presence of the invisible nucleus  $N_3$  in (8b), one can conclude that the status of the governor in a trochaic PG relation is what makes a ghost vowel visible. Ghosts which are proper governors are audible and visible, while those which are not governors are invisible. Trochaic PG offers an explanation for the diverse behaviour of audible ghost vowels with respect to stress. It is not unexpected that structural heads (here: PG heads) may not be ignored at other hierarchical levels (here: in metrical structure), while non-heads may be.

In Mohawk, just like, e.g. in Polish, stress takes into consideration only those empty nuclei which have the status of (trochaic) proper governors, and ignores those which are properly governed or otherwise licensed. The difference between Polish and Mohawk is that in Polish properly governed nuclei are never phonetically realised, while apparently in Mohawk they sometimes are.

Recall that the Revised ECP, unlike its standard formulation, does *not* specify whether the proper governees should remain inaudible. While the status of a proper

governor always involves audibility, the opposite does not necessarily have to be true.

#### 2.4. Problems for the standard approach

Under the standard theory, one is compelled to interpret the phonetic presence of a nucleus as evidence that iambic PG fails to affect it. Such an interpretation follows from the standard formulation of the ECP. What is more, PG has been argued to be optional in some languages, e.g. in French (cf. Charette 1991). This could then also be the case in Mohawk. However, in Mohawk such an approach faces several problems.

Consider again the word [yó:tErE?] 'it's in the dish' given in (9), this time analysed within the standard framework.

- (9)
- |   |                |   |                |   |                |   |                |
|---|----------------|---|----------------|---|----------------|---|----------------|
| O | N <sub>1</sub> | O | N <sub>2</sub> | O | N <sub>3</sub> | O | N <sub>4</sub> |
|   |                |   |                |   |                |   |                |
| y | o              | t | r              | ↑ | ?              |   |                |
|   |                |   |                | E |                |   |                |
- ✓ - domain final parameter      \*yótrE?  
    \*yotÉrE?

Given iambic PG, N<sub>3</sub> lacks a proper governor to its right since the final empty nucleus N<sub>4</sub> must be (parametrically) licensed itself. Ungoverned N<sub>3</sub> should surface and be able to properly govern the preceding empty nucleus N<sub>2</sub>. N<sub>3</sub> is indeed phonetically realised, but so is N<sub>2</sub>. What is more, it resembles a contentful vowel more than its putative (iambic) proper governor, i.e. N<sub>3</sub>, because it does not block tonic lengthening in the preceding syllable.

Alternatively, if one assumes that PG is optional in Mohawk and applies neither to N<sub>2</sub> nor to N<sub>3</sub>, the question arises why PG is not optional across the board and why some empty nuclei never surface. An even more serious problem is how to account for the different stress behaviour of these nuclei, i.e. the visibility of N<sub>2</sub> and invisibility of N<sub>3</sub>.

The model assuming trochaic PG and the revised ECP does not face such problems. Trochaic PG can adequately predict which empty nuclei must be audible as well as visible.

#### 2.5. Tonic lengthening

Under trochaic PG, the blocking of tonic lengthening in Mohawk before an inaudible empty nucleus or audible invisible ghost vowel in the following syllable can be accounted for in the same way as the shortening of long vowels before an empty nucleus in Turkish and Yawelmani which are dealt with in Rowicka (in press).

Within Strict CV, tonic lengthening is viewed as addition of an empty onset+nucleus sequence following the vowel under main stress. The tonic vowel

spreads its melody to the following empty nucleus so that a long vowel results. Such an analysis of tonic lengthening has, for instance, been proposed for Italian by Larsen (1996).<sup>5</sup>

Such a view of Mohawk tonic lengthening is represented in (10). The stressed unit, i.e. the stressed syllable and the lengthening unit, is underlined.

- (10) /s-atorat/ → sató:rat 'hunt, imper.'
- |   |                |   |                |   |                |   |                |   |                |
|---|----------------|---|----------------|---|----------------|---|----------------|---|----------------|
| O | N <sub>1</sub> | O | N <sub>2</sub> | O | N <sub>3</sub> | O | N <sub>4</sub> | O | N <sub>5</sub> |
|   |                |   |                |   |                |   |                |   |                |
| s | a              | t | o              | r | a              | t |                |   |                |

In Rowicka (in press) I argue that a long vowel in a language with Strict CV structure involves spreading from a contentful proper governor; here N<sub>2</sub>, to the following empty governee, here N<sub>3</sub>, under trochaic PG, provided that the intervening onset is empty.

Consider now an input such as /w-akra-s/ 'it smells' where the nucleus following the main stress location is empty. The representation is given in (11).

- (11) /w-akra-s/ → wákÉras 'it smells'
- |   |                |   |                |   |                |   |                |
|---|----------------|---|----------------|---|----------------|---|----------------|
| O | N <sub>1</sub> | O | N <sub>2</sub> | O | N <sub>3</sub> | O | N <sub>4</sub> |
|   |                |   |                |   |                |   |                |
| w | a              | k | ↑              | r | a              | s | ⊙              |
|   |                |   | E              |   |                |   |                |

The empty nucleus N<sub>2</sub>, although audible, requires to be properly governed by the preceding vowel which happens to be the tonic vowel N<sub>1</sub>. The insertion of an empty syllable under main stress in this case would result in a sequence of two empty nuclei which both need to be properly governed from the left. This is shown below in (12).

- (12)
- |   |                |   |                |   |                |   |                |   |                |
|---|----------------|---|----------------|---|----------------|---|----------------|---|----------------|
| O | N <sub>1</sub> | O | N <sub>2</sub> | O | N <sub>3</sub> | O | N <sub>4</sub> | O | N <sub>5</sub> |
|   |                |   |                |   |                |   |                |   |                |
| w | a              | k | r              | a | s              |   |                |   |                |
- \*wá:kÉras

N<sub>2</sub> can be properly governed by contentful N<sub>1</sub> and tonic lengthening, i.e. spreading from N<sub>1</sub> to N<sub>2</sub>, can take place, but N<sub>3</sub> remains ungoverned. The resulting form in (12) is ill-formed and incorrect. Instead, in order to guarantee trochaic PG for N<sub>3</sub>, no empty syllable is inserted and no lengthening takes place.

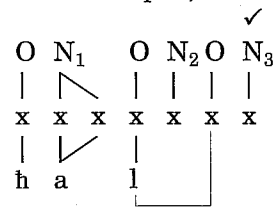
<sup>5</sup> See also Sheer (this volume)

## 2.6. Interonset Government

I come back now to the mechanism which triggers the phonetic realisation of some properly governed nuclei. As an internuclear relation, Proper Government is expected to be blind to the melody of intervening consonants. I argue that this is indeed so in Mohawk. The surfacing of empty nuclei in between specific consonants has been shown *not* to affect their status as proper governees.

The regular breaking up of certain consonantal sequences in Mohawk indicates that not only internuclear relations are relevant in the audibility of empty nuclei, but that interconsonantal relations can play a significant role as well. The existence of relations between consonants in separate onsets was first suggested by Guerssel and Lowenstamm (1988) (see also Kaye 1990, Cyran 1996 as well as Cyran and Gussmann, in press). Interonset Government (IO) is said to be contracted between two consonants in an onset position separated by an empty nucleus. IO has most often been resorted to in cases when an empty properly ungoverned nucleus could remain silent in between specific consonants (i.e. between the two parts of a geminate or a homorganic consonantal cluster). See the Moroccan Arabic example from Kaye (1990) in (13).

(13) ha:ll 'to open, active participle'



*Interonset Government*

Cyran and Gussmann (in press) have been the first to point out the opposite effect of IO. In Polish certain types of consonantal sequences are unattested and cannot even result from the operation of PG. They argue that this is due to the requirements of IO. IO Government in Polish is parametrically set to operate left-to-right. Therefore it favours clusters of raising sonority across empty nuclei, e.g. /kɔn/, and rules out those of decreasing sonority, e.g. /nɔk/. IO seems to take precedence over PG in Polish in that consonantal sequences which are disallowed by IO cannot be "saved" by applying PG to the intervening empty nucleus. That is why the form in (14a) is attested in Polish, while those in (14b) and (14c) are impossible.

(14) a. *Proper Government*  
*Interonset Government*  
tknać 'to touch'

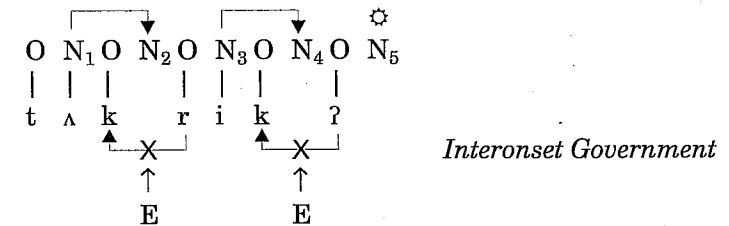
b. *Proper Government*  
*Interonset Government*  
\*cnekić

c. *Proper Government*  
\*cenkić

Cyran and Gussmann argue that the ranking IO over PG can be derived from some general principles. Cyran (1996) also has some proposals regarding this issue.

The situation in Mohawk seems to be the opposite in several respects. "Branching onset-like" clusters are always broken-up by a ghost vowel. This indicates that no sonorant can be a dependent of the preceding consonant in a left-headed IO relation. Consider the example in (15).

(15) /t-ʌ-k-rik-ʔ/ → tʌkErikEʔ (\*tʌkrikʔ) 'I will put together, side by side'



No left-headed IO relations are possible between the onsets enclosing N<sub>2</sub> and N<sub>4</sub> in (15). Therefore the intervening nuclei must be phonetically realised to break up the clusters.

The glottal stop patterns in behaviour with sonorants. Clusters of a consonant and [ʔ] are impossible, not only in word-final position. I suggest that N<sub>4</sub> above is also phonetically realised for the reasons of IO requirements. The glottal stop cannot be in an IO relation with the consonant it stands next to. The melodic adjacency has to be broken up by a surfacing nucleus.

Contrary to Polish, one does not observe "positive" IO effects, i.e. although clusters of increasing sonority are ruled out, those of decreasing sonority are not favoured, either. I propose that IO functions in Mohawk only exist in the form of negative conditions on melodic sequencing.

Mohawk also differs from Polish in that PG in Mohawk functions totally independent of IO. As I have argued, PG relations are established irrespective of the melodic content of consonants. Whether or not IO requirements make an empty nucleus audible has no effect on the proper governing status of this nucleus.

This difference between Polish and Mohawk can be interpreted as evidence that there is no universal ranking between IO and PG, contrary to the conclusions of Cyran (1996) and Cyran and Gussmann (in press). What is more, there is no interaction between the two types of relations in Mohawk. Alternatively, one may conclude that the situation in Mohawk calls for a two-level analysis. Lexically, only PG relations can be contracted, and IO conditions play no role. Stress and tonic lengthening must also be determined at this level. Postlexically a new system has developed in which IO relations are relevant and possibly interfere with PG, but cannot "undo" the results of lexical PG and stress assignment. In this paper I will leave open the issue as to which of these approaches seems more adequate. The precise working of the IO mechanism and its interaction with the rest of the phonology requires a more detailed study in Mohawk as well as cross-linguistically.

### 3. Conclusion

In this paper I have discussed the behaviour of the ghost vowel [e] in Mohawk. Such vowels, even though audible, i.e. phonetically realised, are not always visible with respect to stress. They do not have a consistent effect on tonic lengthening, either, since only invisible ghosts block it.

I have proposed an analysis in terms of trochaic Proper Government. According to this analysis, what distinguishes visible from invisible ghosts is the status of the former as proper governors. It also indicates that, in terms of internuclear relations, audible but invisible ghosts have the same status as empty nuclei which are inaudible. Both are invisible to stress, both block tonic lengthening in the preceding syllable, and both trigger the surfacing of a proper governor in the preceding syllable. I have argued that the phonetic audibility of some invisible ghosts is due to IO requirements. These are independent of PG in Mohawk.

The primary conclusion which follows from the above analysis is that PG does not simply pertain to the phonetic presence or absence of a nucleus, but to its phonological status. The latter can be deduced from the former two aspects in the great majority of languages, where licensed nuclei are always inaudible and unlicensed nuclei are always audible. In Mohawk the differences in the phonological status are manifested instead in the way nuclei are treated by stress. Within a model adopting trochaic PG, phonological relevance is an attribute of (proper) governing heads, which is to be expected.

### References

- Alderete, J. (1995) Faithfulness to prosodic heads. Ms. Amherst: University of Massachusetts.
- Beatty, J. (1974) *Mohawk morphology*. Ph.D. dissertation. New York: City University of New York (1972). Published in *Occasional publications in anthropology linguistics series 2*. Greeley, CO: Museum of Anthropology, University of Northern Colorado.
- Bonvillain, N. (1973) *A grammar of Akwesassne Mohawk*. Ottawa: National Museum of Man.
- Chafe, W. (1977) Accent and related phenomena in the Five Nations Iroquois languages. In *Studies in stress and accent. Southern California occasional papers in linguistics 4*. L. Hyman, ed., 169-181. Los Angeles: Department of Linguistics, University of Southern California.
- Charette, M. (1991) *Conditions on phonological government*. Cambridge: Cambridge University Press.
- Cyran, E. (1996) Licensing properties of nuclei and principle ranking in Irish. *The Linguistic Review 13*:1-31.
- Cyran, E. and E. Gussmann (in press) Consonant clusters and governing relations: Polish initial consonant sequences. In *The syllable: views and facts*. H. van der Hulst and N. Ritter, eds. Berlin and New York: Mouton de Gruyter.
- Guerssel, M. and J. Lowenstamm (1988) Classical Arabic "metathesis". Paper presented at the Generative Phonology Workshop "How phonology is different", University of Leiden.
- Gussmann, E. and J. Kaye (1993) Polish notes from a Dubrovnik café. I: the yers. *SOAS Working Papers in Linguistics and Phonetics 3*:427-62.
- Hagstrom, P. (1997) Contextual metrical invisibility. *MIT Working Papers in Linguistics 30*: 67-86.
- Hulst, H. van der and G. J. Rowicka (1997) On some parallels between (un)stressed vowels and (un)realised empty nuclei. In *Phonology in progress - progress in phonology*. G. Booij and J. M. van de Weijer, eds., 125-49. The Hague: Holland Academic Graphics.
- Kaye, J. (1990) 'Coda' licensing. *Phonology 7*:301-30.
- Kaye, J., J. Lowenstamm, and J.-R. Vergnaud (1990) Constituent structure and government in phonology. *Phonology 7*:193-231.
- Larsen, U. B. (1996) Vowel length, raddoppiamento sintattico and the selection of the definite article in Modern Italian. Ms. Paris: Université Paris 7.
- Lowenstamm, J. (1996) CV as the only syllable type. In *Current trends in phonology: models and methods*. J. Durand and B. Laks, eds., 419-441. Salford, Manchester: European Studies Research Institute.
- Michelson, K. (1981) Stress, epenthesis and syllable structure in Mohawk. *Harvard studies in phonology 2*:311-53.
- Michelson, K. (1983) *A comparative study of accent in the Five Nations Iroquoian languages*. Ph.D. dissertation. Cambridge, Mass.: Harvard University.

- Michelson, K. (1988) *A comparative study of Lake-Iroquoian accent*. Dordrecht: Kluwer.
- Michelson, K. (1989) Invisibility: vowels without a timing slot in Mohawk. In *Theoretical perspectives on native American languages*. D. B. Gerds and K. Michelson, eds., 38-69. Albany, N.Y.: SUNY Press.
- Mithun, M. (1979) Iroquoian. In *The languages of native America*. L. Campbell and M. Mithun, eds., 133-212. Austin: University of Texas Press.
- Piggott, G. (1995) Epenthesis and syllable weight. *Natural Language and Linguistic Theory* 13:283-326.
- Postal, P. (1968) *Aspects of phonological theory*. New York: Harper and Row.
- Potter, B. (1994) Serial optimality in Mohawk prosody. *Papers from the 30th Regional Meeting of the Chicago Linguistic Society* 1:347-61.
- Rowicka, G. J. (in press) On trochaic proper government. In *Phonologica 1996. Syllables!?* J. R. Rennison and K. Kühnhammer, eds. The Hague: Holland Academic Graphics.
- Rowicka, G. J. (in prep.) *On ghost vowels*. Ph.D. dissertation. Leiden: HIL/Leiden University.
- Yoshida, S. (1990) A government-based analysis of the "mora" in Japanese. *Phonology* 7:331-51.

## Governing domains are head-final\*

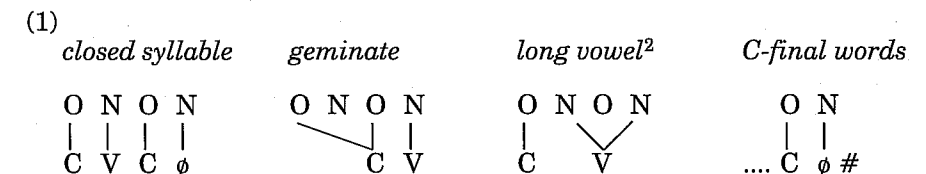
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In recent work, analyses have been put forward which assume a "CVCV"-constituent structure allowing only for a strict sequence of non-branching onsets and non-branching nuclei (Lowenstamm 1996).<sup>1</sup> These analyses rely crucially on the assumption of a CVCV-structure and are not sustainable within a more traditional model recognising branching constituents and codas.

In this paper, I explore some of the consequences that a strict CVCV structure entails for phonological and government theory. The logical implications discussed will allow for an evaluation of the CVCV model in comparison with traditional views of constituent structure. It will be shown that the assumption of a strict CVCV structure leads to a unified model where all governing domains are head-final. After a short introduction to CVCV (section 1), the particular questions I address are Proper Government (section 2), interconsonantal relations (section 3), vowel length (section 4), and the governing and licensing abilities of various phonological actors (section 5).

### 1. CVCV syllable structure

The CVCV-model (Lowenstamm 1996) views syllabic structure as a strict alternating sequence of non-branching onsets and non-branching nuclei (i.e. no branching constituents, no codas). For the sake of clarity, consider how closed syllables, geminates, long vowels and the right edge of consonant-final words are represented within this framework



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<sup>1</sup> See e.g. Lowenstamm (1988), Guerssel and Lowenstamm (in prep.), Bendjaballah (1995), Creissels (1989), Bonvino (1995), Ségéral (1995), Hérault (1989), Nikiema (1989), Ségéral and Scheer (1994, in press), Larsen (1994, 1995), Heo (1994), Scheer (1996, 1997b, in press b).

<sup>2</sup> A discussion of the headedness of long vowels is provided in section 4.