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QUANTITY IN PHONETICS AND PHONOLOGY: A GOVERNMENT PERSPECTIVE

A b s t r a c t. The major aim of this article is to discuss the phonetic manifestation of phonological structure as regards the dimension of quantity. The model adopted in the analysis is that of Government Phonology which remains in sharp contrast with the generative framework that employed distinctive features and binary feature values to express the phonological opposition between short and long phonemic units. Government Phonology represents quantity on a separate autonomous level consisting of skeletal positions.

We shall pinpoint the major problems pertaining to the phonetics—phonology interface as regards the dimension of quantity. To this end, the linguistic systems of English, Irish or Japanese will provide us with examples depicting the existing mismatches between the phonological representations of quantity and their phonetic manifestations. Interestingly, what sounds short or long phonetically not always need to be the manifestation of the two corresponding structural configurations.

Key words: quantity, quality, structure, stability, manifestation, interface.

1. INTRODUCTION

The phonetic manifestation of phonologically-encoded information has always occupied a significant place in phonological investigations. Analyses couched within the generative framework employed distinctive features and binary feature values to express the phonological opposition between short and long phonemic units. Government Phonology (henceforth GP) departs from such an approach to quantity. The model proposed by Kaye, Lowenstamm and Vergnaud (1985, 1990) (henceforth KLV) and developed in Charette (1991), Harris (1994), or Cyran (2003, 2010), Scheer (2004), Bloch-Rozmej (2008), represents quantity on a separate autonomous level con-

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sisting of skeletal positions. Skeleton is both the timing tier and one where the basic relations of dominance are represented.

This presentation is meant to outline the major problems pertaining to the phonetics—phonology interface as regards the dimension of quantity. We shall look into a number of linguistic systems, including English, Irish or Japanese, with a view to depicting the existing mismatches between the phonological representations of quantity and their phonetic manifestations.

2. HISTORICAL DIGRESSIONS

Phonological quantity contrasts may involve both vowels and consonants. There are languages that possess long versus short vowels to the absence of true geminates (e.g. English), those that lack either long vowels or consonants (Polish) and interestingly, we can also find systems such as Luganda where both types of vocalic and consonantal quantity contrasts can be found. The examples illustrating the last language category are *wela* 'refuse' versus *weela* 'rest' as well as *yiga* 'learn' versus *yigga* 'hunt' (Tucker, 1962). It is noteworthy that phoneticians came to notice the problem of sound duration long before phonology was born as an independent linguistic field. Suffice it to mention the classical school of phonetics with such representatives as Henry Sweet, E. Sievers, P. Passy or Otto Jespersen. From the point of view of the later development of phonology, their most important postulate was introducing a distinction between distinctive and non-distinctive phonetic features. This principle was first formulated by Winteler in 1876 who also used the commutation test—a fundamental mechanism in the Prague School of phonology. In his analyses produced in the years 1897-99, Jespersen employs the diacritic symbols to indicate the differences in sound length that are dependent on either word stress or the position of the units in syllable structure. Later phonological theories recognized the concept of sound quantity as one of the basic criteria underlying phoneme distinction. It was of particular importance in the SPE model where the long/short contrast was expressed by means of the binary valued distinctive features [+/− long]. As will be depicted in the subsequent sections, the representation of the long/short contrast by means of the distinctive feature turns out insufficient in the account of the compensatory lengthening phenomena demonstrating the principle of quantity stability. Importantly, it was McCarthy (1979) to represent duration contrasts as ones in the number of V or C slots to which

a segment was linked. In this way the phonological dimension of 'segmenthood' was autosegmentalised and thus separated from the melodic properties. Hence, in non-linear theories, such as Autosegmental Phonology or Government Phonology, which is rooted in the autosegmental tradition, the melodic and relational information is represented on independent levels of phonological structure. There is also a separate timing tier where the quantity dimension is encoded. In models that stem from this tradition, multiple association of melodies to timing slots is realized as length.

3. QUANTITY IN GOVERNMENT PHONOLOGY

In Government Phonology segments with their contrastive and non-contrastive properties cease to be the major concern of phonological analysis. The central preoccupation of the theory are the relations obtaining between skeletal positions. It is in terms of lateral relations in which the positions are engaged that a phonological representation is structured. The properties spanning skeletal slots have a direct bearing upon both their organisation into syllabic constituents and the association of concrete melodic material to prosodic positions.

The non-linear framework of Government Phonology represents quantity on an autonomous skeletal tier. Short segments are treated as melodies associated to single skeletal slots, whereas phonetically long segmental expressions are structures in which melodic material is linked to two prosodic positions.

(1) quantity-related representations

a. *a short segment* b. *a long melody*

The structure depicted in (1a) encodes a single consonant or a short vowel. The other one in (1b) depicts a long vowel or a consonantal geminate.

The quantity-based assumptions of Government Phonology stem from the understanding of the fact that features should code two types of phonological information: the properties of the segment that constitute its phonetic identity, e.g. height, roundness, and the relations between segments in a string (e.g. +/−syllabic, +/−stress, +/−long). The former have a relatively stable interpretation, whereas the latter do not. More specifically, the distinction

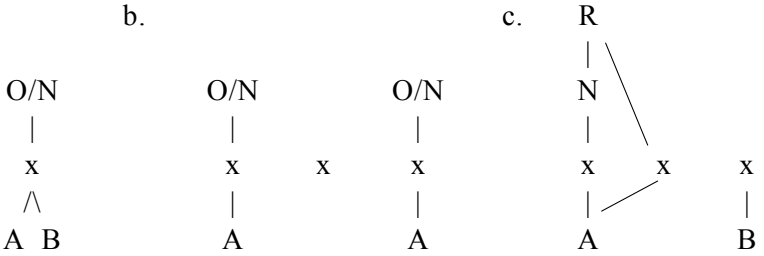
between +long and −long cannot be expressed in absolute temporal values. Rather, as Harris (1994: 32) puts it, "it manifests itself as a difference in the relative duration of the two segments when these are compared in identical contexts." Hence the model of GP postulates to keep the phonetic and relational information formally distinct. The former is thus represented on its own melodic plane, while the latter in terms of hierarchical structure. These two levels are independent of each other, which is demonstrated by such phenomena as compensatory lengthening after the loss of consonants, in the history of English for instance.

(2)

As depicted in (2), the loss of the velar fricative, effected through line deletion, i.e. de-association of the melody from the skeletal slot, is compensated for by the lengthening of the adjacent vowel whose melody spreads to the available empty position. This development illustrates the phenomenon of quantity stability whereby the change in the melodic plane does not cause any alteration of the relations that hold at the skeletal tier. The number of the timing slots remains intact despite segment deletion. Clearly then in this particular case, the phonetic realization of the lexical representation reveals the type of phonological structure present in the domain. However, in the systems of the world's languages we can find illustrations of the less obvious phonology to phonetics correspondences. Precisely, what counts as long or short phonetically may be the result of the lexically different structure than follows from (1). In (3) below, the other available theoretical configurations have been demonstrated:[1]

[1] As depicted in (3), the skeletal slots are organized in the syllabic constituents at the constituent level – a higher projection in the phonological hierarchy within a phonological representation of a domain. GP recognizes three syllabic constituents: Nucleus (N), Rhyme (R) and Onset (O). A phonological domain constitutes a sequence of onsets and rhymes. Skeletal positions are gathered under a single constituent on the basis of the governing and licensing relations they are involved in. For example, an onset can be structured either as a branching or non-branching unit. In the former case, the neighboring slots need to constitute a left-headed governing domain. For more details concerning the abovementioned relation types, see KLV (1985, 1990), Harris (1994) or Bloch-Rozmej (2008).

(3) a. b. c.



Thus, the structure in (3a) corresponds to an affricate. This can be either a vocalic short diphthong or a consonantal contour unit. Affricates, recall, are two phase segments in terms of their phonetic manifestation, incorporating both stopness and delayed release responsible for the friction component. Their bipartite phonetic characteristics cannot, however, be mirrored in the phonological structure in the form of two skeletal positions. Consider the bahaviour of affricates with respect to stress placement in English.

(4) *Final affricates*: m**a**nage, p**i**llage, d**a**mage, enc**ou**rage
Final cluster: coll**a**pse, torm**e**nt, rel**a**x
Final long vowel+(C) ar**ou**se, maint**ai**n, cons**u**me, all**ow**

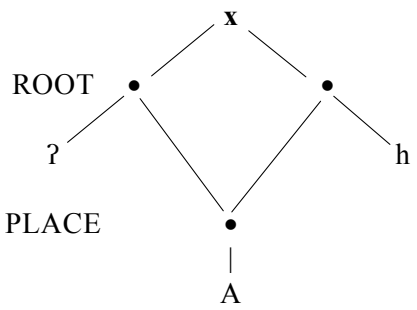
As depicted above, polysyllabic words containing a short vowel followed by and affricate exhibit quite a different response to stress assignment. In particular, they are not stress-attracting as opposed to short vowel plus cluster or long vowel containing final syllables. The latter two types count as heavy and it seems that affricates are treated by the system as short consonants. Further, in many systems affricates exhibit the so-called edge effects whereby affricates behave as stops with respect to the segments on their left and as fricatives with respect to right-hand neighbours. Consider the glottalisation of plosives before other stop consonants in English.

(5) a. get changed [...ʔtʃ...] but b. match time [...tʃt...]
did John [...ʔdʒ...] cage door [...dʒd...]

Quite clearly, whenever a plosive precedes the affricate, it can undergo glottal replacement, whereas the reversal of the affricate-stop sequence results in the absence of glottalisation of the affricate. Government Phonology offers a structure-based solution to such a behaviour of affricate sounds. More specifically, Harris (1994: 40) argues that affricates are *qualitatively complex but quantitatively simplex* and should be represented as contour structures. In this way, he subscribes to the bi-partite analysis of affricates,

whereby two melodies are subsumed under a single skeletal point. The relevant structure is provided in (6).

(6)



[ts]

As advocated by GP, in segmental structures, elements are organized under class nodes: Root, Place and Laryngeal. Manner-defining primes are gathered under the Root. The Root node dominates the two remaining class nodes. The existence of the class nodes reflects the functional unity of specific groups of primes. The class nodes dominate the terminal nodes, i.e. primes, and mediate between elements and the skeleton. Phonological processes may target either individual primes or the entire class nodes in which case all the elements gathered under the node will undergo the process.

For our analysis of the affricate behaviour it is important to notice that that element encoding stopness finds itself on the left side of the structure. Hence, when another stop-containing segment occurs before it, two occlusion elements are strictly adjacent, which triggers the loss of one of them. Whenever an affricate precedes the plosives, however, it is the noise prime (responsible for friction) that immediately precedes the occlusion in the plosive and therefore no glottalisation ever takes place.

Let us now turn to the second representation that reveals the phonetics-phonology mismatch as far as quantity is concerned, depicted in (3b) above. The structure depicts a situation where two skeletal slots are independently associated to the same melody but are phonologically separated by another empty position. Phonetically, this type of structural configuration will be interpreted as either a long vowel, consonant or a geminated sound.

With respect to geminates, it needs to be observed that the procedure of multiple association accounts for their immunity to certain rules as they exhibit integrity (Guersell, 1977 and 1978). For example, vowel epenthesis

fails to split them up. Also processes cannot change only a half of the geminate as in its structural configuration a single (and hence indivisible) melody is linked to two skeletal positions.[2]

Returning to the structure depicted in (3b), examples of such representations can be found in Connemara Irish. The dialect possesses long vowels which are phonetic manifestations of such structures in the presence of the so-called tense nasals. A handful of examples illustrating this realization are supplied in (7) below (Bloch-Rozmej 1998: 109).

(7)	a.	gann	[gɑ:N]	'scarce'	b.	gan [gan]	'without'
		Mill	[m´i:L´]	'destroy'		mil [m´il´]	'honey'
		am	[ɑ:M]	'time'			
		im	[i:M]	'butter'			
		tinn	[t´i:N´]	'sick'			
		tarr	[tɑ:R]	'belly'		tar [tar]	'come'

Traditionally, vowel lengthening which has taken place in the words presented in (7) has been attributed to the presence of the so-called tense sonorants [R, L, N] and [M] which are distinguished from the lax series.[3] Ó Cuív (1975, 119) defines the contrast 'tense versus lax' as that of 'lenited versus non-lenited'. O'Rahilly (1976, 49) refers to them as 'long liquids or nasals'. Also Ó Siadhail (1989, 48) points out that *tension is in practice expressed by length*.[4] In the existing analyses of this phenomenon (e.g. Cyran 1994, or Bloch-Rozmej 1998) it is argued that vowel lengthening should be treated as a direct consequence of the phonological representation of tense sonorants which have the geminate structure.[5]

[2] For other insightful treatments of geminate behaviour in languages, see among others Hayes (1986) and Schein and Steriade (1986). The phenomenon of geminate integrity is accounted for within the framework of harmonic phonology in Goldsmith (1993).

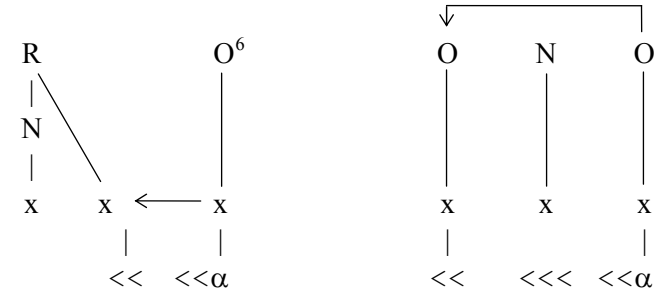
[3] The tense quality of this segment manifests itself in the lengthening effect it exerts on the preceding short vowels rather than in its phonetic realisation. Because of the existing length alternations it evokes, we shall classify [M] to the group including [N], [R] and [L]. Also in the more traditional descriptions of the Irish phonology, e.g., Ó Siadhail (1989, 49) the bilabial nasal is treated as tense.

[4] In spelling, the tense sonorants (except [M]) are doubled, e.g., *nn* for [N] etc. (Doyle and Gussmann (1996)). In the phonetic transcription of tense sonorants, we shall be using the capital letters to differentiate them from the lax counterparts.

[5] The idea that tense sonorants are underlyingly geminates was first proposed in Cyran (1992). This proposal has been adopted, although further modified, in the analyses of syllable lengthening in Bloch-Rozmej (1994). The present discussion is intended to outline the major facts concerning the problem and suggested solutions. The reader is referred to Cyran (1992; 1994) and Bloch-Rozmej (1994) for a detailed interpretation of this issue.

Government Phonology recognises two different underlying structures of geminates. One involves a governing domain holding between an onset and a preceding rhymal complement position, the other—two onset positions forming a head-final interonset governing domain. The two possibilities are illustrated in (8) below:

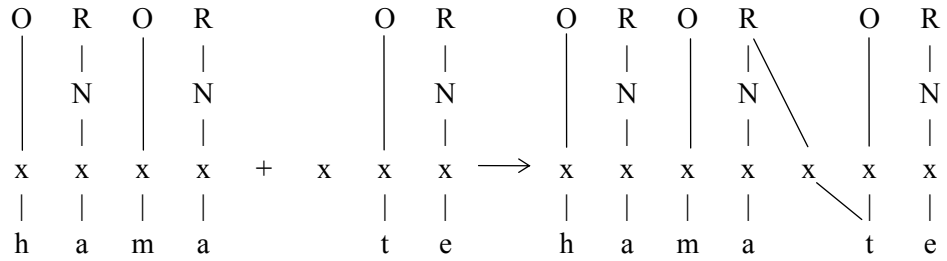
(8)



Rhyme–Onset structure *Interonset structure*

The rhyme–onset structure, found in Japanese for instance, is created by the addition of certain suffixes. Yoshida (1991) provides an example of a geminate which arises due to the attachment of the quotative *-tte*.

(9)



hamatte ‘that Yokohama’

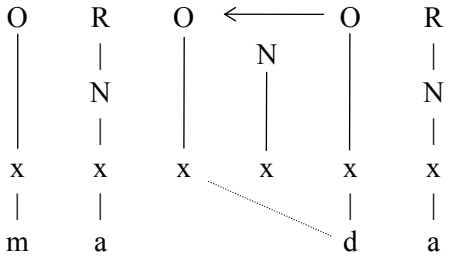
As we see, once again a single melodic unit in the phonological structure attached to two timing slots can be phonetically interpreted as a doubled consonant. Thus, melodic coding at the level of phonological structure does not match the physically complex manifestation. This is feasible thanks to the presence of two timing slots at the skeletal level.

The other type of the geminate depicted in (8) involves government by projection (Kaye (1990)). Examples of such a representation can be found in Arabic where in biliteral stem words mapped onto a triliterate template, the

[6] This type of structure is employed in Cyran (1992) to represent tense sonorants in Munster Irish.

second consonant becomes linked to both the second and third non-nuclear points (Yoshida (1991)). Consider the structure in (10).

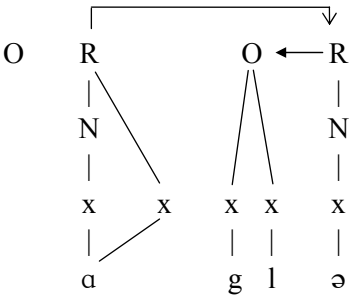
(10)



It should be noted that interonset government is possible when the intervening nucleus is phonologically empty. Otherwise no spreading of the elements from the governing onset onto its governee could come into effect. The empty nucleus is licensed by the interonset domain and, hence, remains unrealised. What this structure contributes to our discussion of the phonetics-phonology relation with respect to quantity, is the presence of three timing slots in the lexical representation which are interpreted phonetically as a doubled sound.

Turning now to the possibility indicated in (3c), it needs to be explained that structurally, it represents the situation in which the vocalic melody spreads to the non-vocalic position. The result of this operation is a phonetically long vowel. The representation of that sort is found in Connemara Irish and pertains to the stem nucleus. In the literature it is known as the *Johnsen vowel* in which a nuclear segment is linked to two skeletal positions of which one is dominated by the nucleus and the other is the rhymal complement point. Such a structure enables both long vowel and diphthong creation. We illustrate this structural setting with the lexical item *eagla* [ɑ:glə] 'fear'

(11)



In the analysis of long vowels in Irish proposed in Bloch-Rozmej (1998), vowel lengthening which takes place in the left-hand nucleus here is due to

the Irish-specific parameter which requires that the ultimate source of licensing for a complex onset must be a complex nucleus. Since the left hand nucleus is originally non-branching and it is the head of the domain (the source of all licensing potential), it has to undergo lengthening to the available rhymal complement point, thus satisfying the parameter just mentioned. It seems that a vowel must be subject to lengthening as the onset formation principles are universal and independent of language-specific parameters.

4. CONCLUSION

In the brief of this presentation I have tried to illustrate the existing mismatches between phonetics and phonology as far as quantity is concerned. The model of Government Phonology offers a number of different structural configurations that can underlie the phonetically long/complex sounds, both vowels and consonants. The theory assumes that the primary factor determining the long/short distinction is the number of timing slots that are present on the skeletal tier of phonological structure. More specifically, a melody associated to a single skeletal position should yield a short phonetic unit, whereas its attachment to two slots results in a long sound. However, what sounds short or long phonetically need not derive from the corresponding phonological structures. We have seen that a single skeletal slot can be linked to two melodies, as was the case with affricates. Also, the phonetic result of longer duration can result either from the presence of three skeletal positions or two adjacent ones but associated to a single melodic unit. However, the brevity of this presentation does not allow us to demonstrate that the presence of a number of skeletal positions in the phonological structure is no guarantee that a long sound will be realised phonetically. In many cases other, more language-specific requirements have to be fulfilled for the attachment or spreading of melodies to such positions to be possible.

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FONETYCZNA A FONOLOGICZNA DŁUGOŚĆ SEGMENTU W UJĘCIU MODELU FONOLOGII RZĄDU

S t r e s z c z e n i e

Celem artykułu jest przedstawienie zagadnienia fonologicznej długości segmentów w ujęciu modelu fonologii rządu. Relacja między fonologiczną reprezentacją długości głosek a jej fonetyczną manifestacją nie zawsze jest łatwa do przewidzenia. Często bowiem w określonych systemach językowych fonologicznie krótka jednostka melodyczna ulega wzdłużeniu w specyficznych kontekstach fonetycznych, jak również złożona struktura fonologiczna może odpowiadać fonetycznie krótkiej głosce. Stąd potrzeba precyzyjnego zdefiniowania relacji między strukturą leksykalną a jej realizacją fonetyczną w odniesieniu do długości segmentu.

Artykuł omawia konkretne przykłady zjawisk językowych z języka angielskiego, irlandzkiego i japońskiego, które bezpośrednio odnoszą się do pewnych niezgodności między reprezentacją fonologiczną a jej manifestacją fonetyczną w kontekście długości. Pozwala to na sformułowanie wniosków odnoszących się do relacji długość-jakość wyrażeń melodycznych w obrębie teorii fonologii rządu.

Streściła Anna Bloch-Rozmej

Słowa kluczowe: długość segmentu, jakość segmentu, struktura, stabilność struktury, manifestacja, interfejs.