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ELEMENT INTERACTIONS AT DOMAIN EDGES

1. INTRODUCTION

The aim of the forthcoming article is to outline and exemplify the approach of *Government Phonology* (henceforth *GP*) to the problem of inter-segmental effects attested to at the edges of phonological domains.¹ This goal, in turn, requires prior explanation of the ways in which morphology contributes to the conditions under which phonological phenomena arise. The considerations submitted in this paper are of general introductory character. We shall refrain from going into any polemic with other theoretical frameworks and restrict ourselves to scrutinizing the *GP* perspective. The examples illustrating the issue of segmental interactions will be taken from English and Connemara Irish. Our immediately succeeding discussion will be devoted to the internal structure of melodies as defined by *GP*.²

2. ELEMENTS AND ELEMENT INTERACTIONS

Government Phonology (KAYE, LOWENSTAMM AND VERGNAUD³ 1990; CHARETTE 1991; HARRIS 1990, 1994, 1997; HARRIS AND LINDSEY 1995;

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² Today, the framework of *Government Phonology* encompasses a considerable number of different developments and research progresses. The model adopted in the present article is that of classical *GP* as defined in HARRIS (1994) and GUSSMANN (2002, 2007). For a more detailed presentation of the other *GP*-rooted models, see BLOCH-ROZMEJ (2008a).

³ Henceforth KLV.

BROCKHAUS, 1995a, b; CYRAN 1998, 2003; SCHEER 2004; PLOCH 2003a, b; and GUSSMANN 2002, 2007) subscribes to the autosegmental view of melodic structure. In *GP*-based representations, phonological elements constitute the primary units enjoying stand-alone phonetic interpretations and capable of forming more complex structures. Thus, segments are composed of one or more primes (elements) which contribute to the phonetic manifestation of melodies. An element acquires its interpretability once it is licensed by (and hence linked to) the relevant skeletal position on the timing tier of the phonological representation.⁴ The skeletal and melodic dimensions of phonological representations are mutually independent, whereas elements are granted considerable autonomy, each residing on its own autosegmental tier and being susceptible to phonological processing independently of other primes belonging to the same segment. This is guaranteed by the direct linkage of individual primes to the prosodic position, involving no mediation via any other element. The elements recognised by the model are listed in (1) below together with the properties they define:

(1) <i>Element</i>	<i>Property</i>
A	non-high vowel, coronality in consonants
I	frontness in vowels, palatality in consonants
U	roundness in vowels, labiality in consonants
@	velarity ⁵
?	occlusion (stopness)
h	noise
L	slack vocal cords (low tone)
H	stiff vocal cords (high tone)
N	nasality ⁶

As already indicated, each element can be directly manifested phonetically once it is licensed by a skeletal slot, which in terms of representation, is ef-

⁴ Importantly, skeletal positions, together with their respective segments enter into licensing and governing relations in terms of which phonological constituents are constructed. There are three basic constituents: onset, nucleus and rhyme. More discussion on the structure of constituents and whole domains will be provided in section 3.

⁵ Some analyses still use this neutral element to represent central vowels and velar consonants (e.g. JASKULA 2008). The present study follows CYRAN (2003) in representing velarity as empty-headedness of phonological expressions. We eliminate the neutral element from the representations of melodies.

⁶ In recent phonological studies, attempts are being made to replace the nasal element with the low tone element **L**, or rather fuse the two elements, for example PLOCH (2003a).

fected as establishing an association line between the prime and the position. It is noteworthy that within complex segmental structures, elements enjoy different status. The dominance relations observable therein involve the *head* prime and other possible dependents. Language-specifically, the head may refuse to combine with certain primes as operators (dependents), which within *GP* is captured in the form of *licensing constraints*. Further, the head position of a phonological melody can remain empty, i.e. unoccupied by any active prime. In vocalic segments, this property defines their lax character, whereas in consonants, empty-headedness specifies their velar place of articulation. Below in (2), the major traits of phonological primes as perceived by *GP* have been summarised:

(2) *Elements as minimal phonological units*

- ◆ elements are autonomous
- ◆ they are directly co-indexed with skeletal slots
- ◆ each prime resides on its autosegmental tier
- ◆ elements are gathered under class nodes which dominate them
- ◆ each element has a unique phonetic interpretation
- ◆ elements can combine to form complex melodic structures
- ◆ their attachment to slots requires an autosegmental licence
- ◆ only elements associated to skeletal positions can be manifested phonetically
- ◆ within segmental structures, primes can enjoy different status (head, operator/ dependent), while the head prime defines the salient property of the segment.

Elements as autonomous units are capable of exhibiting various forms of prime interaction. One obvious form is their ability to combine with other primitives within complex melodic structures. As already stated, elements may enter such relations at different rights, one of them being the head and others mere dependents. Element interactions can be subject to language-specific licensing constraints delimiting the co-occurrence of specific primes within given systems. In English for instance, **I** and **U** may not combine within vocalic expressions, which accounts for the lack of front rounded vowels in this system. In fact, the same restriction is operative in Connemara Irish in the structure of vowels, though in consonantal expressions, the two primes are allowed to co-occur. Hence, the presence of palatalised labials in this language, e.g. *mí* [m'í:] 'month'.

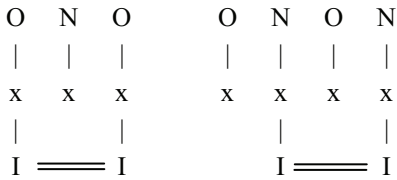
Further, elements belonging to adjacent segments can be shared in certain languages (e.g. in Irish, as described in BLOCH-ROZMEJ 1998 and CYRAN

1997). The mechanism of *prime-sharing* enables access of consecutive onset and nuclear positions that are involved in a licensing relation to the element **I/U** specified distinctively in the O-N domain, rather than either the onset or the nucleus alone.⁷ This means that the shared element can contribute to the phonetic interpretation of either the nucleus, or onset units, both of them or neither, all these options being contingent on language-specific constraint and parameter settings. The mechanism of sharing as stated above accounts for the realisation of consonants in both Connemara and Munster Irish. Irish can be regarded as having two sets of consonants, traditionally labelled as slender and broad. More accurately, we should treat them as palatalised and velarised respectively. Palatalised consonants may be said to have an [i]-quality, i.e. it is possible to pronounce a weak [i]-sound after them. Broad consonants, on the other hand, possess a kind of [u]-quality, which means that you could hear a very weak [u]-sound after them (Ó SIADHAIL 1988: 5). Thus, if we are to compare the words such as *beo* ‘alive’ and *bó* ‘cow’ in terms of the initial consonant quality, we will obtain [bⁱo:] and [b^uo:] respectively.⁸ The slender (palatalised) quality of a consonant is most clearly heard before such vowels as [ɑ:], [o:] and [u:]. Velarisation, on the other hand, manifests itself most clearly before high, front vowels [i:] and [i]. In addition, the phonetic realisation of short vowels appears to be directly dependent on the nature of the flanking consonants. The C’–C’ environment is unavailable for such vowel sounds as [u], [a] and [o], while the C–C context excludes [i], [e] and [æ]. In other words, the front vowels are barred from occurring between velarised consonants whereas the non-front ones must be absent from the context provided by two palatalised segments. As indicated by the examples above, long vowels are not restricted in this way. To account for the distributional limitations just mentioned, CYRAN (1997) proposed that truly front vowels share their **I** element with a neighbouring palatalised consonant, whereas short [u] and [o] will share **U** with a velarised consonantal neighbour. The sharing of the elements **I** and **U** should be regarded as a manifestation of the *Onset Licensing Principle* holding between the nucleus and the preceding onset.⁹

⁷ A domain is structured as a sequence of onsets and rhymes (headed by nuclei) involved in licensing relations.

⁸ In order to conform to the standard methods, the two forms should be transcribed [bⁱo:] and [bo:] respectively.

⁹ The *Onset Licensing Principle* requires that each onset be universally licensed by the following nucleus.

(4) *bridging*

Thus, bridging involves the interaction of two independent but identical elements, each of them being distinctively licensed by a different skeletal position.

3. LICENSING IN THE STRUCTURE OF PHONOLOGICAL DOMAINS

Phonological domains, within the framework adopted here, are structured as sequences of onsets and rhymes, with the latter being headed by obligatory nuclei. *Phonological licensing* is a mechanism that drives the organisation of lexical structure and constitutes the source of all phonological events. A stronger form of licensing is called government. Governing relations require more stringent contraction conditions and are capable of affecting segments attached to the governed sites in more dramatic ways, including reduction or event total suppression. Within the multi-tiered, hierarchical structure of a phonological domain, skeletal positions are arranged on the skeletal tier and projected onto the syllabic constituents in terms of the governing relations they contract.¹¹ In onset-rhyme sequences, each onset is universally licensed by the following nucleus (*Onset Licensing*). The nucleus, being the head of the Rhyme, also licenses the rhymal complement (coda) position if it is present in the structure of the complex rhyme (e.g. in *tent* [e] licenses [n] which is attached to its rhymal complement point). As just indicated, constituents can branch.¹² The occurrence of branching onsets and nuclei is supported by the existence of phonotactic restrictions, which are captured by the operation of intra-constituent left-to-right government.

¹¹ More detailed discussion of the licensing and governing relations as proposed by *GP* can be found in KLV (1990), KAYE (1990), HARRIS (1994), CHARENTE (1991), GUSSMANN (2002) and CYRAN (2003).

¹² The *Binarity Theorem*, proposed in KLV (1990), assumes that constituents can be maximally binary branching (also see the discussion in CYRAN 1997).

4. CROSS-DOMAIN EFFECTS IN ENGLISH

As indicated in HARRIS (1994:20), ‘the most consistent differences between English root and word morphology are phonological’. The addition of root-level affixes can bring about changes in the composition of root-final segments, thus revealing the existence of element interactions across domain boundaries. However, it has to be stressed that such inter-element ‘communication’ is possible only when root-level suffixation is involved. Consider the examples listed in (6) below (data from WELLS 1989):

(6)	romantic	[rəv'mæntɪk]	romanticism	[rəv'mæntɪsɪzəm]
	metric	['metrɪk]	metricise	['metrɪsaɪz]
	allude	[ə'lu:d]	allusive	[ə'lu:sɪv]
	intrude	[ɪn'tru:d]	intrusive	[ɪn'tru:sɪv]
	explode	[ɪk'spləʊd]	explosive	[[ɪk'spləʊsɪv]
	pirate	['paɪrət]	piracy	['paɪrəsɪ]

The consonantal alternations depicted above, traditionally referred to as velar softening and spirantisation, involve the final [k, d, t] segments which, in the forms listed in (6), change into [s] under the influence of the **I**-containing suffix (e.g. /-ity, -ism, -y, -ive/). The effect of suffix addition consisting in the consonantal modification is illustrated in (7).

(7)	<i>pirate</i>						<i>piracy</i>								
	O	N ₁		O	N ₂	O	N ₃		O	N ₁		O	N ₂	O	N₃
			↘								↘				
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	p	a	ɪ	r	ə	A		p	a	ɪ	r	ə	A	I	
						h								h	
														≠	
						?								?	
						H								H	

The domain of impact of the palatal element **I** (in boldface) includes the onset segment to its left. The influence of the **I**-containing suffix in this case manifests itself as the loss (delinking) of the occlusion prime from the onset

consonant. This operation yields the spirant [s]. Noticeably, such effects will be absent from forms derived by the addition of the word-level affixes.

(8)	pirating	['paɪrətɪŋ]	not	*['paɪrəsɪŋ]
	pirated	['paɪrətɪd]	not	*['paɪrəsɪd]
	alluded	[ə'lu:dɪd]	not	*[ə'lu:sɪd]
	flighty	['flaɪtɪ]	not	*['flaɪsɪ]

On the whole, word-level derived forms exhibit the same properties as sequences of words. For example, we can come across the same sound sequences across domain boundaries in either case. Further, word-level morphology introduces sound contrasts and segmental strings unattested in underived and root-level forms. For example, consonant gemination is allowed in word-level forms, though it is absent from morphologically simplex forms: *u[nn]erved* vs. *i[m]inent*.

The approach of *Government Phonology* to the distinction between root-level and word-level forms comes down to treating the former as having the same status as underived words that need to be listed in the lexicon. Consequently, consonant alternations specified in (6) will not be synchronically analysed as active phonological processes. Admittedly, however, the structures proposed in (7) could be posited as representations of the relevant forms at some stage in the history of English.

Given such a radical stance with respect to the relation between phonology and morphology which treats root-level boundaries as phonologically invisible, we can still observe element interaction effects across word-level boundaries in English. A conspicuous example of that is voicing assimilation involving word-final consonants and the plural /-s/ ending, as in

(9)	dog / dogs	[dɒg] / [dɒgz]
	cat / cats	[kæt] / [kæts]

Clearly, the laryngeal specifications of the noun-final plosive determine the voicing quality of the suffixal consonant. This indicates the existence of some inter-segmental relation whereby the plosive defined by means of the **H**-prime (defining voiceless segments) 'selects' the voiceless variant of the plural suffix. With reference to that, two alternative solutions can be proposed. Firstly, we might submit that the **H** element specified in the suffixal spirant requires support from another **H** to its left. When the stem finishes

with a voiced (**H**-less) consonant, no such support is available and the [z] form is realised. Also notice that [z] is manifested when immediately preceded by the vowel [ɪ], as in *bus*[ɪz] or *bush*[ɪz]. In such forms, the presence of the intervening vocalic segment creates an obstacle for the **H**-support mechanism. Consider the structure in (10) below.

(10)	O	N	O	N	O	N	O	N	O	N	O	N
	x	x	x]	x	x	x	x	x	x]	x	x	x
	k	æ	t		s		b	ʌ	s		s	
												≠
			H	=====	H				H=	/I	H	

Alternatively, it could be assumed that the consonant of the plural suffix is lexically voiced, which in *GP*-terms would mean the lack of the **H** prime. Its voiceless realisation after **H**-containing consonants would result from the spreading of **H** from this word-final segment onto the suffixal [z]. Word-final voiced consonants, deprived of the stiff-vocal cords prime would be unable to spread any **H** onto the suffixal segment, thus creating a cluster of two voiced consonants. This solution seems to take the upper hand over the one relying on the **H**-support mechanism. One piece of evidence in favour of the **H**-spreading analysis pertains to the realisation of the voiced [z] variant of the suffix after vowel final nouns, as in *cars* or *seas*. In such forms, no cross-morphemic inter-onset relation is possible within which the supportive mechanism could possibly be effected. Also, English possesses numerous consonant-final nouns where the final C is voiceless, as in *cat*, *pot* or *rock*. In these words, the voiceless segments do not lose their **H** primes even though the element does not receive any support from another **H**.

In what follows, our attention will be focused on some element interactions attested to in the system of Connemara Irish that are observed to involve elemental material belonging to adjacent domains.

5. CROSS-DOMAIN SPREADING IN IRISH

In Connemara Irish, two significant phenomena of palatalisation and velarisation can be shown to make reference to the element-spreading

As indicated above, the element **I** whose presence is the marker of the comparative undergoes leftward spreading and modifies the composition of the adjacent vowel by causing **U**-suppression and becoming linked to the nuclear slot. When compared to the form *trom*, the two-domain word (stem+suffix) *troime* differs both in terms of the palatalised quality of the rightmost consonant [m] but also the fronted realisation of the stem vowel.

The examples provided in (11) above could suggest that in Connemara Irish, **I** and **U** spreading is almost automatic and will always be effected if the suffix added contains either **I** or **U**. This however is not the case. Below in (13) we supply a handful of items which reveal that the element spreading mechanism can be sensitive to the kind of domain boundary involved.

(13) barr	[ba:r]	‘tip, surface, top’
barrchéim	[ba:rx´e:m´]	‘climax, apogee’
barrsheol	[ba:rx´o:l]	‘topsail’
lag	[lag]	‘weak person’
lagbhri	[lagv´ri:]	‘weakness’
lagaigh	[lagi:]	‘weaken’

As illustrated in (13), the [r] and [g] segments do not undergo palatalisation, even though they are followed by a palatalised consonant or a front vowel. Especially in the forms *barrchéim* and *lagbhri* the non-automatic character of **I**-spreading is visible. These items appear reminiscent of the English situation where the operation of particular processes is impossible across a word-level boundary (e.g. the lack of degemination in *unnerved*). As explored in CYRAN (1997) and BLOCH-ROZMEJ (1998), there are a number of spreading-blocking factors in Munster and Connemara Irish. For sure the presence of the realised nuclear expression prevents further propagation of the spreading prime.¹⁶ There are also consonants that do not undergo palatalisation due to the working of Irish-specific licensing constraints that delimit the combinability of elements in particular systems. The limited space of this article does not allow us to plunge into all these spreading-related restrictions. Nevertheless, as evidence indicates, the element-spreading mechanism can also be obstructed by the word-level boundary ‘on its way’.

¹⁶ Notice that [tr] in *troime* will not be palatalised.

6. CONCLUSION

Although phonology and morphology are mutually independent, their interaction seems to be inevitable. Some degree of morpho-syntactic structure has to be visible to phonology. Phonological theories differ from one another with respect to their understanding and representing this phonology-morphology interface. Within the framework of *Government Phonology* forms derived by means of the addition of root-level affixes constitute single phonological domains without any inner boundaries and behave like underived words. On the other hand, items created through the addition of word-level affixes are both morphologically and phonologically complex. The mechanisms of, element spreading and bridging enable the interaction of morphology and phonology by involving elemental material belonging to different though adjacent domains. Their employment is a matter of language-specific choice.

Within the confines of this brief overview of element interactions, we have indicated that primes are capable of spreading across domain boundaries and exert influence on the segments in adjacent domains. Further, it can be hypothesised that they can participate in element-bridging relations whose most frequent function is element support. However, both the contraction conditions and exact effects of element bridging is a matter of language-specific conditioning. We have seen that both in English and Irish it is spreading that enables the interaction of primes belonging to adjacent morphological domains.

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INTERAKCJE MIĘDZYSEGMENTOWE NA GRANICY DOMEN MORFOLOGICZNYCH

Streszczenie

Artykuł porusza tematykę związaną z istnieniem zjawisk językowych pomiędzy dźwiękami na granicy domen morfologicznych. Autorka podejmuje próbę przybliżenia podejścia do analizy interakcji międzysegmentowych, jakie proponuje niederywacyjny model Fonologii Rządu. Zdefiniowane zostają zatem takie pojęcia formalne jak: domena fonologiczna, segment, element oraz trzy podstawowe typy relacji czy też oddziaływań pomiędzy dźwiękami. Są to relacja dzielenia się elementami, rozprzestrzeniania się elementów raz połączeń mostowych. Każda z tych relacji wymaga spełnienia odmiennych warunków, aby zaistnieć w obrębie domeny fonologicznej, oraz skutkuje innymi konsekwencjami dla struktury segmentów. Materiał badawczy, który służy do zilustrowania wspomnianych zjawisk, pochodzi

z języka angielskiego oraz irlandzkiego. Rozważania zamieszczone w artykule mają charakter ogólny, a ich celem jest uwypuklenie roli, jaką w fonologii odgrywa informacja morfologiczna, zwłaszcza dotycząca rodzaju granicy między sąsiadującymi morfemami.

Streściła Anna Bloch-Rozmej

Słowa kluczowe: segment, element, dziedzina, dzielenie, rozprzestrzenianie się elementu, relacja pomostowa.

Key words: segment, element, domain, sharing, spreading, bridging.