

VOCALIC ELEMENTS IN PHONOLOGY
A STUDY IN MUNSTER IRISH

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1. ISSUES IN GOVERNMENT PHONOLOGY

1.1. Introduction

Government Phonology (GP) (Kaye, Lowenstamm and Vergnaud (1985, 1990)),¹ Kaye (1990), Harris (1990a), Charette (1991), Gussmann (1992)) aims to demonstrate that relations of government are present in phonology as well as in syntax. It makes a dramatic break with the classical generative approaches in that it replaces the rule component with a group of universal principles common to all linguistic systems along with a series of parameters delimiting the nature of linguistic variation from one system to another. Unlike the rule-based approaches, GP is fundamentally a theory of representations where phonological phenomena are viewed as stemming directly from a series of principles and parameters. It is a highly constrained theory in its view of phonological structure. Formally (structurally), it imposes a binary limit on the number of positions that a syllabic constituent - onset, nucleus, rhyme - may contain, while substantively, it does not make use of distinctive features. On the other hand, all phonological oppositions are expressed in terms of univalent elements each of which has an independent phonetic interpretation. The elements may combine to form new segments. The notion of government is central to the theory and it is defined as a maximally binary, asymmetrical relation between two skeletal points. These relations are subject to a series of conditions discussed below. GP attempts to eliminate any arbitrariness in the relation between a phonological event and the context in which it takes place: it claims that there is a direct relation between a phonological process and the context in which it occurs, and it tries to reveal the factors motivating phonological events.

¹Below, we will use KLV to refer to Kaye, Lowenstamm and Vergnaud (1990, 1985).

1.2. Conditions on phonological government

As mentioned above, government is defined as a binary asymmetrical relation holding between two skeletal positions. In order for this relation to be established, both formal and substantive types of conditions must be satisfied. The formal conditions involve the notions of *locality (adjacency)* and *directionality*. The substantive conditions involve the properties of segments which contract governing relations.²

1.2.1. Formal conditions

Let us begin with the formal conditions from which the binary theorem is derived (KLV (1990)).

(1)

a. THE STRICT LOCALITY CONDITION

The governor must be adjacent to the governee at the P_o projection, i.e. the projection containing every skeletal point. (No position may intervene between the governor and the governee)³

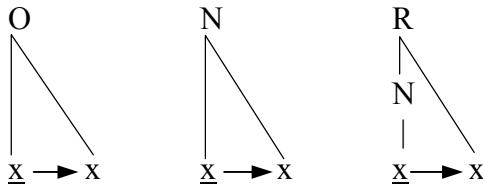
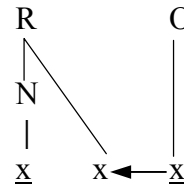
b. THE STRICT DIRECTIONALITY CONDITION

Directionality of government at the skeletal level is universal and not subject to parametric variation.

There are basically two types of government: *constituent* and *interconstituent*. The former is head-initial while the latter is head-final. Thus, strict directionality universally defines how skeletal points are syllabified into constituents, or even how the constituents are grouped together within a domain such as the word. This is illustrated below (heads are underlined).

²The initial proposal (KLV (1985)) concerning the substantive conditions on government referred to charm values of segments. The theory has been revised in this respect in favour of the notion of segmental complexity (Harris (1990a)). Both issues are introduced below for comparison.

(2)

a. *Constituent governing domains*b. *Interconstituent government*⁴

(←)/(→) direction of government

Three basic syllabic constituents are recognised by the theory, namely, O(nset), N(ucleus) and R(hyme). GP rejects the Coda as a possible constituent. The syllabic constituents may or may not branch, subject to parametric variation within individual languages. All branching constituents are head-initial.

Resulting from the Strict Locality and Strict Directionality conditions, the following theorem is derived:

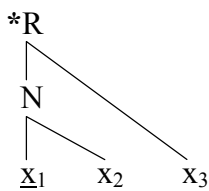
(3)

BINARITY THEOREM

All syllabic constituents are maximally binary

The binary theorem precludes the existence of the so called Super-heavy rhyme illustrated below.⁵

(4)



³The strict adjacency condition is relaxed in a few situations e.g., in the case of internuclear or interonset relations where the head and the complement of such governing relations are adjacent at the relevant projection.

⁴Apart from the Rhyme-Onset interconstituent relation the theory recognises government between nuclei or onsets at their projection (KLV (1990), Kaye (1990), Charette (1991)). Internuclear government is discussed below in 1.3 in connection with Proper Government and the Empty Category Principle.

⁵See however Harris (1994a) for conditions underlying the occurrence of what appears to be this structure in English forms such as *find*, *chamber* and *laughter*.

The reason for excluding this structure from the list of possible phonological representations is that the head of such a domain (x_1) cannot govern (x_3) because these positions are not adjacent. On the other hand, if we assume that any other position is the head of the governing domain e.g. (x_2), then the strict directionality of government within a constituent (\rightarrow) would be violated.

Thus the formal conditions restrict the types of syllabic constituents that can occur in natural languages. Now let us see what governs the way segments are grouped into constituent or interconstituent relations. The question is why a sequence of adjacent segments [t] and [r], in that order, are always syllabified as a branching onset (a constituent) rather than a rhyme-onset (interconstituent relation).

1.2.2. Substantive conditions

In GP, syllabification, i.e. the grouping of segments into constituents, results from governing relations that skeletal points along with their segments contract. This means that skeletal positions are organised and associated with constituents in terms of governing relations. Thus, syllabification proceeds from government and not vice versa. On the other hand, the types of governing relations that are contracted depend on the governing properties of segments which delimit their combinatorial possibilities.

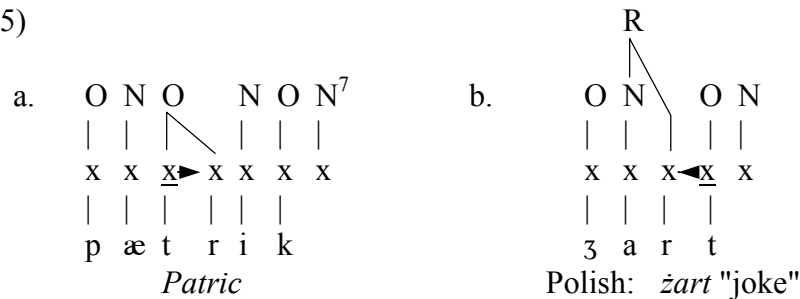
Initially (KLV (1985)), these special governing properties of segments were defined in terms of charm. There were three charm values: positive ($^+$), negative ($^-$) and neutral (0). Governors were either positively (vowels) or negatively (obstruents and fricatives) charmed, while governees were charmless (sonorants).

The theory of charm has recently been replaced with the notion of segmental complexity (Harris (1990a)), which is expressed by the number of elements forming a compound object. The complexity defines governing relations by simply stating that the governor must be more complex than its governee. Given that the respective representations of [t] and [r] in terms of elements are (H, h, \emptyset , R) and (h, R),⁶ we may state that [t] will always govern [r], but the latter may not govern [t] because it is less complex. Therefore, depending on the order of these objects in the phonological string, they may either form a

⁶The phonological elements are discussed in section 1.5.

branching onset [tr], i.e. a head-initial governing domain (5a), or an interconstituent governing domain [r-t] which is head-final ((5)b).

(5)



We can now introduce a special type of government with accompanying principles.

1.3. Proper Government

Proper Government is a special type of government which, among other things, is responsible for vowel-zero alternations in languages like Polish, French, and, to some extent, Irish. The formalism is given below.

(6)

PROPER GOVERNMENT

α properly governs β if

α and β are adjacent on the relevant projection

α is not itself licensed

no governing domain separates α and β

Proper Government is strictly related to the phonological *Empty Category Principle* (ECP) in that a properly governed nuclear position remains phonetically null, while in the absence of such a relation the position has to be realised.

(7)

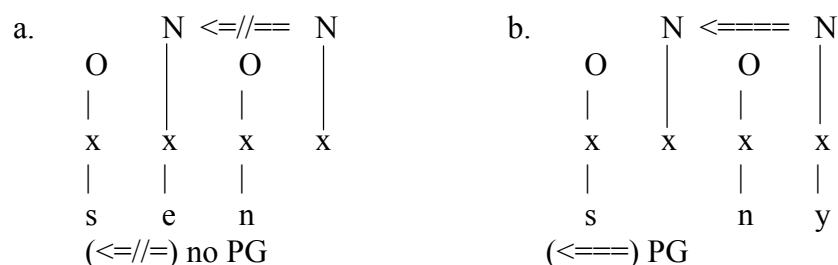
EMPTY CATEGORY PRINCIPLE

A properly governed position remains uninterpreted phonetically.

⁷See the section on licensing in which the presence of word-final nuclei is justified (Coda Licensing (Kaye (1990))).

Let us illustrate the application of Proper Government (PG) and the ECP on the basis of the Polish examples *sen* / *sny* "dream/pl.". ⁸

(8)



The relation of Proper Government takes place on the projection level where the two nuclei are adjacent. In the case of *sen* ((8)a), the domain-final nucleus is itself licensed (by parameter);⁹ therefore it is unable to properly govern the preceding nucleus. This results in the phonetic realisation of the first nucleus as [e]. On the other hand, in *sny* the inflectional vowel (itself unlicensed, i.e. realised) properly governs the preceding nucleus which in turn remains unrealised as per the ECP.¹⁰ Thus only a phonetically realised nucleus can properly govern, and the governee of such a relation must be empty. The direction of this type of relation is assumed to be subject to parametric variation, i.e. either from right to left, or vice versa.

An additional point that needs to be made here is that in the case of phonetically unrealised positions such as the first nucleus in *sny* (/søny/) there is no restructuring or resyllabification of the phonological form. This is ensured by the *Projection Principle* (KLV (1990:221)).

(9)

PROJECTION PRINCIPLE

Governing relations are defined at the level of lexical representation and remain constant throughout a phonological derivation.

Let us now turn to the notion of phonological licensing

⁸For a recent thorough analysis of the Polish yers in this model see Gussmann and Kaye (1993).

⁹All phonological domains end with a nucleus which may or may not be licensed in a given language (see also Coda Licensing (1.4.1)).

¹⁰The application of ECP has been extended also to non-nuclear positions, i.e. to word-initial empty onsets (Charette (1991)) and to the rhymal complement (Cyran (1992)). For the latter see also section 3.2.

1.4. Phonological licensing

Phonological positions are subject to the licensing principle (Kaye (1990:306)).

(10)

LICENSING PRINCIPLE

All phonological positions save one must be licensed within a domain.

The unlicensed position is the head of this domain.

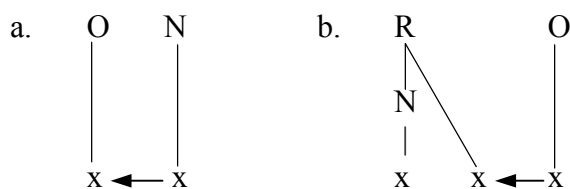
Each phonological unit must be sanctioned in the phonological representation by some other unit. Thus government, be it constituent or interconstituent, may be viewed as a form of licensing in that the head of a governing relation licenses its complement.

Below we present two basic types of licensing, namely *prosodic* (p-licensing) and *autosegmental* (a-licensing). The former refers to the prosodic hierarchy, where each unit has to belong to some higher-order unit (Harris (1992, 1994a)), while the latter occurs between skeletal positions and the melody.

1.4.1. Prosodic Licensing

As mentioned above, constituent and interconstituent governing relations are forms of licensing, from which it follows that licensing may be subject to the locality and directionality conditions. Within branching constituents such as onset, nucleus and rhyme, licensing is head-initial, while licensing between adjacent positions which belong to different constituents is head-final.

(11)



As far as the structure ((11)b) is concerned, Kaye (1990:311) proposes the following licensing principle.

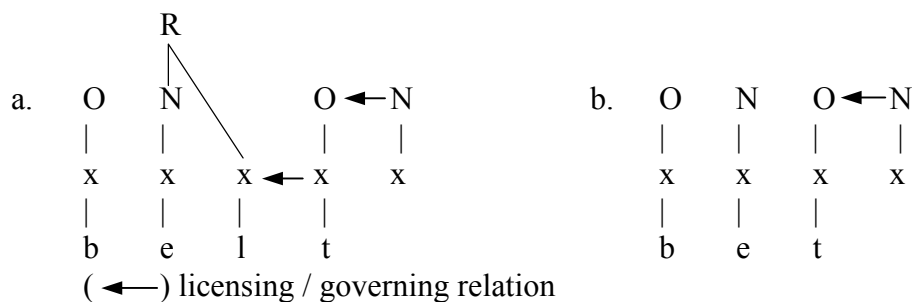
(12)

CODA LICENSING PRINCIPLE

Post-nuclear rhymal positions must be licensed by the following onset.

This universal principle ensures that in all languages a single word-final consonant will always be syllabified as the onset of the following syllable. Such onsets are followed (licensed) by a nucleus which may be empty. The word-final empty nuclei are themselves licensed by parameter, and are required because onsets do not exist on their own, i.e. they must be licensed by a nucleus (see ((11)a) above). To illustrate the application of the Coda Licensing Principle we provide representations of the English words *belt* and *bet*.

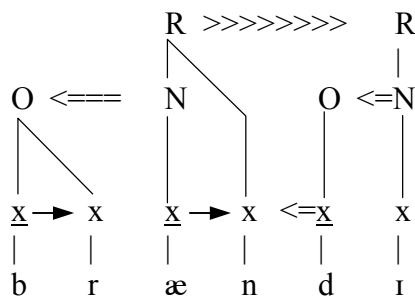
(13)



In *belt*, the rhymal complement is sanctioned (governed/licensed) by the following onset which itself is licensed by its nucleus. On the other hand, in *bet*, there is no following onset to license [t] as the rhymal complement (coda) therefore, this consonant may only be syllabified as the onset itself. Both *belt* and *bet* have an empty nucleus word-finally which is licensed by parameter.

Bellow we attempt to illustrate all the existing prosodic licensing relations in the word *brandy* on the basis of Harris ((1992, 1994a)).

(14)

(→) *constituent* licensing(<==) *interconstituent* licensing(>>>) *projection* licensing

This structure illustrates three basic types of p-licensing:

- constituent licensing which takes place between adjacent positions within branching constituents (here: the branching onset and branching rhyme).
- interconstituent licensing which occurs between the onset [d] and the preceding rhymal complement, and between nuclei and their onsets.
- the last type is referred to as projection licensing (Harris (1992, 1994a)), which takes place at the relevant projection (where the domain of licensing corresponds to some unit such as the foot or word).

With respect to the licensing of non-nuclear heads by their nuclei, Charette (1990:242) proposes the following principle.

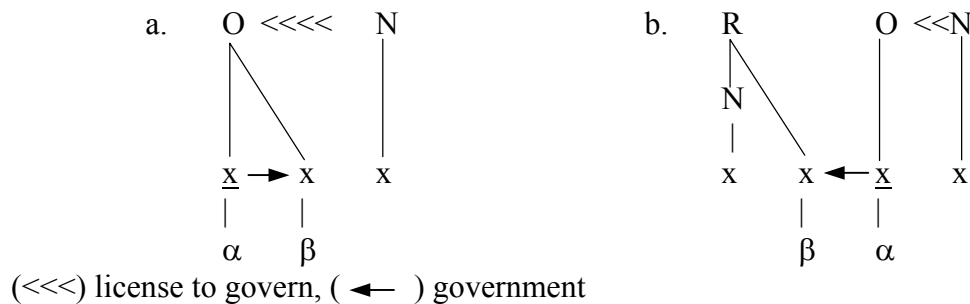
(15)

GOVERNMENT LICENSING PRINCIPLE

For a governing relation to hold between a non-nuclear head α and its complement β , α must be government-licensed by its nucleus.

This principle refers to two types of governing relations, the existence of which must be sanctioned by a nucleus.

(16)



In ((16)a) the nucleus licenses indirectly, as the position occupied by the nucleus is not directly adjacent to the head-position of the branching onset, while in ((16)b) the nucleus licenses the non-nuclear head directly.

Charette proposes also that the licenser of such a relation, i.e. the nucleus, may exhibit different licensing potentials. For example, if in a given language the word-final clusters are limited to interconstituent domains ('coda'-onset ((16)b)), and branching onsets are not found in this position, then this means that the domain-final nuclei in this language do not license indirectly. This is the case in Irish and to some extent in English, in which branching onsets do not occur word-finally. Thus, in Irish we find word-final [...rt#] as in [k'art] *ceart* "right", but * [...tr#] is absent, as Irish empty nuclei do not license indirectly.

The licensing properties of nuclei (their licensing potential) are best manifested in a situation when empty nuclei are compared with realised nuclei. One property of realised nuclei which we have already mentioned is their ability to properly govern empty positions, while empty nuclei cannot do so (see /senø/-/søny/ in 1.3). In section 3.2 we discuss the phenomenon of compensatory lengthening in Irish which seems to be dependent on the different licensing potential exhibited by full (realised) vowels and empty nuclei. This phenomenon can be viewed as an effect of the interaction between prosodic and autosegmental licensing in that a weakly p-licensed position cannot a-license its melodic material (see 3.2). Let us now turn to the question of a-licensing.

1.4.2. Autosegmental Licensing

In order to be pronounced, phonological elements must be associated with the skeletal position, i.e. a-licensed. In 1.4.1, we provided one example of the interaction between the

a-licensing and p-licensing, namely, compensatory lengthening (to be discussed in detail in 3.2).

Another instantiation of that interaction is connected with the dependence of a-licensing potential of a point on its position in the prosodic hierarchy (Harris (1992, 1994a)). Namely, the a-licensing potential of a skeletal point is weaker in prosodically recessive positions, e.g. in complements of governing domains. If we look at the phonotactics within a branching onset, for example, it is immediately obvious that the ability to represent contrasts is greater in the head position (fricatives, stops) than in the governed position (sonorants). This is due to the diminished a-licensing potential of positions which are low in the prosodic hierarchy.

Finally, in recent work (Cobb (1993), Denwood (1993), Charette and Göksel (1994/96)) it has been proposed that autosegmental licensing is additionally subject to certain constraints of a parametric nature which define the combinatorial possibilities that elements exhibit within the melodic units of a given language. Or, to put it differently, certain melody internal constraints define the possible representations of phonological objects.¹¹ This issue is discussed in detail in section 2.4 with respect to possible parameter settings responsible for the Irish vocalic system, while in chapter 4 we propose some parameters defining consonantal systems in general. Let us now see what the phonological primes are in GP and try to articulate possible constraints on their combinability.

1.5. Phonological elements

Elements are the smallest units in the theory of segmental representations (KLV (1985, 1990), Harris (1990a), Harris and Lindsay (1995)) to which phonology has access. They are the primitive phonological units of which segments are composed. Each element is autonomous and pronounceable in isolation. This has been expressed in terms of the realisation autonomy hypothesis (Harris and Lindsay (1995)) which says that elements are big enough to be independently interpretable. For example, the element 'I', when pronounced, corresponds to the vowel [i]. On the other hand, elements can combine to form complex

¹¹ The reader is also referred to Rennison (1990) for a similar proposal.

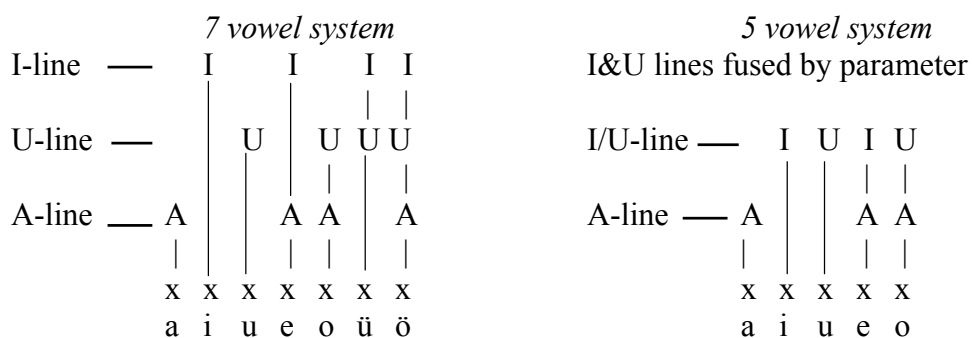
segments. In such combinations two or more elements form a HEAD - OPERATOR relation.¹² Let us first look at the elements used in defining vocalic systems.

1.5.1. "Vocalic" elements

There are three basic resonance elements 'A', 'U', and 'I' which, when pronounced, correspond to the corner vowels [a], [u] and [i] respectively. These elements may combine to form complex vowels. Such combinations take the form of asymmetric relations in which one of the elements acts as the head and the other as the operator. Thus the phonetic reflex of a particular compound is dependent on the role which is assigned to the elements involved in fusion. This can be demonstrated by comparing the two results obtained when we fuse 'A' and 'I'. When 'A' is the operator and 'I' is the head (A.I), the resultant vowel is [e]. On the other hand, when the relations are reversed (I.A), we obtain [æ]. The same applies to the combination of 'A' and 'U', where we can get an open [ɔ] (U.A) or a close [o] (A.U) depending on the combination.¹³

Below, we provide two types of vowel systems, one with seven members, and the other with only five. For the purposes of exposition we assume, following KLV (1985), that elements reside on their own autosegmental tiers where compound expressions involve the co-registration of elements on separate lines.

(17)



¹²For a good introduction to the element theory and a justification of individual elements on the basis of phonological processes see Harris (1990a, 1994a), Harris and Lindsey (1995.).

¹³The head is on the right-hand side.

The five vowel system is derived by the parametric fusion of the 'I' and 'U' tiers. This means that the elements 'I' and 'U' will not combine in such a system.¹⁴

In addition to 'A', 'U', 'I', three other elements were initially proposed, namely, 'N' (nasality), 'F' (ATR), and v^0 (the cold vowel, or neutral element) (KLV (1985)). Of these three, the ATR element was abandoned as the tenseness contrasts came to be expressed in terms of the headedness or headlessness of the vocalic elements 'A', 'U', 'I' (Cobb (1993), Charette (1994), Harris and Lindsey (1995)). Examples are provided below.

(18)

<i>headed vowels</i>	<i>non-headed vowels</i>
(<u>I</u>) = i	(I.v ⁰) = ɪ
(<u>U</u>) = u	(U.v ⁰) = ʊ
(A. <u>I</u>) = e	(A.I.v ⁰) = ε
(A. <u>U</u>) = o	(A.U.v ⁰) = ɔ

Thus the tense vowels are now expressed as headed objects, while the lax vowels are not headed by an active element ('A', 'U', 'I') but rather by the neutral element v^0 .

The status of v^0 (the cold vowel) is that of an "identity" element (KLV (1985), Harris and Lindsey (1995.)). When it acts as the head of an expression it yields a reduced schwa-like vowel. In section 4.1.1. the use of that element in vowels and consonants is discussed in detail. Let us now introduce the elements which are used to define consonantal objects.

1.5.2. "Consonantal" elements

The resonance elements 'U', 'I', 'A', and v^0 are also found in segmental representations of consonants where their role is to define the place of articulation. Thus, 'U' defines labiality, 'I' is used to mark palatality, 'A' indicates pharyngeality, while the cold vowel (v^0) represents velarity.¹⁵ In KLV (1990) and Harris (1990a) we find the following consonantal elements:¹⁶

¹⁴More recently the autosegmental tiers have been dispensed with in GP, and the absence of front rounded vowels in a given system is accounted for by setting a parameter which disallows a combination involving 'I' and 'U' (Cobb (1993)). This development is discussed in detail in 2.4 where we try to define the Irish vocalic systems by means of such parameters.

¹⁵In chapter 4, we consider the possibility that the element 'A' may be used to define coronality as well.

(19)

- R - coronal gesture
- ? - occluded (constriction)
- h - noise
- N - nasal
- H - stiff vocal cords (fully voiceless)
- L - slack vocal cords (fully voiced)

These elements may combine to produce complex segments. For example, a combination of 'U' and 'h' yields a labial fricative, while the compound (h, ?, U) defines a labial stop which may further be voiceless (H, h, ?, U) or voiced (L, h, ?, U).¹⁷ Consider the representations of some labials below in which the tone element 'H' is ignored.

(20)

[p]	[f]	[w]
x	x	x
U	U	U
h	h	
?		

The decreasing complexity of the segments presented above corresponds to the lenition trajectory of the opening type (see e.g. Lass (1984:178) and a discussion in Harris (1990a)). The lenition of [p] to [f] is found, for instance, in Irish e.g. [potə] *pota* "pot" - [sə fotə] *sa phota* "in the pot". In the following paragraphs more will be said about the way in which GP views phonological processing.

¹⁶Of the list given below, the element defining coronality (R) is now assumed to be otiose. In chapter-4, we return to the different new interpretations of coronality within GP, either by means of other elements (e.g. Broadbent (1991), Scheer (1994)) or by assuming that coronals are nonspecified (Backley (1993), Harris (1994b)).

¹⁷Typically, the 'L' element is used to define fully voiced objects, otherwise the contrast voiceless / voiced is represented by the presence versus absence of the element 'H'.

1.6. Phonological process in GP

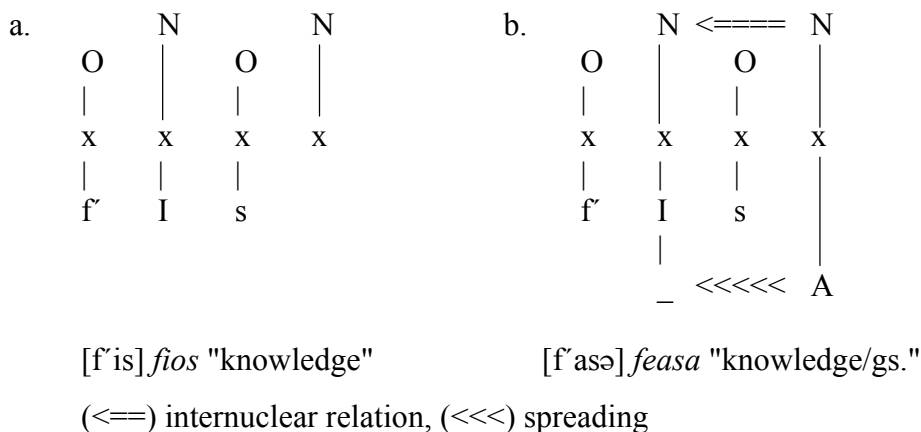
Unlike the rule-based approaches, GP is fundamentally a theory of representations where phonological phenomena are viewed as stemming directly from the structural and segmental conditions which are present in the phonological representation. In this model the phonological processing is viewed as either the *decomposition* or *composition* of segmental material (elements). An example of the former was given above where the lenition of [p] (h, ʔ, U) to [f] (h, U) is treated as the loss of element (ʔ) (see e.g. Harris (1990a)). Similarly, in vocalic systems, vowel raising or lowering may be viewed as the decomposition of a compound. For example, Irish [e] tends to be raised to [i] in palatalised environments, while [o] is raised to [u] in velarised contexts (see 2.4). This may be uniformly represented as the loss of the element 'A'.

(21)



The other type of phonological process, i.e. *composition*, is the reverse of this. Elements are added to a compound by, for example, spreading. In this way we may account for various harmony processes. In section 2.3.4. we discuss what appears to be A-spreading into a nucleus containing 'I'. The resulting compound is a front low vowel [a] which may be viewed as an (I.A) compound. This spreading results from a governing (licensing) relation holding between two consecutive nuclei.

(22)



Segmental composition is conditioned in that the element which is added to a segment must be locally present. In the example above the locality is derived from the relation between two nuclei.

The spreading phenomenon in general, be it an instance of assimilation between consonants or a case of vowel harmony, may be also expressed in "non-dynamic" terms. Namely, it may be understood as the static identification of a governed (licensed) position with its governor (licenser) with respect to melodic material lexically lodged in the latter (Harris (1990b, 1994a)).

Finally, let us see in what way the various linguistic systems may be defined in terms of the principles and parameters reviewed in this chapter.

1.7. Principles and parameters vs. linguistic systems (some examples)

Let us first consider the way in which principles and parameters define the phonological structure of natural languages.¹⁸ Recall that the syllabic constituents: Onset, Nucleus, Rhyme, are maximally binary, i.e. they may contain up to two positions. However, not all languages exploit the binarity of constituents. Thus, for instance, in Polish there are no branching nuclei (hence, no length contrasts), while in Hungarian there are no branching onsets. It is claimed (e.g. Kaye (1990:324)) that the choice between branching and non-branching constituents is parameterized across languages. The parameters are listed below.

(23)	Branching
Onset	YES/NO
Nucleus	YES/NO
Rhyme	YES/NO

It should be stressed that if a language has branching constituents e.g. nuclei, it also has their simplex counterparts and exhibits length contrasts (e.g. English, but not Polish).

Apart from the constituents, we also referred above to parametric licensing of domain-final nuclei. This parameter distinguishes between such languages as Polish and

¹⁸We only concentrate on the parameters which are relevant to this work.

Italian in that, in the former, words may phonetically end with a consonant, while in Italian, the parameter licensing domain-final nuclei is set in the OFF and words must end with a vowel.¹⁹

The parameters mentioned above have the ability to capture various types of phonological systems, and additionally, they allow us to understand better the conditions underlying segmental distribution. Earlier we mentioned that in some languages which have branching onsets their distribution may be limited to word-initial and word-medial position. This phenomenon is ascribed to the licensing properties of domain-final nuclei, which are also claimed to vary parametrically (see Government Licensing (1.4.1)).

More recently, parameters have been employed to delimit possible phonological objects within a given linguistic system. In 1.5.1 we saw how the five-vowel system is distinguished from a seven-vowel one by means of the parameterized exclusion of I-U combinations, thus eliminating front rounded vowels. In 2.4, we will try to define the Irish vocalic system by employing similar parameters, while in 4.2.10 we propose a parameter for the occurrence of the element 'h' in linguistic systems which may allow us to account for languages lacking voice contrasts among fricatives (e.g. Irish) and the absence of affricates in such systems.

Further relevant aspects of the theory of government in phonology will be introduced and expanded in the appropriate sections.

¹⁹Recall that word-final consonants are syllabified as onsets (Coda Licensing (1.4.1)).