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STRESS AND GLIDES IN SPANISH SYLLABLE STRUCTURE

by

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A dissertation submitted to the Graduate Faculty in Linguistics in partial fulfillment of the requirements for the degree of Doctor of Philosphy, The City University of New York.

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Abstract

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José Antonio Méndez

Adviser: Professor Charles Cairns

This dissertation addresses stress and syllable structure in Spanish with special emphasis on phonetic glides. The interdependence of constraints responsible for stress assignment and those pertaining to syllable structure shows that the former determine syllabification in Spanish, specially in the context of vowel sequences. A bottom-up approach to prosodic and metrical analysis achieves a holistic treatment of the facts through the interaction of universal constraints, with minimal use of language-particular stipulations.

Chapter 1 presents a brief overview of Optimality Theory and compares the workings of constraint interaction to Grid Theory as a possible alternative to account for stress and syllabification.

Chapter 2 discusses nominal and verbal stress in Spanish. Nominal stress is a partially-predictable system with two groups, depending on the location of stress. The relative ranking of the constraints ALIGN RIGHT and NON-FINAL explains the facts in a principled way. Verbal stress differs from nominal stress in that the latter is an

invariable system and that consonants do not undergo Weight by Position. Differences between tenses is accounted for by the domain at which constraints operate.

Chapter 3 addresses syllabification of vowel sequences. A constraint forcing the alignment of the main foot with the stressed mora explains heterosyllabic parsing when the second element of the sequence receives main stress. Sonority considerations, together with syllable structure constraints are shown responsible for the different parsings involving low and non-low vowels.

Chapter 4 focuses on glides, which are analyzed as the phonetic realization of input high vowels. Similar mechanisms to those applying to [-high] vowel sequences are responsible for the behavior of high vocoids. This chapter also analyzes the effects of pre-vocalic glides in the assignment of stress. A parallelism with palatal consonants calls for the formulation of a constraint requiring the alignment of the left edge of the prosodic foot with an onset associated with the feature [+high]. Cophonologies in syllable structure account for the different parsings in *cámbio/espío, carícia/policía.*

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Á túa memoria, papá.

CHAPTER 1

Introduction

1. 1 Stress

Stress does not have an exact phonetic correlate. Bloomfield (1933) defines stress as a "secondary phoneme," consisting in speaking one of the syllables louder than the others. According to Bloomfield, stress—the equivalent to intensity or loudness—consists in a greater amplitude of sound waves, and is produced by more energetic movements. Hayes (1992), drawing on experimental work by Fry (1955, 1958) claims that loudness has the least effect on stress perception, with duration and pitch as the principal clues for stress perception. However, pitch is not a clear indicative of stress, as interrogative phrases clearly show. In yes / no questions (Pennsylvania?), the stressed syllable receives the lowest pitch.

The aim of this chapter is to analyze stress as the result of rhythmic structure (see Hayes 1982: 15 and ff. for detailed explanations). In this regard, an array of phenomena will be presented to achieve a characterization of the stress pattern of Spanish, providing a set of mechanisms that can be applied to other languages as well.

This chapter is organized in a chronological fashion. The departing point will be the work of Halle and Vergnaud (1987), Halle and Idsardi (1995); and Harris (1983, 1991, 1995), as it applies to Spanish. Although differences exist among the works just cited, these authors will be grouped together under the term umbrella of Grid Theory.

The Prosodic Hierarchy approach will be tested against some related phenomena, such as stress assignment and some reduplicative data. The brief discussion presented in

this chapter should constitute enough evidence to justify my choice for Prosodic Theory in general and Optimality Theory.

Section 1.1.1 provides an overview of the grid as a theory which, equipped with language-particular ordered rules, derives the stress pattern of Spanish. Section 1.1.2 uses prosodic hierarchy as the sole means for characterizing stress.

1.1.1 The grid

This section examines the analysis of stress as presented in Halle (1990), Halle and Idsardi (1996), Halle, Harris, and Vergnaud (1987, 1991), Harris (1983, 1991), Kager (1996), among others, as it applies to the computation of the stress.

The defining feature of GT approaches consists of projecting marks from stressable elements into line 0. Some of these marks project onto line 1, some of which project onto line 2. Which marks project onto higher levels is basically governed by the parameters in (1), from Halle and Idsardi (1995).

(1) Parameters in grid theory

(a) Project a line 0 element for each syllable head.

(b) Syllable Boundary Projection parameter: Project the left / right boundary of certain syllables onto line 0.

(c) Head Location parameter: Project the left / right-most element of each constituent onto the next line of the grid.

(d) Edge-Marking parameter: Place a left / right parenthesis to the left / right-most element in the string.

(e) Iterative Constituent Construction parameter: Insert a left / right boundary for each pair of elements.

Not all languages have a particular setting for each of the parameters presented in (1). Quantity-insensitive languages do not project any mark to the left / right of heavy syllables, whereas in quantity-sensitive ones heavy syllables behave differently from light, as is the case in English and Spanish. Additionally, languages allowing non-heads to be the stress bearer element need an extension of (1a) so these segments can project a mark onto line 0. This approach shows some deficiencies in the computation of stress in Spanish, as we shall see in chapter 2, where the GT and Prosodic Theory approaches are studied in some more detail.

An OT approach to stress and other related phenomena will now be discussed and shown to constitute an adequate account for the data under consideration.

1.1.2 Stress in OT

A critical set of data to determine the adequacy of a theory is its capability to account for the non-canonical data. To take a familiar example, the opposition between regular and exceptional stress in English will be presented. The taxonomy in (2) is based on Chomsky and Halle (1968), henceforth SPE, and will serve as the springboard to define the basic constraints operative in the computation of Spanish stress undertaken in chapter 2. An exhaustive treatment of English stress would take us too far afield. The data in (2 I-III) will be used for illustrative purposes only to place the reader in the context of the actual discussion of further chapters. The English data is also intended as

an invitation to further research, which would be an invaluable test for some of the major claims made in this dissertation as they try to account for syllabification and stress phenomena.

(2) English stress pattern

I	II	III	IV	V	VI
América	aróma	veránda	políce	húrricane	cemént
cínema	baláika	agénda	profáne	ánecdote	adúlt
aspáragus	hiátus	consénsus	seréne	pédigree	éffort

Group I is straightforward in that the last syllable does not play a role in the computation of stress, thus complying with the English Stress Rule of Hayes (1980, 1995) with extrametricality marking on the last syllable. Groups II, III contain a heavy penultimate syllable which thus holds stress since heavy syllables project left parentheses. A GT approach to English stress derives the intricacies in (2) through the general mechanisms of grid projection equipped with the parameters described in (1) and a series of additional rules, such as a special mark on final long vowels (see Halle and Vergnaud 1987, Halle and kenstowicz 1991, inter alia for exhaustive analyses).

From an OT perspective, some constraints will now be defined as they play a crucial role in the computation of the general mechanisms of stress assignment illustrated in (2 I-III). These constraints are defined in (3). The constraint ranking in (4) and the tableaux in (5a,b) illustrate some of the basic mechanisms of OT relevant to our discussion.

(3)

FOOT BIN: Feet are binary at some level of analysis (moras in this case).

FOOT TYPE, MORAIC TROCHEE: Feet are left-headed.

NON FINAL: The right edge of the main foot cannot coincide with the right edge of the Prosodic Word.

ALIGN: (AL.R., Σ, PrWd.) The right edge of the foot coincides with the right edge of the Prosodic Word.

(4) Constraint ranking

FT BIN, FT TYPE >> NON-FINAL >> AL. RIGHT

5a		FTBIN / FT TYPE	NON-FINAL	AL. RIGHT
a.	(á.me.)ri.ca			μμ!
b.☞	a.(mé.ri.)ca			μ
c.	a.me.(rí.ca)		*!	
d.	a.me.ri.(cá)	*!		

5b		FTBIN / FT TYPE	NON-FINAL	AL. RIGHT
a.	(á.mal.)gam	*!(FT TYPE)		μμ
b.☞	a.(mál.)gam			μ
c.	a.mal.(gám)		*!	

As for groups IV-VI, the observable inconsistencies led researchers of the different approaches to formulate language-particular mechanisms to derive the desired result (see Goldsmith 1991:209 for a treatment of group VI, Halle and Vergnaud 1987, Halle and Kenstowicz 1991, Halle 1996).

Some attempts were made to account for the controversial cases from an OT perspective. The reader is referred to Hammond (1996, 1997) and references cited there for an analysis of long vowels as they differ from heavy syllables in that only the former force final stress. Hammond (1996) proposes that the Weight to Stress Principle (WSP) of Prince and Smolensky (1993) be expressed as two universally-ranked constraints: WSP(VV) >> WSP(VC). For a treatment of low vowels, see Rice (1996) and his interpretation of Selkirk (1982) and Halle (1977). For the purposes of our discussion, the most relevant factor of the English stress pattern is that English has a general pattern with deviations which are subject to rule or constraint interaction. Regardless of the theory we adopt, it seems obvious that some lexical information is needed to explain the stress facts.

An immediate question derived from the problem words just presented is how to handle exceptions. In the case at hand, the question arises of whether lexical marking is more economical than proposing a complicated machinery sometimes difficult to motivate, such as the case of mora-generation in English. Hammond (1996) outlines three possibilities to treat exceptions: particular constraint ranking or special constraints for some classes of words (see Hammond 1994 for detailed discussion). The third possibility is lexical metrical assignment (Inkelas 1994).

My contention is that, at least for Spanish, particular rank-ordering of constraints constitutes the most adequate means of treating exceptional words. As we shall see in chapter 2, the exceptional cases in Spanish, as in English, are grouped within categories, conforming to a pattern and deviating from the general paradigm in a consistent way. Chapter 2 will also show that the constraints responsible for stress assignment in English account for the Spanish data as well, although with a different rank-ordering: what is

canonical in English (non-final stress) is exceptional in Spanish. However, the marked—less abundant—words are strictly subject to the ranking of FTBIN, NON-FINAL, and ALIGN R. First I will try to provide some evidence against lexical metrical assignment and pre-specified accent and then make the case for particular constraint ranking.

As with English, the accentual pattern of Spanish admits deviations and exceptions, but these are subject to rule. Since constraints are understood to operate on output forms only, lexical entries could, in principle, display any prosodic arrangement: nothing would prevent input forms such as, i.e., /(á.me.)ri.ca/, /(vé.ran.)da/. Marked [pirámide] in Spanish would then correspond to input /pi.(rá.mi.)de/. Ranking faithfulness constraints above AL. RIGHT guarantees the correct output, as shown in (6), where RESPECT METRICAL STRUCTURE represents a family of faithfulness constraints which require input-output identity (requiring /(á.me.)ri.ca to come out as ámerica.)

(6)

/pi.(rá.mi.)de	RESPECT METRICAL STRUCTURE	AL R(Σ, PrWd)
a. ☞ pi.(rá.mi.)de		*
b. pi.ra.(mí.de)	*!	

According to the constraint ranking in (6) an input form such as /(pí.ra.)mi.de/ should surface unchanged. However, words with pre-antepenultimate stress are unattested in the language. Notice further that this statement does not entail what has been called in McCarthy and Prince (1994) "The Fallacy of the Unmarked," but with the

opposite effects. According to McCarthy and Prince, languages do not consist exclusively of sequences of unmarked sounds (perhaps [ta]) because faithfulness requirements delimit the effects of phonological constraints. The ranking in (6) leaves room for high-ranking of prosodic constraints, such as FTBIN, thus allowing room for rearrangements on an input form such as */(pí.)ra.mi.de/. The important point to bear in mind is that RESPECT METRICAL STRUCTURE is ranked above AL. RIGHT, otherwise marked forms would never emerge. However, since nothing would in principle prevent aberrant input forms in terms of right (un)alignment, they should surface unchanged. However, in Spanish the limits of what is possible and what is not are clearly defined, strongly suggesting that both marked and unmarked forms are subject to constraint ranking and that metrical structure emerges as the interaction of constraints rather than assigned in the lexicon. Notice that this reasoning applies to a hypothetical language with lexical stress and a three-syllable window. Unless constraints operate in input forms, an undesirable move, the system cannot ban stress on the fourth syllable from the right because faithfulness constraints will always prevail. The only way to solve this problem would be to formulate ALIGN in terms of "do not separate the foot more than X elements from the right edge of the prosodic word," which contradicts the commonly-accepted assumption that a constraint is either respected or violated.

To summarize this section, lexically-assigned stress cannot explain why the three syllable window is never violated in Spanish. An extension of (6) to hypothetical input forms such as /píramide/ reveals that given an input with stress on the pre-antepenultimate syllable, alignment constraints would move stress to the right edge of the prosodic word, but ALIGN is necessarily ranked lower than faithfulness constraints (otherwise marked forms would never emerge). Therefore, [(pí.ra.)mi.de] should be the output form, contrary to fact.

As an alternative to the lexical assignment approach, sub-regularities may best be explained by particular rank-ordering of constraints, whereby a language L may contain

various sub-grammars (co-phonologies in this case), each coresponding to a particular ranking of constraints. Thus grammar G_1 emerges as the result of the constraint ranking A >> B >>C, grammar G_2 entails the ranking A >> C >> B, and so on. Of these, one grammar usually represents the canonical, most productive pattern. Language learners readily identify the unmarked case and classify exceptions as belonging to a particular subgroup. This seems to be the case at least in the accentual system of Spanish, where learners face a general group and a class of exceptions which are subject to well-defined mechanisms.

Once the constraints responsible for stress assignment have been defined, a rationale will be made to motivate what is perhaps the most important single notion behind my analysis of stress and syllabification: the notion of mora and the superiority of an analysis based on prosodic hierarchy rather than on grid projection and the skeletal tier. Some epiphenomenal data will be brought into the discussion to show the simplicity of a moraic analysis. Some background information will be provided first as a motivation for the mora. Adopting a chronological approach, a brief discussion of the skeletal tier will be presented to motivate the need for higher prosodic structure, in particular moras and prosodic foot.

1.1.3 From the Skeletal Tier to Prosodic Hierarchy

The skeletal tier provides a means of representing segment length independently from its featural content. It requires sometimes a two-to-one mapping between root slots and skeletal positions, such as the case of affricates. Long vowels and geminates, on the other hand, require a one-to-two mapping, since a single root node anchoring feature specifications must project two timing units (for detailed explanations see Broselow 1995 and work cited there). The X tier contributes to an understanding of some timing-related

phenomena, such as length and template preservation, once segmental information has been removed or shifted by morphological processes or even language games (Broselow op.cit., Bagemihl 1995). In Italian for instance, some words trigger gemination of the first consonant of the following word, as illustrated in (7). Compensatory lengthening, discussed in some detail later in this section, is another indication that some timing tier must be part of phonological representation.

(7)	bella	beautifull (fem.)
	citá bbella	beautiful city
	dónna bella	beautiful woman

Additional phenomena to consider the role (and accuracy) of skeletal positions is provided by some instances of reduplication. Broselow (1995), drawing on work by Levin (1983, 1985), presents the case of Mokilese reduplication, where neither the syllable nor a XXX or CV template provide a straightforward explanation of the facts, here illustrated in (8).

(8) Mokilese reduplication (Broselow's examples)

wadek	wadwadek	"read"
poki	pokpoki	"beat"
pa	paapa	"weave"
andip	andandip	"spit"

McCarthy and Prince (1986) found in these and related data motivation to look for reduplicative templates above the timing tier, both below and above the syllable node,

e.g. metrical feet and moras. Reduplication in the first example in (8) wadek / wadwadek cannot be explained by means of the syllable, nor can we say that the reduplicant is a closed syllable (see last example in [8], where the reduplicant would then be "an").

The claim that the reduplicant template in Mokilese is a XXX sequence does not seem to be well motivated for no prosodic category is defined in those terms. Additionally, although Broselow does not provide examples with complex onsets at the beginning of the word, a CCVC.CV base is expected to have CCVC as its reduplicant, thus copying four elements instead of three. On the other hand, the fact that the three slots copied in Mokilese reduplicative are not necessarily the first three elements of the base leads Broselow to consider alternatives to the skeletal tier, to be found in prosodic templates.

(9) diar	diidiar	(find)
alu	allalu	(walk)

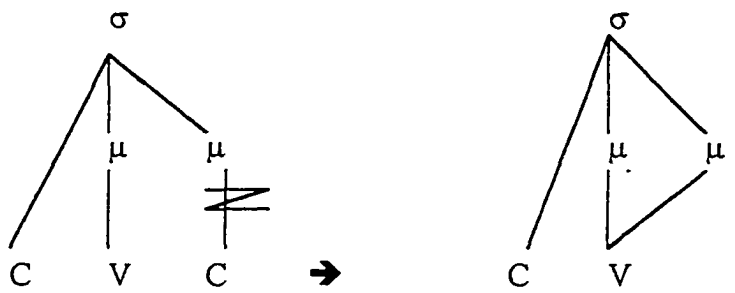
The notion of Prosodic Hierarchy I adopt here rejects the need for a skeletal tier and subscribes to the theory put forward in Hyman (1985), Hayes (1989), and Selkirk (1990), among others.[1] Two sets of data will be brought into the discussion to provide additional support to mora theory and claim the otiosity of the skeleton. These two sets of data are compensatory lengthening and geminate consonants.

Compensatory lengthening (henceforth CL) consists of the lengthening of one segment as a consequence of the loss of a neighboring one. Only segments that contribute

[1] Selkirk (1990) proposes a two-root theory of length, by which long segments (either long vowels or geminate consonants) consist of a single Place Node associated with two root slots. In turn, these root nodes are linked to moras: two in long vowel configurations, one in geminate consonants. The choice of one versus two root nodes is not crucial to the discussion here and will be ignored at this point. The important aspect of Selkirk's approach is her rejection of the skeleton.

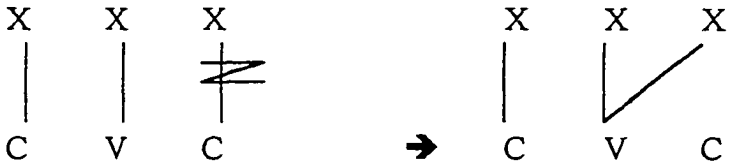
weight trigger lengthening of another segment. As seen in (10) in a very schematic way, lengthening of a vowel occurs only after a coda consonant is lost. Loss of an onset element does not trigger lengthening of a neighboring vowel, a direct consequence of the representation, since onsets are not associated with moras.

(10)



Skeletal representations can derive similar results by re-attaching an X position to a segment after deletion takes place, as illustrated in (11), but they cannot distinguish between positions left empty by deletion of, i.e., coda consonants and onsets, since they both project identical marks.

(11)



An additional argument in favor of a moraic analysis is that of geminate consonants. Regardless of whether geminates are represented as one or two roots, the first member of a geminate belongs to the coda of the preceding syllable, with the second member usually associated with the onset of the following one. In a one-root theory of length, the statement that geminate consonants consist of a single root linked to a mora, in contrast with single consonants which are not inherently linked, suffices to rule out

onset geminates. In a two-root theory of length, sonority constraints ban two identical elements from appearing in the onset. Selkirk (1990:162-164) points out that the automatic morahood of geminate consonants in a one-root theory of length encounters the problem of accounting for the stress pattern of languages with no Weight by Position and geminate consonants on their inventory. The two-root theory of length accounts for these facts by attaching the first root (or even both if coda conditions allow for it) to the coda of the preceding syllable and the second to the onset of the following one, without need to assign a mora to geminate consonants in lexical representation.

The repercussions of Selkirk's analysis for the present study are that mora assignment is motivated only by the position of a particular segment within the syllable and that mora theory is an adequate means of accounting for stress and syllabification. The chapters that follow make crucial use of this notion, showing a close relationship between syllable structure and stress facts. Before moving into an analysis of stress assignment in Spanish, I will outline some aspects of syllable structure crucial to the understanding of the framework developed in chapters 3 and 4.

1.2.1 Syllable structure: towards an analysis of glides

Syllable structure is understood here as the result of the interaction of universal constraints. The basic notions of Optimality Theory that constraints are violable and that different rank-orderings of constraints explain the different syllabic arrangements of the languages of the world will be the basic premises of our discussion.

No comparison will be made between rule-based approaches and constraint-based theories to justify the choice of the latter (see Hammond 1997 for a comparison of both

models). Instead, the discussion centers on some criteria to determine the appropriateness of a theory and then test OT against such criteria. Two of the basic requirements that a theory must meet are: (a) The mechanisms must account for the data, and (b) the machinery of the theory cannot not generate impossible patterns. The simple syllable types presented in (12) suffice to test OT against these two basic requirements. To simplify matters, this typology does not include complex onsets and codas. Material in parentheses is understood as optional, O stands for onset, C stands for coda.

(12) Syllable types (from Hammond 1997:36)

a.	(O)V(C)	Optional onsets and codas, (C) V (C) languages (English)
b.	OV	Onset is mandatory, no coda CV languages
c.	OV(C)	Required onset, optional coda (Yawelmani)
d.	(O)V	Optional onset, no coda (Hawaiian)

How can OT account for the languages in (12)? The constraints in (13a) with the rankings in (13b) account for (12 a-d). More complex scenarios, such as those with complex margins or nuclei, can be easily handled by ranking faithfulness constraints (forcing phonetic implementation of input segments) above those which prohibit such configurations, namely *COMPLEX ONSET, *COMPLEX NUC, and *COMPLEX CODA.

(13a) Formulation of constraints

ONSET: Syllables must have onsets.

NO CODA: Syllables must end in a vowel.

FAITHFULNESS: Pronounce everything in the input and only what is in the input.

(13b) Constraint rank-ordering

a. (O)V(C): FAITHFULNESS>>ONSET, NO CODA

b. OV: ONSET, NO CODA>>FAITHFULNESS

c. OV(C): ONSET>>FAITHFULNESS>>NO CODA

d. (O)V: NO CODA>>FAITHFULNESS>>ONSET

The second requirement we listed to test a theory is that it cannot predict impossible language types. We must now determine what are some impossible languages and show that no constraint interaction would trigger such patterns. Notice that the configurations in (14) are understood as language prototypes, not as tokens. Any such configuration could appear in a particular language (as is the case in English) just to comply with FAITHFULNESS (See Hammond 1997: 37 for an extensive analysis). The important thing to bear in mind is that no rank-ordering of the universal constraints for syllable structure would force the syllable types listed in (14). Particular rank orderings could allow some of these configurations, but not require any of them.

(14) Impossible language types

V VC OVC (O)VC V(C)

As we shall see in chapter 2, this simple set of constraints can explain the basic facts of syllabification in Spanish. Additional constraints will be brought into the discussion to account for language-particular facts and to explain some variation that comply with the requirements just presented. The most intricate aspect of Spanish syllabification is provided by vowels, specially high vowels, which sometimes alternate with glides. The following paragraphs should prepare the ground for the analysis of high vocoids in Spanish.

1.2.2 The need for [consonant]

The simple notion that syllables are phonological units which organize segments into melodic structure based on their sonority values (Blevins 1995) will be taken as a point of departure to motivate my contention that the feature [consonant] is redundant and should therefore be dispensed with, at least for Spanish. The Sonority Sequencing Generalization establishes that between any member of a syllable and the syllable peak, a sonority rise or plateau must occur (see Blevins, 1995:210 and references cited there). This notion will affect our understanding of syllabification in Spanish undertaken in chapter 3, and most crucially in the analysis of glides presented in chapter 4.

Vowels, glides, and laryngeal consonants have traditionally been understood as constituting a natural class of segments, perhaps influenced by the articulatory-based definition of consonants provided by Chomsky and Halle (1968) SPE. Glides have also

been defined as consonants in some analyses, mainly to explain what otherwise would constitute OCP violations in /yi/ or /wu/ sequences, present in many languages. Additional motivation for the existence of [consonantal] value in glides comes from three-way distinctions in high vocoids, which sometimes surface as vowels and other times are realized as glides. Hume and Odden (1996), drawing on work from Waksler (1990) present data from Lenakel showing this three-way distinction.

(15) a. [Øcons]: vocoid alternates between vowel and glide
[ní.an] "daytime" vs. [lén.yan] "at the time"

b. [– cons]: vocoid is always realised as vowel
/ekutuan/ [e.ku.tú.an] *[e.kut.wan] "cook"

c. [+cons]: vocoid is always realised as a glide
/ai+ausito/ [ay.u.si.to] *[ay.wasito] "to tell a story"

Rosenthall (1994) analyzes the alternations in (15), not as a result of an underlying contrast between these classes of vocoids in terms of their [consonantal] value, but rather in terms of their position in the syllable and its relation with stress. Briefly summarized, vowels are syllable peaks whereas glides are not. At the same time, exceptional stress in those forms surfacing always as full vowels grants vocalic status to these segments.

The Lenakel data finds an almost exact correlate in Spanish, although in the latter the facts are somewhat more complicated. Rosenthall extends his analysis to the Spanish data claiming input identity between surfacing glides and high vowels. Oppositions such

as [día] / [dyá.ryo] (day / journal) are understood in Rosenthall (1994) as different output realizations of an input high vowel which surfaces as a glide if it is not the stress bearer. Both Rosenthall (1994) and Hume and Odden (1996) treat examples (b, c) of (15) as special cases as they represent only a "handful of words" in Lenakel. As we shall see in chapter 4, the Spanish data is different in that the special cases are more than a few isolated words and will prove to follow a productive pattern. Anticipating the discussion, stressless prevocalic high vowels do occur in Spanish (bi.óm.bo, pi.á.no), but those instances are limited to high vocoids preceding a stressed vowel, never following it (*bó.i.na, *bá.i.le).

I adopt the basic claims made in Hualde (1991a), Roca (1991), Rosenthall (1994), among others, advocating for input identity between surfacing high vowels and glides (for the opposite view, see Harris 1995). However, I differ from them in that the glide / high vowel opposition does not emerge as a direct consequence of the position of stress within the word, nor do high vocoids surface as vowels (or at least as part of the syllable nucleus) by virtue of a constraint of the type V-MORA (project moras from vowels), crucial to Rosenthall's analysis. Instead, morahood (or peak-hood) of a segment is understood here as a direct consequence of its sonority value, which I consider not derived, but intrinsically assigned to each segment, along the lines of Selkirk (1984). The rationale for this analysis is that rejection of [consonantal] entails rejection of its opposite value [–consonantal], and therefore to the notion of vowel all together as a distinctive mark for segments, thus conflating vowels and glides into one class of segments.

Hume and Odden (1996:355 and ff.) present convincing evidence for the non-existence of a natural class of [–consonantal] segments. Two basic arguments for the

non-existence of a natural class which includes laryngeals, glides, and vowels are nasal spreading and sonority calculation.

Nasal spreading appears at first glance as a clear indicator of the existence of a natural class of segments integrated by the three groups at hand. This evidence is provided by languages such as Arabela and Warao, where nasal spreading affects laryngeals, glides, and vowels only. However, Hume and Odden (op.cit.: 357) show a taxonomy of languages where nasal spreading affects other segments as well (liquids in Urhobo; liquids, nasals and fricatives in Applecross Gaelic). As for sonority, Hume and Odden see a problem in the characterization of laryngeals, which, given their [–consonantal] character should qualify as syllable peaks, contrary to fact.

Although more research in this area is needed to demonstrate that [+consonant] and therefore [VOWEL] may be dispensed with, Hume and Odden (1996) present convincing evidence that this is indeed the case. The analysis of Spanish glides undertaken in chapter 4 attempts to contribute some additional data pointing in that direction. If the endeavor is successful without appealing to [+/– consonantal] specifications, we will be more in a position to reject such notion.

1.3 Conclusion

The computation of stress proposed in this chapter advocates for the adoption of Prosodic Hierarchy Theory. The basic framework discussed here will be used in the analysis of Spanish stress presented in chapter 2. The basic elements of this analysis are universal constraints responsible for prosodic structure. The interaction of FOOT BIN (feet are binary at some level of analysis), FOOT TYPE- MORAIC TROCHEES, ALIGN

R (Σ, PrWd), and NON-FINAL will suffice to account for the regular, marked, and impossible forms in the language.

Additionally, my approach to stress and syllabification makes crucial use of the interdependence between both phenomena, which will be treated as intrinsically related facts proven to have important effects on each other.

Both syllabification and stress in Spanish present general patterns coupled with an array of exceptions, but these respond to productive patterns. Therefore, exceptions will be studied as sub-regularities rather than unsystematic exceptions. Systematic variation will be approached as responding to particular rank-ordering of constraints, generating more than one grammar within a particular language. Learners identify one rank-ordering as the most productive paradigm, but will build co-phonologies in which to include those forms not responding to the general mechanism.

CHAPTER 2

STRESS IN SPANISH

Introduction

This chapter examines stress in Spanish. Section one analyzes nominal stress, section two centers its discussion on the verbal paradigm. Both systems will be proven to respond to radically different mechanisms, yielding an only partially predictable paradigm for nouns but a rigid and exception-less pattern in verbs. Although descriptively related, both sections illustrate two different theoretical claims.

The observable irregularities of nominal stress will be presented here as an instance of the importance of co-phonologies within the grammar of a particular language. Three types of nouns will be analyzed: unmarked (common), two groups of marked forms, and impossible forms. The differences between the unmarked and marked forms will be analyzed as a consequence of different rank-ordering of constraints. Evidence will be provided showing that anomalous stress in Spanish should not be understood as assigned in the lexicon. Although lexical information is needed to account for marked forms, this information will be proven to respond to specifications for constraint ranking rather than pre-assigned metrical structure. Verbal stress will be analyzed as a morphologically-driven system, yielding a completely predictable paradigm.

2.1 Nominal Stress

2.1.1 Data

The assignment of stress in Spanish nouns depends heavily on the internal structure of the last and penultimate syllables. Forms with heavy final or penultimate syllables can only receive final or penultimate stress. A noun with a CV(C).CVC.CV or CV(C).CV.CVC syllabic structure cannot receive stress to the left of the penultimate syllable. More generally, and in compliance with the three syllable window (Harris 1983, 1985, 1991, 1992), stress can never be placed to the left of the antepenultimate syllable. A word such as *pirámide* is marked but possible, whereas **píramide*, with pre-antepenultimate stress is an impossible noun.

In an schematic way, the stress pattern of Spanish nouns may be summarized as follows:

(1) Stress pattern in Spanish. Representative non-verbs (...CCV sequences are understood as having a syllable boundary between both consonants.)

INPUT	UNMARKED	MARKED	IMPOSSIBLE
a. CVCVCVCV	caramélo	pirámide	*píramide
b. CVCVCCVCV	cabalgáta	heráldico	*héraldico
c. ...CVCVCVC	calamidád	caníbal	*cánibal
d. CVCVCCV	Rigobérto	--------	*Rigóberto
e. ...CVCCVC	maternál	cárcel	*máternal

Rows (a, b, d) can also have a second member in the marked column: words ending in a stressed last vowel (*Panamá, dominó, menú, papá, mamá...*). These words were not included in the table above, which concentrates on the distance of the stressed element from the right edge of the word, and they will be analyzed as special cases. Stress assignment in forms containing glides is postponed to chapter 4, where a complete treatment is offered. (1) suffices to give us an idea of the stress pattern in Spanish. For the unmarked case, CV(C).CV words receive stress on the penultimate syllable, CV(C).CVC words prefer the last syllable as the stress bearer. The marked paradigm consists of either final stress in words with final light syllables or antepenultimate stress as long as neither the penultimate nor the final are light.

The paradigm in (1) shows that Spanish non-verbs can be classified into three categories[1] according to the position of stress:

Type A—unmarked—forms receive stress on the penultimate syllable if final is light, or on the final if heavy. Nouns of this category include: *trabájo* (work), *libréta* (notebook), *papél* (paper), *animál* (animal).

Type B—marked—nouns have stress on the antepenultimate syllable in words with light final and penultimate syllables: *bolígrafo* (pen), *teléfono* (telephone). Also included in this category are words with heavy ultimas and penultimate stress. These include *césped* (grass), *revólver* (revolver), *trébol* (trefoil).

Type C includes nouns with final stressed light syllable. Forms such as *café* (coffee), *papá* (dad), *menú* (menu) constitute a small category, whose members are

mainly loan words. Type C is beyond the scope of treatment in most researchers' theory, including this one.

Most treatments of Spanish stress concentrate on types A and B. Researchers agree that type A is the regular paradigm, type B being the exceptional case.

2.1.2 Is stress placement in Spanish a regular system?

The structuralist school considered Spanish stress an unpredictable system (Alarcos 1968, Navarro-Tomás 1968, Quilis 1981). The numerous exceptions that would weaken any attempted analysis led these linguists to conclude that stress in the language is just part of the underlying representation. In terms of learnability, children acquiring the language would have to learn stress placement by the same mechanisms they acquire new lexical items or the past tense of irregular verbs.

Spanish has a partially predictable stress system. Learning a set of mechanisms does not suffice to place stress in the appropriate position in all forms. Native speakers therefore need some more knowledge in order to acquire the accentual system. Hayes (1982) invites the reader to consider whether the rules proposed to account for the stress pattern of English are just notational maneuvers to translate the results of historical evolution, or in fact they represent what is in the mind of the speakers. This is a legitimate question to ask for Spanish as well. In fact, Alarcos (1943), Roca (1986) argue that many of the regularities of the system are just the result of historic evolution.

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[1] These categories are theory-neutral and illustrate the three kinds of non-verbs according to the position of stress: A (regular), B (marked, less abundant, with stress to the left of what would otherwise be type-A), and C (final stress in vowel-ending forms).

The challenge to a synchronic account is to explain the facts in terms of a learnable system, i.e., a description of the data that could possibly represent what is in the mind of the speakers. It seems reasonable to assume that the child learning the language is not aware of the history of the language and the intricacies of the evolution of the vowel system from Latin into Romance languages. Yet, language learners make no mistakes and the boundaries of what may be permitted appear to be clearly delimited.

Scholars in the generativist tradition based their analyses on the consistencies that seemed apparent in the system. The most productive regularity shown by the Spanish stress system consists of the prohibited stress sites mentioned at the end of the previous section:

1. No stress placement more than three syllables to the left.
2. No antepenultimate stress with branching rime in the penultimate syllable.
3. No antepenultimate stress with branching rime in the last syllable.

Regardless of the treatment it may receive, it seems clear that there is something in the mind of the speakers that prevents stress from being at a certain distance from the right edge of the word. The number of units that should be considered in order to measure such a distance may provide us with the adequate solution. We shall return to this point on section (2.1.5) when considering the marked stress paradigm.

The regularities of the Spanish stress pattern, whatever their nature might be, must have an effect on learnability. If there is a pattern for stress assignment, this set of rules must govern the assignment of stress to unknown forms by native speakers.

Hochberg (1988) pronounced different types of words to pre-kindergarten Spanish-speaking children and asked them to repeat after her. The degree of difficulty repeating those words will give us an idea of what words should be considered marked in the language. Using pre-literate subjects has the advantage of eliminating the spelling pronunciation. The results obtained by Hochberg are summarized in (2). In this table, the higher the number, the less natural is the form in Spanish. The numbers indicate the percentage of error repeating each particular input with stress placed in different syllables. For the second row, for instance, subjects showed a 37% difficulty repeating a word of the form CV.CVC with stress on the first syllable versus a 18% if the input was given with stress on the last syllable. Boldface, underlined larger font size indicate the stressed syllable.

(2) Degree of difficulty in a repetition task (Hochberg 1988)

	σ σ σ σ	σ **σ** σ σ	σ σ **σ** σ	σ σ σ **σ**
1.CV.CV			7	23
2.CV.CVC			37	18
3.CV.CV.CV		20	13	32
4.CV.CVC.CV		77	42	75
5.CV.CV.CVC		34	47	21
6.CV.CV.CV.CV	56	33	14	34

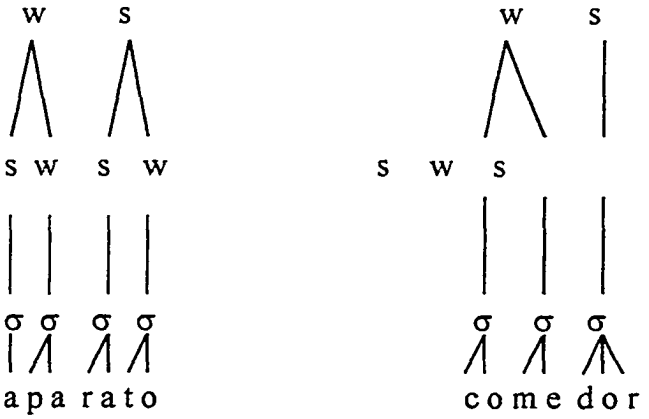
The results of Hochberg's experiment provide an answer to the question of whether Spanish has a regular, predictable pattern for stress assignment in nouns. The

rightmost heavy syllable of the word receives stress. In words with no heavy syllables, the normal stress placement corresponds to the penultimate syllable. This is not new, however. In fact, from early accounts such as Whitley (1976) in which Spanish stress was considered to fall normally on the penultimate syllable, and any other syllable would receive diacritic stress, to more sophisticated ones, such as Halle and Vergnaud (1987), Harris (1983, 1991, 1993), all analyses contemplated penultimate stress as the normal case—a fact apparent in the data.

2.1.3 G.T. Treatments

Harris (1983, 1991)[2] made an analysis of Spanish stress in terms of left dominant, quantity-sensitive binary feet operating from left to right with a right dominant word tree.

(3) Spanish stress system (adapted from Harris 1983):

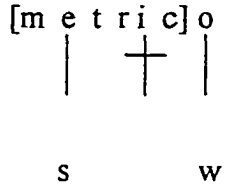


[2] Harris (1995) revises many of the claims made in these works. To follow a historical sequence, earlier work will be first discussed to move later into the (1995) framework.

The domain of stress is the word, comprised of the Derivational Stem (DS) and Terminal Element (TE). According to Harris, the basic stress rule of Spanish is: stress the penultimate syllable in [ ]$_X$, where X represents the word. Stress rules are "well-formedness conditions on arrangements of prominence with respect to specific morphological configurations" (1983: 95).

Words such as *mamá* (mom) or *café* (coffee) with final stress need the stipulation that the final vowels of these forms are "strong" and therefore, stressed. Words with antepenultimate stress are explained in terms of extrametricality, formalized as in the example in (3).

(4) Extrametricality



Stray Rhyme Adjunction incorporates extrametrical elements into prosodic structure. This mechanism is structure-preserving in that it does not alter the labeling of elements as "s" or "w." (4) shows that extrametrical elements are peripheral in the constituent in which they apply.

Following Hayes (1982) and more recent tradition, Harris states that extrametrical elements lose their extrametricality if they are separated from the edge of their morphological domain by another element at the same level of representation.

(5) Extrametricality loss

<a> → a / [X __ Y b Z]

In forms like *sábana* (bed sheet), second [a] sá.b(a).na will be marked extrametrical. Note that, under this analysis, several extrametrical elements may occur in the stress domain to the extent that they are peripheral in their morphological domains:

[[(saban) a] s]

Roca (1988) sees a problem in Harris' analysis in that it does not have a domain isomorphy between stress and extrametricality. Words are parsed into a Derivational Stem (DS) and a Terminal Element (TE). In *órgano* (organ), this would work like this:

[[organ] o].

TE's play no role in the derivation: *organ*+ista =*organista* (organist). On the other hand, as pointed out by Roca, the word is the sole domain of the stress algorithm in Spanish. The derivation of *organ+ista* [*organísta*] and *organ+ill+ero* (barrel organist) [*organilléro*] confirm this hypothesis. Notice that stress falls on the first vowel of [órgano] and moves to the right as suffixes are added. The DS, therefore is not a stress domain, otherwise *organista* would be stressed as *[órganista] instead of [organísta].

Extrametricality as a principle of prosodic phonology may be dispensed with both in OT and in GT approaches, as Harris did in his 1995 framework. Harris (1995), following work by Halle and Vergnaud (1987) computes metrical prominence in the grid. A word such as *caramelo* (candy) is represented as in (6).

(6) *

* * (* *)

c a r a m e l o

In representation (6), baseline (line 0) marks are projected from syllabic elements in the melody. In turn, some of these marks project into line 1 according to some principles. According to Harris (op. cit.: 873) this system does not allow for special diacritics such as Heavy, Light, and so on. Crucially, marks of the grid structure and the boundaries that group them together are independent from syllable structure, and therefore integrate a different plane, only segmental and lexical structure may project onto line 0.

Once [*] marks are projected onto line 0 from the relevant elements, metrical boundaries "(" or ")" are created at particular edges of a small type of heavy syllables and morphemes. Additionally, two universal mechanisms control the projection of boundaries. One is to place a L/R boundary to the R/L of the rightmost or leftmost [*]. The second mechanism of edge-marking, the Iterative Constituent Construction parameter (ICC), inserts a boundary every two [*]. Either the left or right mark of each group after operation of ICC becomes the head and therefore projects onto the upper line.

Spanish imposes a "(" boundary to the left of heavy syllables. In words with final consonants, according to Harris, an underlying extra final vowel is needed to derive stress assignment in words with heavy ultimas and non-final stress, i.e., *mármol, árbol.* Words ending in [s] are analyzed in terms of a filter preventing final complex rhymes from being

metrically heavy, a mechanism that applies to plurals. The filter, formulated in Harris (1995: 874) as [*(•#], explains why antepenultimate stress is possible in [pirámides], although it encounters difficulty accounting for Cáracas, whose non-existence could only be explained if an extra V is postulated at the end of the word (*CáracasV).

(7) analyzes canonical *carretéra* versus anomalous *pirámide, epístola*, and *apóstol.* A special ")" is built before word-final vowels in special—type-B nouns. The basic mechanisms at hand are described first.

(7)	carretéra	pirámide	epístola	apóstolV	
	* * * *	* * * *	* * * *	* * * *	
	* * * *	* * *)*	* * *)*	* * *) *	
	* * (* *)	* (* *)*	* (* *)*	* (* *)	ICC
	*	*	*	*	Head L

A crucial move in Harris's latest approach lies on the fact that Spanish does not have consonant-ending nouns in underlying representation (it is crucial that verbs admit this configuration, as we shall see later). The new approach to Spanish stress adopted by Harris does away with the notion of extrametricality, whose effects are now accomplished by the special lexical labeling of some stems as stress retractors, a property that [apóstolV] has and [papélV] lacks. The difference between both is that the former considers only the stem [apostol] for stress assignment, whereas the latter looks at the entire form. Identical mechanism should apply to irregular [almíbarV], [pirámide], as shown in (8).

(8)	a l m i b a r]$_L$ V	p i r a m i d]$_L$ e	
	* * * *	* * * *	line 0
	* * *) *	* * *) *	∅ →) in special stems
	* (* *) *	* (* *) *	ICC
	*	*	Head: Left

Identical mechanisms apply to forms with heavy penults [kantánte] (singer). In this kind of word, penultimate stress is derived regardless of the point at which right parenthesis is inserted. If feet construction is built on the entire form, the ICC would insert a [(] to the left of the penultimate syllable. If on the contrary, [kantánte] is considered a special, stress retractor stem, a left parenthesis is inserted to the left of a heavy syllable. Similar results are obtained through an OT analysis, as we shall see. In the latter, penultimate stress in [kantánte] is obtained regardless of the relative ranking of ALIGN and NON-FINAL.

The new line of attack to Spanish stress based on GT considerations leads Harris to positing three groups for Spanish stems depending on their final vowel. His classification is reproduced in (9).

(9) Spanish stems (Harris 1995:882)

Class A:		aváro	pájaro	"stingy"	"bird"
Class B:		sabána	sábana	"savanna"	"sheet"
Class C:	(i)	jarábV	árabV	"syrup"	"Arab"
	(ii)	animálV	caníbalV	"animal"	"cannibal"

In class C, the unspecified [V] at the end of the words is phonetically realized as [e] in cases (i) and deleted in (ii). The criteria for its inclusion or deletion is the avoidance of a prohibited coda in word-final position (any consonant other than voiced or continuant coronal).[3] Both V's in class C play identical roles in terms of stress assignment, which otherwise could not derive correct placement in forms such as [animalV], since final consonants do not force (under Harris' approach) projection of a "(" boundary.

Section 3 in chapter 3 makes a detailed analysis of these facts and their implications for syllable structure in general and plural formation in particular. However, it must be pointed out that the boundaries between (i) and (ii) in class C are not as clear as they appear at first glance. There are pairs such as [relox] / [biaxe], [papel] / [mole] which challenge the apocope hypothesis. Important as it is, this apparent shortcoming does not seriously compromise the general value of Grid Theory,[4] as it applies to Spanish. A theory that allows "ghost" elements to play a role in phonological processes may accommodate the data in (9) in a way such that Spanish words ending in a possible coda consonant delete class-C word-marker [e], listing the nouns ending in -le, -ne, -Ōe, -xe, -se as exceptions to the apocope rule. It is unclear however, why these marked words,

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[3] Roca (1996) establishes two kinds of [-e]-ending stems whereby some words end in fully-specified [e], with phonetic implementation, and others where [e] is minimally specified (class C(ii) of Harris).

[4] The theory can account for [animal] without resorting to an extra vowel at the end of the word. If the stipulation of "final closed syllables do not project a "(" boundary" is removed from the algorithm, stress assignment in [animal] is not different from monosyllables [peθ] or [luθ]. Plural-maker [-s] would just lie outside of the stress domain.

whose special character consists of a preference for a consonantal ending, do not reinsert final [e] after some suffixation processes. (10) outlines some of the controversial data.[5]

(12)

sol	sol eádo (sun/sunny)
papel	em papel ádo (paper/wrapped with paper)
compás	a compas ádo (musical rythm/rythmic)
clase	des clas ádo (class/with no class)
común	comun ménte (common/commonly)
inmune	inmune ménte (immune/adv.)

The first pair (sol/papel)[6] represents a problem for any theory, since words with identical endings differ in the way suffixes are attached to the stem. However, a comparison of [soleado] with [desklasado] (from [klase]) suggests that final [e] is

[5] The words in the second column are written and pronounced as one word. Spaces between morphemes are added here for convenience. The -mente ending is a mark for adverbs: many adjectives can be converted into adverbs just by adding this suffix, e.g., fácil / fácilmente (easy / easily).

[6] There are not many consonant-ending words that insert an extra [e] after morpheme attachment: sol-soleado, flor-floreado, cal-caleado, all curiously monosyllabic stems. Some words that do not end in a consonant also have this same extra [e]: manta-manteado.

retained precisely in a word in which this vowel is supposedly "weak," or maximally unspecified, but eliminated in [klase], where final [e] would need full specification.[7]

The [kompás] / [klase] opposition could be understood as an indicative that suffixes attach directly to the stem, leaving final [e] (whether specified or not) out of the derivation. Why then [inmunemente] does not surface as *[inmunmnete], paralleling [komunmente]? These questions pose a problem to the apocope approach, a key factor for a GT approach to Spanish stress.

Additional evidence against the existence of an unrealized [e] at the end of consonant-ending forms may be provided by the fact that Spanish, except in very formal speech, rejects some consonants at the end of the word. Forms such as Madrid [madríθ], verdad [berdáθ] are commonly realized as [madrí], [berdá]. If the language rejects this particular consonant at the end of the word, why delete it when a vowel was there in the first place? Notice that realization of this word-final vowel would eliminate the problem altogether. Anticipating the discussion of constraint interaction in syllable structure, this question can be recast in terms of violation of two faithfulness constraints instead of none (it is important to keep in mind that input for [verdaθ] would be /verdadV/, a perfect output form, cf. *estado, cruce*).

[7] A possible explanation of this peculiar phenomenon in terms of "weak" vowel deletion is untenable for the following reason: Spanish, like many other languages, deletes a vowel in contact with another vowel under certain circumstances. However, vowel truncation is not triggered by feature co-occurence constraints (in the case at hand), but probably by syllable structure considerations, to avoid an onsetless syllable or a complex nucleus. At the melodic tier, the featural content of a segment is irrelevant and therefore, both unspecified and specified vowels should display identical behavior.

This section showed that in fact, GT is capable of accounting for the Spanish data, although it needs phonetically unrealized vowels playing a crucial role in the derivation of stress. The section that follows attempts to account for the same data in a simpler and more economical fashion.

2.1.4.1 Optimality Theory

Studied from the perspective of constraint interaction, the assignment of stress in Spanish non-verbs can be accounted for in terms of satisfaction of the constraints FOOT FORM, FOOT BIN., ALIGN and NON-FINAL.

(11) Formulation of constraints responsible for stress assignment

FOOT TYPE: Moraic Trochee.

FOOT BIN: Feet are binary at some level of analysis (moras in this case).

ALIGN: (AL. R FT, PrWd) The right edge of the main foot coincides with the right edge of the prosodic word.

NON FINAL: Foot with main stress cannot be final in Prosodic Word.

These constraints are ranked in the following manner:

(12) Constraint rank ordering (see Rosenthall 1994:168):

For type A words: FOOT FORM, FOOT BIN >> ALIGN >> NON-FINAL

For type B words: FOOT FORM, FOOT BIN >> NON-FINAL >> ALIGN

The challenge for OT (and for any theory) consists of placing the three syllable window, penultimate regular stress and the effect of heavy syllables under the same

umbrella. The interaction of constraints along the lines of Prince and Smolensky (1993) and McCarthy and Prince (1993 a, b) will prove to be able to provide the adequate formal mechanisms to account for these facts.

How can OT explain that a CV.CVC form prefers to be stressed in the last syllable and that a CV.CV word prefers penultimate stress? The Weight to Stress Principle (WSP) discussed by P&S (1993) and repeated here seems to account for this phenomenon:

(13) Weight to Stress Principle (WSP): Heavy syllables are foot-head.

The Generalized Alignment framework of McCarthy and Prince (1993) constitutes adequate means of resolving this issue. These authors propose a series of constraints on prosodic edges they call Alignment. These constraints establish that the edges (left or right) of two phonological categories must coincide. For the cases at hand, since Spanish stress falls as far to the right of the prosodic word as possible, ALIGN RIGHT (Foot, Prosodic Word) must be highly ranked.

A comparison of [ka.ra.mé.lo] with [ka.pi.tán] (captain) will now be established based on the interaction of ALIGN and FOOT TYPE as an alternative to the projection of a [( ] to the left of a heavy syllable in grid theory. Penultimate stress in the former and final stress in the latter constitutes evidence to support the claim that the Foot type for Spanish stress is the moraic trochee. Therefore, a ...CVC.CV template must be parsed as in (14a) and not as in (14b). A moraic analysis coupled with alignment considerations

captures the stress facts in a simple manner. The analysis of Spanish stress presented in this section is very similar, although not identical, to that of Rosenthall (1994)

(14) a. (CVC.) CV b. (CVC.CV)

The interaction of ALIGN and FOOT TYPE will now be studied with respect to three representative words (carbón, cása, cárta), the latter illustrating the discussion initiated in (14).

(15) Tentative analysis of disyllabic forms

(a) heavy penult (carbón)

CVCCVC	ALIGN (Foot R, PrWd R)	Foot Type-Moraic Trochee
a. ☞ (CVC).(C'VC)		
b. (C'VC).(CVC)	μ μ	

(b) light penult and final syllables (cása)

CVCV	ALIGN (Foot R, PrWd R)	Foot Type-Moraic Trochee
a. ☞ (C'V.CV)		
b. CV.(C'V)		

(c) heavy penult, light final (cárta, cantánte)

CVCCV	ALIGN (Foot R, PrWd R)	Foot Type-Moraic Trochee
a. ☞ (C'VC)CV	μ	
b. (C'VC.CV)		*

The relative ranking of ALIGN and FOOT TYPE is established by (15c). The optimal candidate violates Align but complies with Foot type. Therefore, Foot-Type must dominate Align. Notice that both candidates are empirically indistinguishable, but their representation is different (see Mester 1994, Hayes, 1995 for different predictions depending on representations a, b in 15c.)

If a CV.CV input is parsed as (CV).(CV) with final stress, the marked form would be perfect with respect to ALIGN and FOOT TYPE. However, according to Hochberg's study, this seems not to be the case. The CV.CV pattern with final stress showed 23% difficulty versus 7% difficulty for penultimate stress. Two syllable words with penultimate stress is perhaps the most common pattern found in the language (90% of the total vocabulary according to Harris 1993). There must be therefore, a constraint against the (CV).(CV) parse. This constraint has been defined by P&S as Foot Binarity (FtBIN) (1993:27)

The interaction of Foot-Type, Align and Ft. BIN should be sufficient to account for the possible, unmarked forms in Spanish.

(16) Foot-Type , Ft. BIN >> Align R(Ft., PrWd)

Ft. BIN and Ft. BIN are never violated in Spanish and they will not be included in subsequent tableaux. They relative rank-ordering cannot be established and therefore they are separated by dashed lines.

(17) Unmarked forms.

(a) caramelo

	FOOT TYPE	FtBIN	ALGN R(Ft., PrWd)
a. ☞ (ca.ra.)(mé.lo)			
b. (ca.ra.)(me.ló)	!*		
c. ca.ra.(me.ló)	*!		
d. ca.(ra.me.)(ló)		!*	

(b) verdád

	FOOT TYPE	FtBIN	ALGN(Ft. R., PrWd R)
a. ☞ (ver.)(dád)			
b. (vér)(dad)			μμ

(c) ventána

	FOOT TYPE	FtBIN	ALGN(Ft. R., PrWd R)
a.☞(ven.)(tá.na)			
b. (vén.)(ta.na)			μμ
c. ven.(ta.ná)	*		
d. (ven)ta(ná)		!*	

2.1.4.2 Impossible stress sites

As stated in the introduction, Spanish stress is subject to two major generalizations: the productive paradigm (with exceptions) and the impossible forms (the only possible exceptionless statement about Spanish stress). The previous section explains the mechanisms responsible for stress assignment in the unmarked words. The legitimate question is whether the constraint interaction in (16, 17) is capable of excluding the second generalization, namely the impossible, unattested forms, exemplified in the fourth column of (1).

The primitive idea to account for the forms under consideration is that stress cannot be moved "too far" to the left. The impossible case is illustrated in (18), where only the ALIGN constraint is considered (cf. Rosenthall 1994:168-69).

(18) polysyllabic words with light syllables

CVCVCVCV	ALIGN(FOOT R., PrWd, R.)
a. (C'V.CV.)(CV.CV)	!μμ
b. CV.(C'V.CV)CV	!μ
c. ☞ (CV.CV.)(C'V.CV)	

Candidate (a) is impossible, candidate (b) is marked but possible and (c) is the optimal form. The tableau in (19) shows similar results[8]:

(19)

CV.CVC.CV	ALIGN(Ft. R., PRWD,R)
a. ☞CV.(C'VC)CV	μ
b. (...C'V).CVC.CV	! μμμ

CV.CV.CVC	ALIGN(Ft. R., PRWD,R)
c. (C'V.CV)(CVC)	! μμ
d. CV.(C'V.CV)C	!μ
e. ☞ CV.CV(C'VC)	

[8] Candidates with final stress have been analyzed and rejected by means of violations of FT TYPE or FT BIN.

Violations of ALIGN are justified as long as they are required to satisfy NON FINAL. An output form incurring one violation of ALIGN is always more harmonic than a candidate with two or more violations.

The three syllable window cannot be formulated in terms of "the main foot cannot be more than one mora away from the right edge of the Prosodic word," nor can it be formulated in terms of "the stressed syllable cannot be more than two moras from the right edge of the word." This is illustrated by *vértigo, cántaro.*

The advantage of this analysis is that it accounts for all the regularities shown by the impossible words in Spanish: the three syllable window and the prohibition against antepenultimate stress with branching rimes in the ultima or penultimate syllable. We are now in a position to explain both phenomena by a single claim: the interaction of FT TYPE and ALIGN RIGHT.

2.1.4.3 Type B

As we have seen, the difference between type A and type B words is that in the former, the Alignment constraint is ranked above NON-FINAL, whereas for the latter the situation is just the opposite. This difference may have its origins in one of two facts: Type-B words are lexical exceptions, or they form a sub-regularity within the system.

The first possibility entails that type B nouns enter the lexicon with pre-assigned metrical structure. From this perspective, these words must be considered as exceptions to the general mechanisms of stress assignment in Spanish nouns. Language learners, therefore, must be assumed to acquire these exceptional forms the same way they acquire lexical items or any other irregular aspect of the language.

Studied from another perspective, these nouns can be claimed to constitute a co-phonology, derived from a different rank ordering of the same constraints that operate in the unmarked, regular, paradigm. This approach is in line with one of the basic principles of Optimality Theory: Different rank ordering of constraints trigger different grammars. Insofar as these forms constitute a sub-regularity in the system, they form a different category, a different grammar within the general algorithm of stress assignment (see Inkelas et al 1994 and references there for an extensive treatment of this issue).

As stated above, the relative rank ordering of ALIGN and NON-FINAL suffices to determine whether a noun belongs to either type A or B. Let's consider a type B noun, *bolígrafo* (pen) with an input /boligrafo/ with no prosodic structure of any kind. The function Gen. generates an infinite set of candidates, among which only one is optimal. For reasons of space, candidates violating FT FORM and FT BIN will not be considered in this tableau since both constraints are irrelevant for the current discussion.

(20) interaction of NON-FINAL and ALIGN

boligrafo	NON-FINAL	ALIGN RIGHT
a. bo.li.(grá.fo)	*!	
b. (bó.li.)gra.fo		μμ!
c. ☞bo.(lí.gra.)fo		μ

Both candidates (b) and (c) satisfy non-finality and yet, one is better than the other, since only one can survive. The determinant factor for choosing candidate (c) over (b) is that the latter incurs a minimal violation of ALIGN, whereas the former violates it

by two moras. A type B word such as *vértigo* with the prosodic arrangement (vér.)ti.go, violates ALIGN by two moras, but no candidate incurring less violations of ALIGN passes the high ranked constraints. (21) illustrates this claim.

(21) vértigo

vertigo	FT FORM	FT BIN	NON-FINAL	ALIGN
a. (vér.ti)go	*!			μ
b. ver.(tí.)go		*!		μ
c. ver.(tí.go)			*!	
d. ☞ (vér)ti.go				μμ

Candidate (a) is not a proper moraic trochee, since it is built on syllables rather than moras. Candidate (b) is eliminated due to violation of FOOT BIN. Candidate (c) violates NON-FINAL, and therefore, we are left with (d) as the only possible output: no candidate can be found which respects NON-FINAL at a minimal cost of ALIGN.

Any theory concerned with stress assignment must face the problem of what is the input for the marked forms. If the input is a string of segments with no metrical structure at all, we clearly need a constraint which selects *bolígrafo* and rejects what would be the unmarked *boligráfo*. NON FINAL gives us the desired results. In this respect, the marked forms in Spanish are very similar to Latin or English nouns. However, the order of NON FINAL above ALIGN would be a property of just a set of nouns, since it is not operative in the overwhelming majority of Spanish nouns. In any case, the words in which NON FINAL is at work come marked in the lexicon.

There is another possibility: the marked forms receive metrical structure in the lexicon. In OT terms, the input to *bolígrafo* is bo.(lí.gra).fo: syllables, feet and stress are not assigned by constraint interaction, since they come in the input. Input-output correspondence constraints superseding those discussed so far in this chapter prevent the candidates at hand from re-footing to conform to the regular paradigm. However, this proposal cannot explain why candidates are fatal if they violate ALIGN by more than two moras. An input form that implies a violation of ALIGN by three moras would not survive. The fallacy of establishing a threshold for ALIGN emerges again here, and since that maneuver would be the only possible explanation to the non-existing forms, the lexically-assign stress approach must be rejected.

Another argument could still be put forward in defense of the lexically-assigned-stress hypothesis, which is to claim that forms violating ALIGN by more than two moras are inconceivable as input forms, and that native speakers would automatically reinterpret those hypothetical input forms and accommodate them to the three-syllable window. In fact, native speakers of Spanish learning English as a second language have problems with stress assignment in words in which the stress is placed more than two moras to the left. Most of the time, these words are pronounced as conforming to the Spanish paradigm. Second language acquisition data (Mairs 1989; Archibald 1993) suggest that native speakers of Spanish learning English as a second language move stress to the right in words that violate ALIGN by more than two moras. Although Mair's and Archibald's subjects changed the stress site of words such as "Budweiser", they did not place it in what would be the normal position in Spanish, that is, final position in words with heavy final. Instead, they moved it one syllable to the right, respecting both

ALIGN and NON-FINAL, which they assume highly-ranked in English. The assumption that Spanish Type B words have metrical structure in lexical storage would suggest that Spanish learners of English would store words like "Budweiser" with metrical structure. However, the data discussed here imply that this is not the case.

To summarize this section, the question of determining what the input form is for type-B nouns is then reduced to two possibilities: a) Irregular words receive their stress in the lexicon. Constraint interaction then determines if stress either remains on its original place or is moved to the right, or b) Marked words are specified as having NON-FINAL ranked above ALIGN. We have just shown that hypothesis (a) is untenable and therefore type-B forms are best characterized as responding to domain-specific rank-ordering of constraints.

A final comment should be made regarding type-B nouns and the circumstances under which some nouns are in this category. Some stems appear to be marked as type-B (*pirámide, sábana*). There are also suffixes that trigger affiliation to this group (e.g. -ico in *democrático*, -metro in *cronómetro*). Another class of suffixes require penultimate stress (-ero in *papelero*, -eda in *arboleda*) even when attached to a type-B stem, such as in the pair árbol (type B) / arboléda (type-A). From a markedness standpoint, this could appear as a problematic scenario, since we are altering marked stress assignment. Whereas the opposite scenario—an unmarked noun becoming marked through attachment of a marked affix (peryódo/peryódico)—is uncontroversial, the marked-to-unmarked calls for an explanation, which may be readily found once we consider the entire prosodic word as the domain for stress assignment, a fact acknowledged since earlier treatments of Spanish stress (Harris 1983, 1995, Roca 1988). Notice that

considering /arboleda/ the input for stress renders the desired results since no marking is necessary. On the other hand, input /perIodico/ has the marking of "stress retractor" (NON-FINAL>>ALIGN in OT terms) and output [peryódico] is thus obtained.

2.1.4.4 Type C

Another challenge that the theory must face is final stress in words ending in light syllables: *café* (coffee), *Panamá*, *mamá* (mother, familiar). There are very few such forms, and many of them are loan words from French (*mamá, papá, menú, café...*). Although I do not intend to achieve a definite analysis of this problem here, it is worthwhile to point out that there are four possible approaches to this phenomena: (1) these words may be irregularly iambic; (2) they may end in a degenerate (monomoraic) foot; (3) there may be an empty, word final, mora-bearing position, that is not realized phonetically; (4) these words are lexically stored with metrical structure. Since it seems reasonable to draw the handful of monomoraic words of Spanish into the same analysis, we may reject alternative (1). Hayes (1995) in his analysis of minimal words in Cahuilla considers degenerate feet to explain the existence of monomoraic words in a language with a stress pattern of moraic trochees. Spanish does not have many monomoraic words, but those ending in a stressed light syllable suggest a very similar analysis, as pointed out by Hayes in a footnote: "these words, [...] could be analyzed with a lexically listed final degenerate foot" (1995:93). Within the OT framework, this could be stated in terms of the effects of FTBIN, which require Spanish feet to contain two moras. Lexically-marked material can escape this constraint and surface as violations of FTBIN. Following Hayes, there are three types of languages with respect to FTBIN: those that never violate it, those

that violate it in special circumstances, and a third group of languages in which FTBIN is freely violated.

Although Spanish seems to belong to the third category, with free violation of FTBIN, it will be shown that this is not necessarily the case. It will be claimed that violations of such constraint in Spanish are only apparent, and therefore Spanish belongs to the first group of languages, i.e. all feet are binary at moraic level. An examination of (21) will clarify this point. This list is, to my knowledge, representative of monomoraic non-verbs in Spanish. It will be shown on chapter 4 that [pye] is a monomoraic word. Although the theoretical discussion of this issue is postponed until then, the assumption can be supported here by the fact that monosyllabic forms with (surface) glide + vowel are unattested (except in *pie*), whereas nouns with accented high vowel followed by (heterosyllabic) vowel (tío, lío, día, d·oà .) are very common.

(21) Monomoraic words

fe	faith	té	tea	pie	foot

The third possible analysis considers *café* as containing an extra element at the end, an empty position not realized phonetically but with some presence in certain phonological processes. This claim would be supported by the fact that these forms do not delete their last vowel after suffixation. The opposition is illustrated in (23).

(23) diminutive formation

casa + ita	casíta	(house)	mamá + ita	mamaíta	(mom)
papa +ita	papita	(pope)	papá +ito	papaíto	(dad)

The empirical problem facing this line of attack is that suffixation, and diminutive formation in particular, is not a completely homogeneous process. Forms ending in unstressed [e] add [-cito], the diminutive for consonant-ending nouns instead of expected [-ito(a)]. From *Perú* (Peru) we derive *Peruáno* (Peruvian), but the adjective from *Panamá* (Panama) is *panaméño* (Panamanian).

Therefore, provided that no generalization can be achieved, forms ending in stressed vowel are best analyzed as entering the lexicon with pre-assigned metrical structure.

2.2 Verbal stress

2.2.1 Preliminaries

The analysis presented so far indicates that nominal stress in Spanish is subject to particular idiosyncrasies in some words, yielding an unpredictable paradigm, subject to some restrictions as we have seen. Contrary to nouns, stress in verbs presents a regular, unexceptional system, determined only by the morphological content of the form.

The existence of minimal pairs in nouns (cf. *sábana*, bed sheet, versus *sabana*, savanna) indicates that the mechanisms for stress assignment must be equipped with some lexical information. In verbs, minimal pairs motivated by the position of stress do

not emerge as a consequence of a lexical marking of an entry, but as a characteristic of a tense. Stress functions here as a taxonomic distinctive feature, which, together with segmental material (traditional tense markers, i.e., -ba in the imperfect) serve as an indicator of tense. Segmental information coexists sometimes with stress as a tense marker. In many cases, however, stress is the only indicator. This is illustrated in (24).

(24) Stress as a tense marker

[termíno] (1st prsn. sing. present)	[terminó] (3rd prsn. sing. preterit)
[termíne] (1st/3rd prsn. sing. present subj.)	[terminé] (1st prsn. sing. preterit)
[terminára] (1st/3rd prsn. sing. imperf. subj.)	[terminará] (3rd prsn. sing. future)

Harris (1987)[9] is a convenient point of departure for an analysis of verbal stress. He presents four patterns displayed by the verbal paradigm in Spanish in terms of stress assignment. These are illustrated below with a representative tense for each. Spanish verbs are grouped into three categories depending on the infinitive ending. The first category (first conjugation) comprises -ar ending infinitives, the second group is integrated by -er infinitives, and the third by -ir verbs. The forms in (25) belong to the first conjugation. Their -er, -ir counterparts follow identical stress pattern although with different endings. Finite forms are divided into the root (*term* in [25]), the theme vowel TV (*a*), tense marker TM, which may be null in some cases; and person / number marker

[9] This framework offers a convenient taxonomy of verb forms, although only Harris (1995) will be discussed here.

PN. Notice that TV deletes when in contact with vowel-initial tense markers (*termina* + *o* = *termino*, present; *termina* + *e* = *terminé*, preterit).

(25) stress pattern for *terminar* (to finish)

(a) Pattern 1: present indicative. Root + (TV) +PN

SINGULAR	PLURAL
1p. termín o	terminá mos
2p. termína s	terminá is
3p. termína	termína n

(b) Pattern 2: imperfect. Root + TV +TM +PN

1p. terminá ba	terminá ba mos
2p. terminá ba s	terminá ba is
3p. terminá ba	terminá ba n

(c) Pattern 3: weak preterit. Root + TV + PN

1p. termin é	terminá mos
2p. terminá ste	terminá steis
3p. termin ó	terminá ron

(d) Pattern 4: future. Root +TV + TM + PN

1p. termin a r é	termin a r émos
2p. termin a r ás	termin a r éis
3p. termin a r á	termin a r án

Harris (1995) analyzes Spanish verbs in terms of a QI system, in which [*] marks are projected from syllable heads. The data in (26a) is used in that framework as compelling evidence to support the claim that non-heads are neutral in the assignment of stress in verbs. Grid projection is illustrated in (26b).[10]

(26a) cán.te.mos (we) sing (pres. subj. dialectal)

can.tá.ra.mos (we) sing (imperfective subj. cross-dialectal)

(26b) * ** * * ** *

*limpyemos limpyemos (we) clean [límpyemos]

Further evidence in favor of quantity-insensitivity of Spanish verb forms as well as the underlying value of glides is provided in Harris's framework by the third person singular of the present in *apláude* [apláwde] (s/he claps). Canonical penultimate stress is obtained regardless of the existence of a post-vocalic glide, as opposed to *amoína* (s/he annoys), where the underlying high vowel receives stress. Harris (1995:879) claims that stress assignment in verbs is non-cyclic and applies only once at the word level. However, this could be challenged by the form *cantáis* [kan.táys] of the present second person plural in peninsular Spanish. This could only be explained by either positing that

[10] Glides, interpreted in Harris's framework as underlying segments, should not project onto line 0, since they are not syllable heads. If they did, antepenultimate stress in [límpyemos] would violate the prohibition against stress to the left of a heavy penultimate. Some of Harris's claims will be called into question below, specially those regarding the underlying nature of glides.

[-is] has an underlying [i] which became a glide subsequent to stress assignment or that [y] has moraic status in post-vocalic position. The first move takes us to claiming two stages in the derivation, one for stress assignment and another for syllabification. Any other scenario would render *[kán.tays], with—canonical—penultimate stress.

Aside from this problematic form, Harris's account obtains the desired results for the stress pattern of the verbal paradigm in Spanish and his basic conclusions will be adopted here although slightly modified. Below I summarize Harris's main claims for Spanish verb stress.

(27) Summary of verb stress (from Harris 1995)

a. Verbs are QI.

b. Canonical stress is penultimate syllable. Exceptions (lexical markings): [ba] in the imperfect forces insertion of a [)] to the right of the tense marker, preterit and future markers are heads of the foot.

Below I shall provide a characterization of the verbal paradigm capable of accounting for the three groups observed in Harris's framework, illustrated by the present (*cantámos*), the imperfect (*cantábamos*), and the preterit and the future (*canté, cantámos/cantarémos*). If an accurate characterization of the facts is provided using a single plane of representation which looks at structure above the segment and this is done within general mechanisms of prosodic and metrical theory, we will be in a position to claim that adoption of a Prosodic Hierarchy approach and OT in particular is, at the very least, a justifiable decision.

2.2.2 Present tense and imperfect

The analysis I propose for the verbal stress is based on two fundamental observations: one, Spanish verbs do not conform to a Weight By Position system; and two, the difference between tenses — and dialects, when the same tense admits different stress patterns — comes from the different domain at which the stress algorithm is computed. The first claim, (paralleling Harris's account) is supported by the fact that closed and open syllables do not exhibit different behavior with respect to the assignment of stress (see *cánto* vs. *cantámos*, *cantába* vs. *cantában*, where stress is penultimate regardless of the number of rime elements of the last syllable). The second observation constitutes the heart of the analysis put forward here and will be studied in detail in the paragraphs below.

Spanish verbal stress finds some parallelisms in the nominal system. The landing site of stress in nouns is obtained through a moraic trochee placed at the right edge of the prosodic word of the singular forms. The plural marker [s] plays no role in computing metrical feet, neither does the [es] morpheme of consonant-ending nouns. The presence of an additional mora in the plural of *pirámide* (*pirámides*) does not cause rightward movement of stress, despite the unequivocal character of [s] as a weight contributor segment in coda position (cif. *kánasta). The verbal paradigm expands the neutral character of plural markers for stress assignment to apply to person morphemes as well, which in the cases at hand renders two possible domains for application of stress rules: stem plus tense markers and an outer prosodic word to which person and number affixes are attached.

The observational claims laid out in (28) are the direct consequence of attaching the morphological categories that conform the finite forms to different prosodic categories. The informal notation in (28) will be refined as we proceed.

(28) A working hypothesis for verbal stress

(a) Stress is assigned to the rightmost elements in the Prosodic Word, modulo (b).

(b) Tense markers are the ideal stress bearer morphemes.

Drawing on work by Selkirk (1996) and references cited therein, adjunction of functional categories to lexical forms may be formalized in various ways. Adoption of one or another model is largely language-particular and comes motivated by the relative rank ordering of the constraints in prosodic hierarchy reproduced in (29).

(29) Constraints on prosodic structure

a. Headedness: A constituent of the Prosodic Hierarchy must dominate a constituent of the next level down.

b. Layeredness: A constituent of the Prosodic Hierarchy may not dominate a constituent of a higher level.

c. Exhaustivity: A constituent of the Prosodic Hierarchy may not dominate a constituent more than one level down.

d. Nonrecursivity: A constituent of the Prosodic Hierarchy may not dominate a constituent of the same level.

Selkirk (1996) presents the different mappings of syntactic and morphological categories into components of the Prosodic Hierarchy. The relevant arrangements are reproduced in (30), where the order of Fnc and Lex has been reversed to accommodate to the Spanish data.

(30) [Fnc Lex]

(a) $(\text{Lex Fnc})_{\text{PrWd}}$ (b) $(\text{Lex})_{\text{PrWd}}$ Fnc (c) $((\text{Lex})_{\text{PrWd}}\ \text{Fnc})_{\text{PrWd}}$

I will maintain that when more than one Fnc category attaches to a Lex category, the resulting configuration combines the properties of (a) and (b) in (30). Tense markers (Fnc_{TNS}) are claimed to form a Prosodic Word (30a) together with the Lex category verb stem.[11]. On the other hand, person and number markers (Fnc_{PN}) will be analyzed according to the template in (30c). Coexistence of Fnc_{TNS} and Fnc_{PN} yields (31), where one Prosodic Words dominates another, violating Recursiveness. Attachment of Fnc_{TNS} to the same Prosodic Word as Lex takes place at the lexical level.

(31) $((\text{Lex Fnc}_{\text{TNS}})_{\text{PrWd}}\ \text{Fnc}_{\text{PN}})_{\text{PrWd}}$

Present tense: $((\text{termina } \varnothing)_{\text{PrWd}}\ \text{mos})_{\text{PrWd}}$

Imperfect: $((\text{termina ba})_{\text{PrWd}}\ \text{mos})_{\text{PrWd}}$

[11] The choice between (30a-c) does not have crucial implications for the current analysis. (30a) is adopted for simplicity of exposition.

The informal description in (28) can now receive a coherent treatment. Computing the stress algorithm at identical domains in the present and the imperfect renders *[termínamos] in the present and [terminábamos] in the imperfect, but only the latter is correct. Therefore, we can keep the claim made in (28) that the metrical foot is placed at the right edge of the word, with the peculiarity that the present tense looks at the entire prosodic word, whereas the imperfect considers only the innermost prosodic word (stem + tense marker). Both systems are explained below.

(32) Present tense (pattern 1)

ALIGN RIGHT: (AL. FT. R, PrWd R). The right edge of the foot coincides with the right edge of the entire Prosodic Word.

The alignment constraint in (32) is dominated by FOOT BIN and FOOT TYPE (trochee). The most controversial form —*terminái*s— is examined in (33), where moras are projected only from vowels.

(33)

termina+is	FT BIN	FT TYPE	AL. RIGHT
a. ☞termi(náis)			
b. ter(mína)is			μ!
c. termina(ís)	*!		

The fact that final [s] does not project a mora is paralleled in third person plural [terminan], where a moraic trochee along the lines of the proposal for nominal stress presented at the beginning of this chapter would render final stress. The details of why the surfacing glide at the end of *terminais* [ter.mi.náys] in (34) projects a mora regardless of its consonantal nature will be discussed in chapter 3. To anticipate that discussion, I will mantain that the moraic character of a segment is not determined by its vocalic or consonantal nature, but rather by its degree of sonority, along the lines of Prince and Smolensky (1993). A slight modification of the framework developed in P&S is introduced in (34), a constraint restricted to the verbal paradigm.

(34) Mora projection in verbs

*{l} ... {t}-μ: Do not project moras from segments whose sonority value is lesser than the one corresponding to [l]

(34) is a deviation from Prince and Smolensky in that their constraint delimits the likelihood of a segment to be a syllabic peak or margin, whereas here it simply states that Spanish verbs are not subject to Weight By Position for segments less sonorous than /l/. Notice that this move is not tantamount to establishing syllabic trochees for stress assignment, a direct consequence of consonants being neutral for syllabic weight, because the [ays] sequence in *terminάis* is monosyllabic, and yet bears stress.

The imperfect is governed by the same mechanisms that apply to the present tense, with the only difference that in this case, ALIGN is computed at the inner prosodic word.

(35) Imperfect tense

ALIGN RIGHT (AL.R., FT, PWd) The right edge of the foot coincides with the right edge of the inner Prosodic Word.

(36)

termina+ba+mos	FT BIN	FT TYPE	AL. RIGHT
a. ☞termi(nába)]mos			
b. ter(mína)ba]mos			μ!
c. termina(bá)]mos	*!		

The main structural difference between present and imperfect is that the former lacks tense marker, whereas the latter has it (ba). The ideal scenario would the one in which the domain of stress assignment is either the stem (*termina*), or the entire word (stem plus tense, person, and number markers). However, the imperfect appears at first glance to be an illustration of the base for stress assignment not corresponding to any of the established morphological categories. A close look at (38) indicates that the foot is constructed on the last syllable of the stem and the tense marker —[...naba]— suggesting that the relevant domain is the one constituted by the two morphemes in [[termina] ba], thus neglecting a role to the person / number markers.

An alternative to overcome the non-isomorphic treatment sketched above, is to align the head mora of the foot with the right edge of the stem. This solution yields the expected results in the imperfect in that it forces the last syllable of the stem to be the stress bearer element. However, this solution does not yield the correct results in the

present tense. The first person singular may accommodate to this pattern because stress falls on the last (surfacing) vowel of the stem. Recall, however, that the third person singular does not have a person marker and yet stress falls on the penultimate syllable of the only surfacing morpheme, the stem. Identical problems arise from the second person singular and third person plural, where stress is assigned to the penultimate surfacing vowel of the stem. On the other hand, aligning the foot with the stem makes incorrect predictions for the first and second person plural, which would surface as *[termína ÷ mos] and *[termína ÷ is] respectively.

Summarizing so far, stress assignment in the present and imperfect tenses respond to identical mechanisms applying at different domains. In the GT approach of Harris (1995) this is explained through assigning special character (a kind of stress-retractor morpheme) to the imperfect tense marker (ba). Identical results can be achieved from an OT approach by establishing that identical constraints apply to both forms although with different domains. The following paragraphs address stress assignment in the weak preterit and future tenses.

2.2.3 The preterit

Alignment constraints in the preterite impose coincidence of edges of the main foot with the tense marker, requiring the stressed syllable to immediately precede the person marker. As a tense morpheme, stress is placed in [e], [o], or in general in the vowel following the stem. An examination of the preterit tense indicates that the stress-bearer element is the tense marker (cf. 25 c). Compliance with (35) renders the desired

results for the preterit, where the term morpheme-initial stands for tense and person markers, specially the former.

(35) AL L (FT, Tns) The stressed syllable must be morpheme-initial.

(36) evaluates different candidates of the first person plural [terminámos], but any other form of this tense would accommodate to the pattern developed here. Square brackets indicate verb stem.

(36)

termina mos	AL L, Ft, Tns.
a. ☞ [termin](ámos)	
b. [ter(mín]a)mos	!*
c. [termin]a(mós)	!*

The morphological arrangement of the preterit is presented in (37) for convenience.

(37) First and third person in the preterit

$[termin]_{Lex}$ $[e]_{Func}$ $[termin]_{Lex}$ $[o]_{Func}$

$[termin]_{Lex}$ $[a\ mos]_{Func}$ $[termin]_{Lex}$ $[a\ ron]_{Func}$

The first and third person singular (*terminé, terminó*) delete the theme vowel in contact with the person markers [e], [o], which receive stress as we have just discussed. In these cases, rightward movement of stress (a structure-changing mechanism, in the classical Lexical Phonology framework) accounts for the facts without creating a major disturbance to the theory. The stress-bearer segment deletes, leaving two possible candidates for re-association: the last vowel of the stem ([i] in termin + e), or the person marker [e]. The Alignment requirements of (35) are best satisfied if stress is left on its original place although associated with the only surfacing vowel. The desired results are also obtained for the first and third person singular by satisfaction of a constraint prohibiting two consecutive vowels across morpheme boundaries.

(38)

terminá e	*VV]	ALIGN L
a. termin] é		
b. termin]á] e	!*	
c. termín] e		*!

(39) $[[[termin]_{ROOT}\ a]_{TV}\ e]_{FUNC}$ $[[[termin]_{ROOT}\ a]_{TV}\ mos]_{FUNC}$

2.2.4 The future

Stress assignment in the future is similar to that of the weak preterit. The only difference between both tenses is that in the preterit the, the stressed vowel is the tense marker (or the TV in cases where the TM is deleted), whereas in the future, the TV is outside the domain.

2.2.5 Summary of verb forms

The preceding sections tried to formulate a unitary treatment of the different patterns found in the conjugation of Spanish. Four tenses were presented each illustrating a different algorithm whose peculiarities are highly motivated by the segmental content of the different forms. However, the repertoire of possible stress assignment devices may be summarized as in (45), where all tenses necessarily belong to one of the two possible types.

(45) Verb types

Type I: Stress computed in metrical feet, domain varies.

Present (indicative and subjunctive), Imperative, Strong Preterits.

Type II: Stress is prominence-driven.

Preterit, Future, Conditional (indicative and subjunctive)

2.2.6 A comparative analysis

A comparison of the present and imperfect (perhaps the most controversial cases) of Spanish with two closely-related languages, Italian and Galician, will shed some light into the analysis put forward in this chapter and could provide additional support for the hypothesis herein. Both tenses are presented in (46).

(46) a. Present tense

Galician		Italian	
cánto	cantámos	cánto	cantiámo
cántas	cantáis	cánti	cantáte
cánta	cántan	cánta	cántano

b. Imperfect

cantába	cantabámos	cantávo	cantavámo
cantábas	cantabádes	cantávi	cantaváte
cantába	cantában	cantáva	cantávano

Both Galician and Italian display identical behavior in the present and imperfect. Contrary to Sapanish, the placement of stress in the imperfect in these two languages computes the entire word, indicating that [Lex] and [Func] receive a $[\text{Lex Func}]_{\text{PrWd}}$ analysis in both tenses, thus supporting the claim that Present and Imperfect belong to the same category.

Italian third person plural (cántano, cantávano) could be interpreted as a counter-example to the claim that the entire word is the domain of stress, given its retractor

status. However, this fact finds justification if we consider final [o] a post-lexical epenthetic element to prevent violation of highly-ranked NO CODA in Italian.

Affiliation of Spanish present and imperfect to the same group finds additional support in the fact, reported by Harris (1987, 1995) that some dialects of Spanish treat the present subjunctive (standard: cantémos, cánten) in a way similar to the imperfect, with stress retraction: cántemos, cánten. These dialects of Spanish undergo the opposite to what happens in Galician and Italian. In such dialects the person marker is excluded from consideration.

2.3 Conclusion

This chapter analyzed stress in non-verbs and verbs. The main differences between both paradigms are that the former are subject to a partially-predictable system whereas the latter respond to an invariable pattern. Another difference between verbs and non-verbs is that non-vocoids undergo Weight by Position only on the latter. In verbs, stress acts as a tense marker, together with morphemes for some tenses.

The constraints responsible for nominal stress assignment are FOOT BIN (feet are made of two moras), FOOT TYPE (moraic trochee), ALIGN R, FT., PrWd (the right edge of the foot coincides with the right edge of the prosodic word), and NON-FINAL (feet are not final in the prosodic word). Domain-specific ranking of the last two constraints are responsible for the existence of type-B nouns (*priámide*), with stress one syllable to the left of what has been labeled canonical stress (*caramélo*).

Stress in verbs is subject to a classification into two categories, one in which a metrical foot is built at the right of the corresponding domain, entire word in the present

and inner prosodic word (root + tense marker) in the imperfect. In the preterit and the future, the left edge of the metric foot must be aligned with the tense marker.

CHAPTER 3

SYLLABLE STRUCTURE

3.1 Introduction

Spanish shows a preference for a CV syllable type. Codas are allowed, and with the exception of [s] as the second member (*ins.pi.rar, trans.pa.ren.te*), complex codas are prohibited. The paradigm described in (1), adapted from Harris (1983) illustrates the possible syllabic configurations of Spanish. The most salient feature of (1) is that a post-vocalic glide cannot be followed by a tautosyllabic consonant. This issue will be addressed in detail in chapter 4, where I discuss the nature of glides. In (1), coda consonants may be any consonant except for palatals. The second member of the onset can only be a liquid. The nature of the first element of the onset is discussed in section 3.2.

(1) Possible syllables in Spanish[1]

CV	ca.sa	house
CCV	cla.ro	clear
CVC	bar.co	boat
CCVC	blan.co	white
C(C)VCC	--------	
C(C)GV	bue.no, grue.so	good, gross
C(C)GVC	vien.to, san.grien.to	wind, bloody
C(C)VG	bai.le, frai.le	dance, friar
C(C)VGC	---------	

[1] In word-final position the set of coda consonants is reduced to liquids, [n], [s], and [θ].

The examples in (1) will serve as a springboard to the analysis of the co-occurrence constraints responsible for syllable well-formedness in Spanish. This chapter is organized as follows: section 3.2 addresses vowel sequences and the effects of ONSET, section 3.3 discusses codas. Once the analysis of syllable structure is presented, the chapter moves onto a characterization of plural formation in section 3.4. The different plural markers emerge as the result of conditions on syllable structure and the influence of stress. The conclusion summarizes the claims and shows the interaction between metrical and prosodic phenomena.

3.2 Vowel sequences: the effects of ONSET

In general, whether a sequence of two vowels preceded by a consonant surface tautosyllabically or in hiatus depends largely on how mandatory is the existence of onsets in the syllable inventory of the language and on how this onset requirement interacts with other constraints.

With the exception of the nasal palatal [ñ] at the beginning of the word, any segment can be affiliated to onset position. In addition to that, nasals acquire velar place in coda position when followed by a velar consonant, restricting its context to this particular position.

Complex onsets are permitted provided that the second element is a liquid. At this point, I leave the issue of how many segments are allowed in onset position as an open question. Since number of onset elements is crucial to the understanding of glides, this topic is studied in detail in chapter 4. For current purposes, any obstruent other than [s], [t], and [d] followed by [l] may form a complex onset. In addition, [θ] cannot be part of a

complex onset[2]. For detailed descriptions see Alarcos (1961), Navarro Tomás (1982), Harris (1969, 1983), Dunlap (1992).

Given any CVCCV sequence, the preferred syllabification is CV.CCV, provided that sonority requirements allow for it. This shows that ONSET is ranked above *COMPLEX ONSET, and it also indicates that NO CODA is highly ranked, as we shall see later when we address the syllabification of forms such as [su.bli.me] and [des.ye.lo], the latter in chapter 4. Nevertheless, Spanish has many violations of ONSET, both word initially and in the middle of the word, as in (2a).

(2) Vowel sequences

a.		b.	
po.é.ta	poet	roe.dór	rodent
ca.ó.tico	chaotic	ba.ca.láo	cod fish

The pattern revealed in (2) indicates that the parsing of [-high] vocoids is not a homogeneous process. Navarro-Tomás (1982:127 and ff.) points out that, contrary to some Germanic languages such as German or English, Spanish tends to "preferably parse, whenever possible, any vowel sequence as a tautosyllabic group" (my translation). As we shall see below, the tautosylabic parsing just mentioned is governed by sonority considerations and the location of stress, although as pointed out by Navarro-Tomás (1982:129) "prosodists have tried unsuccessfully to reduce the different possible parsings to rule." Different instances of syllabic arrangement of vowel sequences frequently

[2] In dialects where this segment occurs.

depend on extra-linguistic factors, a fact also acknowledged in Hualde (1991a). Other factors at play in determining the syllabification of vowel sequences include dialectal and idiolectal differences.

Below I propose that sequences of two or more unstressed vowels should always be analyzed as belonging to the same syllable, regardless of their sonority value. If they are in decreasing sonority order (ba.ca.láo), for syllable merger to take place the more sonorous must bear stress. Syllable merger does not take place in sequences of increasing sonority (ca.nó.a, to.á.lla). Navarro-Tomás (1982:128) claims however, that any two vowels may be analyzed as a tautosyllabic group, while Roca (1991:613) restricts syllable merger to sequences in which the first vowel is stressed and is more sonorous than the second.

Thus, the two-way opposition in terms of syllabic parsing of vocalic sequences may be summarized as follows:[3]

a) sequences that can never be parsed in a single syllable: [aó] [óa] [aé] [éa], or when the second member receives stress.
b) tautosyllabic sequences: [áe], [áo], [éo] [óe]

3. 2. 1 Heterosyllabic sequences

For purposes of clarity, the possible parsings in (2) will be studied separately. The heterosyllabic parsing discussed now draws on the analysis advanced in Roca (1991). To achieve generalization, we will first examine the scenario favoring syllable merger.

[3] The analysis of sequences containing high vowels is postponed to chapter 4.

Following Roca's study, any two vowels are parsed into the same syllable if they meet one of the conditions in (3).

(3) Syllable merger (Roca)

Two adjacent vowels are attached to the same syllable node if:

a) Neither vowel bears stress, or

b) V_1 is stressed and is more sonorous than V_2

I will attempt to translate the mechanisms in (3) into constraint interaction, providing the answers to why syllable merger is restricted to the contexts described by Roca. A purely descriptive account, not tied up with universal syllable structure forces, has little to add to the discussion, for (3) leaves little room for controversy. To achieve the desired results in a principled manner, first we need to look at the conditions that make syllable merger non-operative: those would be the constraints. The main goal of this chapter is to formulate those constraints in a way such that they are part of the universal mechanisms of syllable well-formedness, and not a purely descriptive, data-driven account.

The description in (3) gives us the characterization in (4), where [a] stands for a [low] vowel, [o] stands for any mid vowel, the accent mark represents stress, and the dots represent syllable boundaries. (4) illustrates the possible parsings of vowel sequences in Spanish, therefore ruling out both [ó.o] and [óa].

(4) Vowel sequences in Spanish

a. ao	b. a.ó
áo	o.á
oa	ó.a
oo	o.ó

The two major generalizations that can be drawn from (4) is that syllable merger is blocked when stress falls on the second member of the sequence or on the less sonorous vowel. Rosenthall (1994:118), in his analysis of Spanish syllable structure, makes crucial use of the constraint SON FAL, whereby tautosyllabic sequences of mora-bearing segments must have a decrease in sonority, thus ruling out tautosyllabic sequences of [ao]. I depart from Rosenthall's analysis both in terms of what we consider the facts to be in some cases and in terms of the formalisms adopted to explain syllabification in Spanish. In particular, my contention is that a form such as [teátro] receives a disyllabic parsing (as Rosenthall presents it) by virtue of the position of stress instead of by reference to SON FAL, which I consider non-operative in Spanish. In [realidád], I subscribe to Roca's analysis and consider the vowel sequence as monosyllabic, since it complies with condition (3a) of syllable merger.

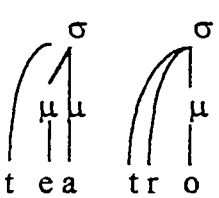
The forms in (5) illustrate the first claim: when the second member of a vowel sequence bears stress, both vowels cannot receive tautosyllabic parsing.

(5) Vowel sequences with second member stressed

to.(á.lla)	towel	ca.(ó.ba)	mahogany
te.(á.tro)	theater	pa.(é.lla)	Spanish dish

Notice that the forms in (5) incur violations of ONSET. These violations need to be motivated by satisfaction of a higher-ranked constraint. To find the nature of this constraint, it will be helpful to construct a hypothetical prosodic arrangement which showed us what would happen if both vowels were attached to the same syllable. This is done in (6), where we attempt to motivate the disyllabic parsing of [eá] by ruling out its opposite parsing. (6) does not consider *[téa.tro], which would be a marked, type-B noun.

(6) Monosyllabic parsing (hypothetical)



The second mora of the word is the first element of the main foot[4]. The syllabic arrangement in (6) creates a scenario by which two moras of the same syllable belong to different feet, an undesired representation (see Hayes 1992 for details). On the other

[4] There is still another possible arrangement whereby the first vowel attaches to the mora of the stressed vowel. This cannot be done in Spanish since independent data support the claim that these vowel sequences are bimoraic. A word such as *gallína* (hen) switches stress to the right when the suffix *-acea* is added, rendering *gallinácea.*

hand, a trochaic foot of the type (μ'μμ) is unattested. Notice that monosyllabic parsing in [ka.ó.ba], studied in (8) would be also ruled out by identical mechanisms: whether we attach [a] to the mora projected from [o] or the reverse scenario, both moras of the same syllable would belong to a different foot. Another fact is worth mentioning at this point with respect to satisfaction and violation of ONSET. Kiparsky (1992) points out that even languages that impose a CV(C) syllable structure allow onsetless syllables at word edges. This principle, named Catalexis by Kiparsky, may be extended to other prosodic categories besides the word, such as the metrical foot. In some languages, word edges license structures otherwise prohibited. The metrical foot, on its part, imposes its form regardless of the syllabic configuration it may originate, a logical consequence of FOOT FORM>> SYLLABLE FORM (See Rosenthal 1994 for discussion.)

The argument just sketched leads itself to the formulation of a constraint forcing the alignment of the stressed vowel with the left edge of the foot. As discussed in the preceding paragraph, this alignment falls directly from the conception of the moraic (or syllabic) trochee: a strong mora/syllable followed by a weak one.

(7) ALIGN FOOT: The stressed vowel must be aligned with the left edge of the main foot.

The following tableau illustrates the workings of the mechanisms described so far. The tableau in (8) is concerned only with the interaction of ALIGN FOOT and ONSET. Candidates attaching the first vowel to the mora projected by the second are not included:

they would be ruled out by BRANCH-μ. Identical constraint interaction is responsible for the rest of the forms in (5), i.e., *toálla* follows the same mechanisms as *caóba*.

(8) constraint interaction in [ka.ó.ba]

kaoba	AL. FOOT	ONSET
a.☞ka.(ó.ba)		*
b. ka(ó.ba)	*!	

The second factor blocking syllable merger is a stressed [–low] vowel as either component of the sequence. Some general notions of syllable formation will also be invoked to account for these forms, illustrated in (9).

(9) Forms with heterosyllabic parsing

ca.nó.a	canoe	a.té.a	atheist (fem)

Following Dell and Elmendahui (1985), syllable head assignment is a language-particular mechanism governed by sonority requirements with respect to the neighboring elements. For instance, whether a consonant surfaces as onset or coda depends exclusively on whether it is flanked by vowels or word edges. As we shall see in chapter 4, the syllabic status of a high vocoid is contingent on whether it is followed by another vowel, in which case it surfaces as onset.

When two vowels merge into one syllable, one of them glides to attach to the syllable node originally projected solely from the other vowel. The processes of syllabification follow the principles of minimality: create the least possible number of

syllables. Whether an [ea] sequence projects one or two moras is language-particular, but when both segments are attached to the same syllable node, the syllable head is always [a], the more sonorous.

Gliding of a vowel is the result of not giving it independent syllabic status, in violation of a one to one mapping between syllabic moras and syllable nodes. Attaching a less sonorous segment to the syllable node projected by another with higher sonority is, as we said, a natural process. The reverse mechanism is not allowed. This basic notion of syllable well-formedness will be encapsulated by a constraint imposing a sonority requirement on syllable licensers. This constraint, defined here as SONORITY PEAK has a double effect: it forces the less sonorous segments to attach to the syllable nodes projected by the most sonorous ones, and it requires the specification of a degree of sonority for a member of a syllable to project its own syllable node. The second part of the constraint is language-specific —some languages allow only vowels to play this role (Spanish), others allow sonorants, etc.— and is responsible for epenthesis or deletion in consonantal sequences otherwise impossible to syllabify. We will be concerned with the first part of the definition only.

(10) SONORITY PEAK: given any two unordered segments A, B project a syllable node from A iff. it is more sonorous than B.

An antecedent of this constraint may be found in Green's (1993) Prominence Alignment. Following work by Prince and Smolensky (1993), Zec (1988), and Hyman (1985), Green subscribes to the claim by Prince and Smolensky (op. cit.: 118) that "The

syllable position [Peak > Margin] and segmental sonority [*a* > *i* ...> *t*] scales are universally aligned." Thus English pine, [payn] must follow the scheme in (11), where a-e represents a set of privative features of sonority.

(11)

x	a
x x	b
x x	c
x x x	d
x x x x	e
p a y n	

SONORITY PEAK is responsible for the inadequacy of representation (12)—a monosyllabic parsing—for *canóa* (canoe). In (12), vertical lines from the mora to the syllable node indicate that the segment dominated by that mora is the head of the syllable; inclined lines indicate attachment to the syllable node projected by the other mora.

Using the same approach as in (6), where we ruled out the possible monosyllabic parsing of a sequence of mid-stressed low ([eá]), we will now try to motivate disyllabic parsing in [óa] by ruling out the monosyllabic alternative. (12) respects ALIGN FOOT but violates SONORITY PEAK since [a] does not project its own syllable node, but is attached to the one projected from [o]. (12) shows that the mechanism described in (10) does nothing but state that the segment that glides is the less sonorous in the sequence.

(12

In *canóa*, both elements of the sequence qualify for syllable head, stressed [o] because by definition, a stressed vowel is the head of the foot, the syllable, and the mora. [a], as the most sonorous element, must also head the syllable. Prince and Smolensky (1993:18 and ff.) discuss a constraint they call *M/a, prohibiting more sonorous segments from being in margin position. Obviously they refer to onset or coda position: given a sequence of segments, the most sonorous has to be the syllable nucleus. Another constraint alluded to in Prince and Smolensky is H/NUC, establishing that the most harmonic nucleus is the one with the greatest sonority, [a] in this case.

To sum up, heterosyllabic parsing of vowel sequences in Spanish is confined to sequences of stressed mid vowel followed by unstressed low (ca.nó.a) *canoe*, or stressed second vowel (to.á.lla)/(ne.ó.fi.to) (ca.ó.ba) *towel/newborn, mahogany* The following tableaux illustrate the claims being made so far. These tableaux show the interaction of AL FOOT>>SON.PEAK>>ONSET. Vertical lines indicate projection of a syllable node from that particular segment. Inclined lines indicate that the segment in question is not the head of its syllable.

(13a)

kanóa	AL. FOOT	SON. PEAK/HNUC	ONSET
| | μμ a ☞ ka.(nó.a)			*
|\ μμ b ka.(nóa)		*!	

(13b)

toalla	AL. FOOT	SON. PEAK/HNUC	ONSET
| | μ μ a ☞ to.á.lla			*
|\ μμ b toá.lla	*!	*	
/| μμ c toá.lla	*!		

(13c)

caoba	AL. FOOT	SON. PEAK/HNUC	ONSET
|| μμ a ☞ ca.ó.ba			*
|\ μμ b caó.ba	*!		
/| μμ c caó.ba	*!	*	

3. 2. 2.1 Tautosyllabic sequences

Once syllable merger (or more properly, the conditions that block it) have been studied from a constraint interaction approach, it is necessary to discuss the tautosyllabic parsing illustrated in (2b) as opposed to (2a). Those examples are not illustrative of an exceptional group: there are hundreds of words conforming to this pattern. As discussed

in the preceding paragraphs, any vocalic sequence may be reduced to a single syllable (modulo syllable merger constraints) under certain circumstances, such as rapid speech or in less formal contexts.

Notice that satisfaction of ONSET in vowel sequences could be easily achieved if the language chose to either eliminate one of the vowels in contact or inserting an epenthetic — consonantal — element between them, in violation of faithfulness constraints, which force input-output identity. McCarthy and Prince (1994) show that marked forms emerge when faithfulness constraints are ranked above other constraints. For instance, the words in (2a) are marked with respect ONSET, since they violate it. Violations of a constraint are forced by satisfaction of a higher ranked constraint whose effects conflict with the former.

(14) Constraint rank ordering so far

FAITHFULNESS>>ONSET

Syllable merger affecting vowel sequences will be studied under two contexts: one in which a stressed low vowel is followed by an unstressed [-low], as in (15a [ba.ka.láo]). The second context for syllable merger is sequences of unstressed [+low] [-low] vowels and vice versa (15b [toa.λé.ro] as opposed to [to.á. λa]). Let us split SON. PEAK into its different components: {a}Peak...>>{i}Peak. This concept will prove to be crucial for the understanding of high vocoids discussed in chapter 4.

(15)

(15a) bakalao	{a}Peak	ONSET	{o}Peak
a.☞ba.ka. lao			*
b. ba.ka.lá.o		!*	
c. ba.ka.láo	!*		

(15b) toa. λé.ro	{a}Peak	ONSET	{o}Peak
a.☞ toa.λé.ro			*
b. to.a. λé.ro		!*	
c. toa.λé.ro	!*		

(15) shows that ONSET supersedes {o}Peak, meaning that tautosyllabic parsing is achieved whenever AL. FOOT is not at play. It was mentioned in section 3.2.1 that forms such as [ka.ó.ba], [to.á.λa] admit the hiatus parsing only. However, the type of words analyzed in this section can surface either way. Careful speech often produces a syllable break between the two unstressed vowels in *toalléro*. To explain this variance from a constraint-based framework, we need to appeal to two different rank-orderings of constraints: one in which SON.PEAK is dominated by ONSET, and a second possibility, enforcing hiatus, by which the scenario is just the opposite.

The interaction of constraints presented in this section accounts for the intricate facts of syllabification of vowel sequences in a way that a simple SONFALL analysis

cannot. SON PEAK, coupled with AL. FOOT achieves the desired results by means of universal principles of syllable structure.

3.2.2.2 Non-low vowels

The analysis of sequences involving [–low] vowels has been postponed mainly because of their difficult analysis. Sequences of unstressed [eo] /[oe] pose no problem to our analysis: forms such as *aéreo* (aerial), *poesía* (poetry), *poetástro* (poet, pejorative), do not challenge syllable merger because neither constraint SON. PEAK nor ALIGN FOOT is at play in the unstressed [e], [o] sequences. Therefore these forms are syllabified respectively as in (16), where ONSET finds no reason to be violated.

(16) Syllabification of unstressed [–low] sequences

aéreo	[a.é.reo]	aerial
poesía	[poe.sí.a]	poetry
poetastro	[poe.tás.tro]	poet, pejorative

We will now analyze combinations of two mid vowels, first when the second one bears stress. The controversial data (stress in the first element) is done right after. In the former, ALIGN FOOT prohibits tautosyllabic parsing. This is shown in (17), where parentheses indicate foot boundaries. AL. FOOT requires the stressed mora to signal the edge of the prosodic foot.

(17) Sequences of mid vowels with stress on the second

beódo	[be.(ó.do)]	drunken
poéta	[po.(é.ta)]	poet
león	[le.(ón)]	lion

Both (16, 17) fall out of the mechanisms developed so far. However, in cases where stress falls on the first element of the sequence, as in (18), this may or may not be subject to syllable merger.

(18) Sequences of mid vowels. Stress on the first element

ateo	[a.té.o] / [a.téo]	atheist
reo	[ré.o] / [réo]	convicted
oboe	[o.bó.e] / [o.bóe]	oboe

Tautosyllabicity is attested for these forms, although the vowel sequences may also surface in hiatus. It is very difficult to establish syllable boundaries in this kind of examples and variation among speakers seems to be the norm rather than the exception. An additional difficulty comes from the fact that other than present tense verbs (limited to a handful of forms, all subject to variability: vé.o/véo *[I] see*), examples of this pattern are very scarce. It is important to keep in mind that heterosyllabic parsing is always a possibility in detriment of ONSET. Syllable merger entails some degree of gliding by one segment to attach to the syllable projected by another adjacent more sonorous segment.

Clearly, this condition is not met in the cases at hand, since there is no sonority difference.

The conclusion to be drawn from these cases is that the two most important factors in determining the optimal syllable parsing of vowel sequences is the position of stress and relative sonority values. When the second member of the sequence receives stress, regardless of its sonority value, monosyllabic parsing is banned. In [óa] [éa] sequences, the combined forces of ALIGN FOOT (with its double effect of aligning the left edge of the prosodic foot with the stressed mora and the requirement that this mora must be the syllable head) and {a} Peak, force the disyllabic parsing.

This section has discussed the conflicting forces of ONSET (favoring syllable merger) and other prosodic constraints which impose a vowel-to-syllable mapping within morphemes. The effects of ONSET, often obscured by SONORITY PEAK and AL. FOOT are clearly visible across morpheme boundaries, as shown below.

3.2.3 Syllabification across morpheme boundaries

The conditions on syllabification in Spanish interact with morphology in an interesting way. Hualde (1991a:287) undertakes an analysis for the syllabification of monomorphemic *sublime* versus prefixed *suboficial, sublunar*. These words syllabify respectively as [su.bli.me], [[su.b]o.fi.cial], [[sub.]lu.nar] (square brackets indicate morpheme boundaries).

Explained from a rule-based approach, these differences in syllabification require a CV rule to operate right after prefixation. Thus in [[sub]oficial], the coda consonant of the prefix becomes the onset of the first syllable of the stem.

(19) A rule-based analysis of syllabification in Spanish

	[sublime]	[sub][oficyal]	[sub][lunar]
syllabification	su.bli.me	[sub.][o.fi.cyal]	[sub.][lu.nar]
prefixation	———	[sub.o.fi.cyal]	[sub.lu.nar]
CV rule	———	su.bo.fi.cyal	———

The CV rule reapplies postlexically, again as a structure-changing rule to derive the syllabification of *con amor* [ko.na.mor]. The Complex Onset rule responsible for [su.bli.me] does not apply postlexically, and therefore, *club latino* syllabifies as [klub.la.ti.no] instead of the otherwise expected *[klu.bla.ti.no]. Note that the process just outlined represents a bottom-up representation for syllable formation which contravenes the desired requirement that initial syllabification be governed by markedness considerations. The initial stages of the derivation of [suboficyal] in (19) violate onset formation, creating marked syllables in Spanish. Additionally, this mechanism requires some stipulations: besides the ordering among rules, complex nucleus formation needs to be labeled structure building lexical ([su.bli.me]). The CV rule, on the other hand, applies lexically structure building (ca.be.za), lexically and postlexically structure changing (su.bo.fi.cial / co.na.mor).

The lines that follow attempt to account for the data from a constraint-interaction approach, rejecting intermediate stages of derivation. The asymmetry offered by *sublime/suboficial/sublunar* can be accounted for by the interaction of the universal constraints defined in (20). COMPLEX ONSET is ranked below NO CODA (su.blime>>sub.lime), and therefore is excluded from the current discussion.

(20) Syllable structure constraints

ALIGN SYLLABLE, STEM: the left edge of the syllable coincides with the morpheme boundary.

NO CODA: * ... VC]$_{\sigma}$

ONSET * [V...]$_{\sigma}$

(21) Input /sublime/, /suboficial/, /sublunar/

(21a) sublime	ONSET	ALIGN SYL.	NO CODA
a. [sub.li.me]			*!
b.☞[su.bli.me]			

(21b) sub+oficial	ONSET	ALIGN SYL.	NO CODA
a. [[sub.]o.fi.cial]	*!		*
b.☞[[su.]bo.fi.cial]		*	

(21c) sub+lunar	ONSET	ALIGN SYL.	NO CODA
a. [[su.]blu.nar]		*!	
b.☞[[sub.]lu.nar]			*

These same constraints are responsible for the differences in syllabification offered by the set *con amor/con interés/con hielo* at the post-lexical level.

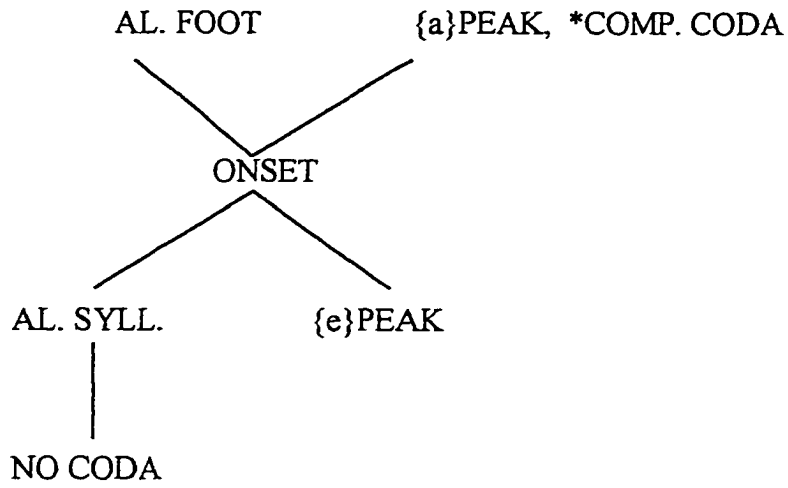
(22) Input /kon interés/, /klub latino/

CANDIDATES	ONSET	AL. SYLLABLE	NO CODA
a. kon.° in.te.res	*!		*
b.☞ko.n°in.te.res		*	

CANDIDATES	ONSET	AL. SYLLABLE	NO CODA
e. klu.‖bla.ti.no		*!	
f.☞klub.‖la.ti.no			*

Section 3.2 presents evidence in support of the constraint ranking in (23) as the governing forces responsible for syllable structure in Spanish. Two possible parsings for unstressed vowel sequences have been presented and explained. In colloquial speech, [ea], [ae], [áe] sequences tend to surface in one syllable, ONSET dominating {e}Peak (ranking in 23). Monitored speech may render a heterosyllabic parsing as a consequence of {e}Peak dominating ONSET, thus favoring hiatus. As with type-A, type-B nouns with respect to stress assignment, Spanish syllable structure is a clear illustration of two different grammars as a consequence of the different rank-ordering of constraints. The difference between both systems, stress and syllabification, is that the former responds to a rigid ranking, two co-phonologies: some nouns come equipped in the lexicon with a pre-established ranking; whereas syllabification triggers two possible parsings depending on factors such as colloquial versus formal speech.

(23)



3.3 Codas

As we have seen, with the exception of [s] as the second member of the cluster (*inspirar, solsticio*), Spanish imposes a limit of one consonant in coda position. The pattern described in (1) reveals that the syllable nucleus may be followed by either a glide or a single consonant, but post-vocalic glide and coda consonant exclude each other. This led some researchers to postulate a constraint, called BI-MAX, imposing a maximum of two moras per syllable (see Rosenthal 1994 for details). As we shall see in chapter 4, such a mechanism would create serious problems accounting for the CGVC vs. *CVGC asymetry displayed in (1).

Another constraint limiting the number of post-nuclear elements, with a more limited scope than BI-MAX, is COMPLEX CODA (*...VCC]$_\sigma$). Both constraints, although overlapping in many instances, have different effects in some configurations. In a Weight by Position language, the former rules out both [CVVC]$_\sigma$ and [CVCC]$_\sigma$ sequences; whereas the latter applies specifically to a [CVCC]$_\sigma$ configuration. Therefore,

if COMPLEX CODA yields the desired results it must be invoked to the detriment of BI-MAX.

Evidence in Harris (1983) may be interpreted as supporting the adequacy of COMPLEX CODA. Nouns of verbal origin are created by adding a suffix to the verb root. When those suffixes are consonant-initial, the last consonant of the verb stem devoices and the suffix is added. This is illustrated in (24a).

(24)	a.	recibir	receptor	to receive / receptor
	b.	esculpir	escultor	to sculpt / sculptor

The difference between (24 a and b) lies on the fact that the process of suffixation in the latter creates a [...lpt..] sequence. Since [pt] cannot form a complex onset, [lp] is forced to attach to the previous syllable, giving rise to a complex coda. In this case, the language resolves to eliminate the offending consonant, in violation of faithfulness constraints. Complex codas are unattested in Spanish, indicating that the constraint ranking in (23) is the responsible for syllable formation.[5]

3.4 Respecting syllable structure: plural formation

The analysis of plural formation in Spanish is a long-standing debate because of its repercussions in the understanding of syllable structure. The controversy of Spanish plural formation is motivated by the existence of two plural markers, -s and -es. The former is attached to vowel-ending stems and the latter to consonant-ending ones.

[5]. [s] needs to be treated as an exception to this claim.

(25) Spanish plural formation

casa	casas	house(s)
libro	libros	book(s)
coche	coches	car(s)
papel	papeles	paper(s)
ciudad	ciudades	city(s)
avión	aviones	plane(s)
lúnes	lúnes	Monday
dósis	dósis	dose
compás	compáses	compass
ciprés	cipréses	cypress

The data in (25) may be explained by one of the following three possibilities: The plural morpheme is [s], with epenthesis of [e] in the consonant-ending stems. The second hypothesis is that the plural marker is always [s], but all Spanish words end in a vowel in underlying representation, with subsequent deletion in certain environments. When the plural marker [s] is attached to these forms, the unparsed vowel surfaces to avoid a complex coda. Thus output [papél] would correspond to input /papele/, with final [e] surfacing only to avoid an *[ls] cluster. The third possibility is to consider [es] as the plural marker, with deletion of [e] when attached to a word ending in a vowel. For

treatments of this issue see Foley (1967), Harris (1969, 1983, 1991b, 1995), Cressey (1978), Hualde (1991b), Roca (1996).

Roca (1996:3) points out that subscribing to the more consensual approach of positing [s] as the only plural marker opens two possibilities in terms of interpreting the incremental [e], namely epenthesis in consonant-ending stems (first hypothesis above), or deletion in vowel-ending words to avoid VV configurations (second hypothesis). I shall provide relevant data in support of [s] as the Spanish plural marker, positing an epenthetic [e] in consonant-ending stems.

Spanish words may end in any of the five vowels in its repertoire (i, e, a, o, u). Non-verbs ending in [i], [u] are scarce, specially if unstressed (*tribu, menú, espíritu, ímpetu, maniquí*) and a handful of others, most of them as stress-bearers loan words, as pointed out in chapter 2. The productive pattern of Spanish nouns consists of words ending in [o], [a], [e]. With a few exceptions (cf. *mano* [hand]), words ending in -o are masculine, while those ending in -a are typically feminine, also with a few exceptions (*día* [day] *tema* [theme], *problema* [problem]). Therefore, -o has been traditionally considered as a word marking for masculine, -a as its feminine counterpart. The controversy arises when -e ending nouns are considered. Final [e] is not a gender marker (*gente* [people], *clase* [class] fem.; *coche* [car], *bigote* [mustache], masc.), suggesting that this segment should be treated as an epenthetic element.[6]

The set of word-final consonants in Spanish is restricted to a (single) voiced or fricative coronal plus [x] in careful speech. Therefore, forms such as *coche, bigote, gente,*

[6] This analysis gains support from prothesis in loan words beginning with [s]: eslavo, esport, esclerosis (see Roca 1996 and references cited there for extensive analyses and chapter 4 of this dissertation for a comparative study.)

insert [e] to avoid unpermissible codas, whereas *papel* (paper), *sol* (sun), and *luz* (light) do not need an epenthetic element at the end because their word-final consonants can be syllabified as codas.

Roca (1996), drawing on work by Foley (1976), puts forward a different approach whereby final [e] is deleted in some contexts (the *papel*-type words) rather than inserted in others (see Harris 1995 for a similar approach). Roughly speaking, in Roca's analysis final [e] is deleted except in those cases in which its absence would cause an ill-formed coda, such as in *coche*, *coyote*. A constraint along the lines of FINAL C (McCarthy and Prince 1994), forcing prosodic words to end in a consonant, is responsible for final [e] deletion.

Although this issue will be addressed in detail in chapter 4, I shall now present some evidence which could compromise the deletion account. First consider the data in (26), showing an opposition between vowel and consonant-ending nouns.

(26)	a	b	
	papel	mole	(paper / mass)
	sol	prole	(sun / progeny)
	reloj	viaje	(clock / trip)
	luz	cruce	(light / crossroads)
	lunes	base	(Monday / base)

The words in the (a) column represent a much larger set than those in (b), indicating that deletion (or no insertion, depending on the approach) is the normal,

unmarked case. If the input for [papél] is /papelV/, FINAL C (APOC[ope] in Roca) is higher-ranked than the faithfulness constraint requiring input vowels to be present in the output. To account for the differences between both columns of (26), FINAL C (in Roca's analysis) would apply depending on the segmental nature of the final [e], being operative only in the context of an unspecified vowel but not with the fully specified ones (including -a, -o, or else *mano*, *casa* would surface as **man*, **cas* respectively).

The ideal scenario is the one in which constraints evaluate output forms without distinguishing between fully-specified and minimally-specified segments. There are no independent phenomena suggesting the existence of an input [e] in (26a)[7] and these forms will therefore be considered here as faithful to the input.

Aside from the different treatment of the *papel / mole* opposition, my analysis of plural formation in Spanish parallels the one in Roca (1996). The plural morpheme is [s] with concomitant epenthesis of [e] in consonant-ending forms. A coda condition imposes a limit of one consonant at the end of the word, forcing epenthesis to avoid coda configurations which are allowed word-internally (cf. *solsticio, perspicaz, abstemio*; but **papels*, **cancións*).

[7] The word sol (sun) has an unexpected [e] in [soleado] (sunny). This [e] does not surface in the other forms, cf. *empapelado* (wrapped with paper), *razón / razonado* (reason / reasoned); nor does it surface in the (b) column words: base / basado (base / based), *viaje / viajante* (trip / traveler).

The difference between words ending in a consonant and those ending with an [e] whose deletion would leave a perfectly syllabifiable coda (*cruce, clase*) is attributed here to input differences. This hypothesis is supported by the existence of nouns such as, *oboe [o.bó.e], tenue [té.nwe], héroe [é.roe]*, and a handful of others with VV sequences at the right edge of the prosodic word. The existence of final [e] in these words is not motivated by any coda condition, nor does the allegedly incremental [e] serve the purpose of conforming with minimum size of prosodic words, which in these cases is satisfied by the remainder of the word. The following tableaux summarize the discussion of plural formation in Spanish.

(27)

papél +s	CODA COND.	MAX I-O	DEP I-O
a. ☞papéles			*
b. papéls	*!		
c. papés		*!	

(28)

libro + s	CODA COND.	MAX I-O	DEP I-O
a. ☞libros			
b. libroes			*!
c. libres		*!	*

The tableau for /libro + s/ (books) is identical to that of *clase, héroe*: adding an [s] to vowel-ending stems creates the optimal plural output, without the need to epenthesis or deletion. The former process is justified in /papel + s/ to comply with the Coda Condition which prohibits consonant clusters at the end of the word.

So far we have ignored a small but important group of nouns, those ending in [s] in their singular. The data presented at the outset of this section shows that some words ending in singular [s] do not change in their plural form (dosis / dosis), whereas others do (compás / compáses). First let's apply the mechanisms responsible for [papeles] to the problematic input /dosis + s/, where the unexpected results are obtained, since the attested output form is (b) [dósis], rather than *dósises.

(29) dósis dósis (dose)
grátis grátis (free)
vírus vírus (virus)

(30)

dósis + s	CODA COND.	MAX I-O	DEP I-O
a. ☞ *dósises			*
b. dósis		*!	
c. dósiss	*!		

Identical mechanisms derive the correct output for *compás* (pl. *compáses*), paralleling the papél / papéles alternation. (31) shows the interaction of CODA CONDITION with the faithfulness constraints militating against insertion and deletion:

(31)

kompás + s	CODA COND.	MAX I-O	DEP I-O
a. ☞kompáses			*
b. kompás		*!	
c. kompáss	*!		

The constraint ranking in (31) derives correct outputs for all cases except for the *dósis, grátis, lúnes* paradigm, suggesting that other factors other than the three constraints considered so far are at play as well. (32) offers a comparison of the entire paradigm for plural formation in Spanish, which may help us discover the responsible factor forcing *dósis* to remain unchanged in its plural form. The rightmost column of (31) indicates the affiliation of the word according to stress assignment. The crucial assumption is that plural marker [s] does not alter the stress pattern of the base and therefore is neutral for stress assignment purposes.

(32)

líbro	líbros	A / A
bolígrafo	bolígrafos	B / B
papél	papéles	A / A

árbol	árboles	B / B
compás	compáses	A / A
dósis	dósis	A / A

Compare now (32) with (33), where the alternatives for the crucial cases are considered.

(33)	árbol	*arbóles
	dósis	*dósises

Final [s] in *dósis* can receive two possible analyses. One is to consider this consonant (only in word-final position) neutral for stress assignment. The second possibility is to refuse [s] any special status and analyze it as any other consonant. Adopting the first hypothesis, singular [dósis] would be a type-A word, which becomes type-B if a vowel is added at the end: [(dósi)ses][8]. It must be noted that, as indicated by *[arbóles], the landing space for stress must be the same for the singular and the plural (régimen/regímenes is the only exception to this claim), rendering [do(sises)] an impossible form. If on the other hand, we subscribe to the second hypothesis and consider [s] no different from any other consonant, singular [dósis] is a type-B word, but its [es] plural form (dósises), would be an impossible form. Examples of both types (stressed vowel + s, and unstressed vowel + s) are given in (34).

[8] Parentheses indicate metrical feet.

(34)	a.	b.	
	compás	lúnes	(compass / Monday)
	ciprés	vírus	(cypress / virus)
	Inés	Cárlos	(proper names)
	anís	álias	(anisette / alias)
	Jonás	Cáceres	(proper name / toponym)
	país	isósceles	(country / isosceles)

With no exceptions, the words belonging to the (a) column of (33) make their plural by adding [-es] to the singular, just like all other consonant-ending nouns do, regardless of the position of stress. However, the words in (33b) behave differently, as we have seen. This seems to be an indicator that [s] must receive a special treatment. Three arguments will be presented in support of the special status of [s]: stress facts, typology, and syllable well-formedness.

As discussed in chapter 2, antepenultimate stress in Spanish is banned by a penultimate closed syllable (cf. *Róberto, *álumno). The only exception of which I am aware challenging this claim is Frómista (name of a small town in the South of Spain), whose penultimate syllable is closed by an [s]. In addition to the three syllable window and the ban on antepenultimate stress in words with a heavy penultimate syllable, chapter 2 claims that stress cannot fall on the antepenultimate syllable if the last one is heavy. This last claim is challenged by the following counterexamples: régimen (regime), hipérbaton, oxímoron (literary figures), isósceles (isosceles), Cáceres (city in the South of Spain), hipótesis (hypothesis), síntesis (synthesis) miércoles (Wednesday), and a few

other highly technical words. Notice that, with the exception of *régimen*, [réximen], all the exceptions have [s] closing the last syllable (hipérbaton and oxímoron are not considered given their etymology and the fact that they are unknown to the vast majority of native speakers).

Another argument for the special character of [s] may be found in coda restrictions in Spanish. With the exception of [s] as the second member, complex codas are prohibited. In addition to *...$CC]_{\sigma}$ configurations, Spanish also posits a ban on *...$GC]_{\sigma}$ sequences. Anticipating the discussion in chapter 4, the restriction on post-nuclear elements may be explained by either a coda constraint (*COMPLEX CODA) or by a bimoraic limit per syllable. In any case, [s] is the only exception to the restriction (*inspirar, claustro*), once again displaying a behavior different from any other consonant.

An additional argument in support of [s] as a special element in coda may be found in certain Caribbean dialects, particularly in colloquial speech in Cartagena (Colombia). These dialects have a tendency to delete some consonants (specially liquids) in coda position. Deletion of [r] or [l] triggers gemination of the following consonant,[9] as shown in (35).

(35)

gordo	[goddo]	fat
falda	[fadda]	skirt

[9] This phenomenon is labeled "hablar golpeado" (beat speech) by speakers of other regions.

However, and in contrast with (35), in cases where [s] is deleted (and not aspirated), gemination of the following consonant does not take place, suggesting that no mora was lost, eliminating the reason for compensatory lengthening.

(36)

esta	[éta]	this, fem.
fiesta	[fiéta]	party

The examples in (36) indicate that loss of an [s] needs not be compensated by lengthening of a neighboring segment, suggesting non-moraic status. However, resorting to a non-moraic treatment of [s] creates a problem in that now otherwise type-A forms such as [kompás], [país] would need to be interpreted as type-C forms for stress assignment, violating FOOT BIN, since the foot (is) would be built at the end of the word, with only one mora.

Although appealing at first glance, the approach of granting non-moraic status to [s] in Spanish creates a complicated scenario and finds no independent support besides the Caribbean dialects. Therefore, this hypothesis is rejected. A more plausible explanation for plural formation in Spanish may be achieved by the mechanisms described in (37).

(37) Plural formation (tentative explanation)

Plural in Spanish is formed by adding [s] to the singular, with the following conditions:

a) Do not create a complex coda at the end of the word. Insert [e] to avoid such configuration, and

b) the stress pattern of the plural must mirror that of the singular.[10]

Condition (a) in (37) is achieved by the interaction of COMPLEX CODA and CORRESPONDENCE. Condition (b) will be labeled here STRESS PATTERN as a cover term for the interaction of NON FINAL and AL. RIGHT responsible for the existence of type-B forms as explained in chapter 2. (38) gathers the relevant data as output forms are confronted with the constraints derived from (37).

(38)

kompás + s	STRESS PATTERN	CODA COND.	MAX I-O	DEP I-O
a. ☞ kompáses				*
b. kompás			*!	
c. kompáss		*!		

[10] This is a reminiscent of output-output constraints in the Correspondence framework of McCarthy and Prince (1995).

dósis + s	STRESS PATTERN	CODA COND.	MAX I-O	DEP I-O
a.☞ dósis				*
b. dósises	*!		*!	
c. dósiss		*!		

Perhaps the most controversial case is why [*dósises] is ruled out in the current analysis. Notice that in singular [dó.sis] the right edge of the foot is one mora away from the right edge of the prosodic word [(dó.si)s]. However, in the plural form alignment would be violated by two moras: [(dó.si.)ses]. The alternative candidate [dosíses] is ruled out because in this case singular and plural forms belong to different types for stress assignment (B in the singular, A in the plural). The latter claim is based on the assumption that plural-marker [s] falls outside the domain of stress assignment, an assumption motivated by the fact that plural *bolígrafos, pirámides, cártas*, would be impossible forms if plural-marker [s] had been included in the stress algorithm (cf. *C'V(C).CV.CVC to which *régimen* is the only exception).

3.5 Conclusion

This chapter addressed the conditions under which two adjacent vowels attach to the same syllable node. These proved to be motivated by sonority requirements and stress. The interaction of stress and syllabification in /kanoa/, /bakalao/, and /poeta/ summarizes the processes claimed to be responsible for both syllable structure and stress in Spanish. Candidates showing violation of Ft. BIN. are not included for they add nothing to the discussion.

(39)

Kanoa	AL FT R, PWd R	AL. FOOT	SON. PEAK	ONSET
a.☞ka.(nó.a)				*
b. (ká.no.)a	*!			*
c. ka(nóa)			*	

(40)

Bakalao	AL FT R, PWd R	AL. FOOT	SON. PEAK	ONSET
a.☞ba.ka.(láo)				
b. ba.(ká.la)o	*!			
c. ba.ka.(lá.o)				*!

(41)

Poeta	AL FT R, PWd R	AL. FOOT	SON. PEAK	ONSET
a.☞ po.(é.ta)				*
b. (poé.ta)		*!		
c. (póe.)ta	*!			

The complex issues about final vowels and plural formation were also handled under the rubric of syllable structure. Both syllabic and stress analyses will prove to be of crucial importance to propose a characterization of glides, which will be shown to follow exactly the same pattern as the full vowels. This is done in chapter 4.

CHAPTER 4

SPANISH GLIDES

4.1 Introduction

This chapter examines glides in Spanish. The main motivation for the present analysis comes from the apparent paradox displayed by prevocalic glides, which seem to behave as mora contributors for purposes of stress assignment, but they behave as non-moraic elements for syllable structure.

The paradox may be summarized as follows: post-vocalic glides cannot be followed by a tautosyllabic consonant, whereas $[(C)GVC]_{\sigma}$ sequences are allowed, suggesting that the former contribute weight, whereas the latter (GV) do not. However, pre-vocalic glides attract stress to the host syllable, suggesting that they have a moraic character.

These stress facts received attention in the literature (Harris 1983, 1985, Roca 1991, Dunlap 1991, Rosenthal 1994). There is a parallelism between pre-vocalic glides and palatal consonants, which also attract stress. However, both facts were never encapsulated under the same motivation, but rather treated as unrelated phenomena. One of the major claims made here is that stress assignment in Spanish is sensitive to the nature of onsets. More specifically, the feature [+high] associated with onset attracts stress, forcing the left edge of the main foot to coincide with this particular feature.

My major claim is that glides in Spanish are the surface manifestation of input high vowels. In prevocalic position, these segments are best analyzed as onset components rather than as part of a complex nucleus, and therefore they do not contribute to syllable

weight. In post-vocalic position, glides will be considered as coda elements, thus projecting a mora.

In an analysis that parallels the study of non-high vowels studied in chapter 2, the behavior of glides will be proven to fall out of the interaction of universal constraints coupled with a language-particular characteristic of Spanish, namely ALIGN ONSET, forcing the left edge of the prosodic foot to coincide with palatal consonants in onset position.

This chapter is organized as follows: Section 4.2 discusses the paradox observed between pre and post-vocalic glides. The syllabic affiliation of glides is considered in part 4.3. Section 4.4 studies the distribution of glides in Spanish. The conclusion briefly summarizes the claims and offers a unitary treatment to the facts advanced in section 4.2.

4.2 The paradox

4.2.1 The paradox described

The first source of the paradox alluded to in the introduction to this chapter is provided by stress assignment in nouns containing prevocalic glides. As shown in chapter 2, stress depends heavily on the nature of the final and penultimate syllables. As we have seen, stress in nouns may not fall on the antepenultimate syllable if either the penultimate or the final syllable is heavy. The forms in (1) also cannot have antepenultimate stress, suggesting that the prevocalic glide has moraic status, thus preventing stress from moving farther than three moras away from the right edge of the prosodic word. As usual, dots indicate syllable boundaries.

(1) Stress in nouns with prevocalic glides

a.bué.lo	(grandfather)	*á.bue.lo
des.grá.cia	(misfortune)	*dés.gra.cia

The examples in (1) contrast sharply with some syllable wellformedness constraints displayed by surfacing glides in the language. Harris (1983) observes an asymmetry between pre and postvocalic glides in Spanish in terms of their distribution in the syllable. Sequences of ...GVC]$_\sigma$ are perfectly permissible, as shown in (2a), whereas ...VGC]$_\sigma$ sequences are confined to no more than three words: *veinte* "twenty", *treinta* "thirty" and *aunque* "although." The first set is usually pronounced [bentiuno, trentiuno], even in radio and television broadcasts, with deletion of the first vocoid in the first syllable.

(2) Pre and post vocalic glides in Spanish

a.		b.
cuar.to	(room)	*caur.to
pi.mien.to	(pepper)	*mein.to

The observable asymmetry between the words in the (a) column and the impossible forms in (b) is difficult to account for if we maintain equal moraic character for both pre

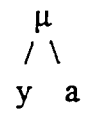
and postvocalic vocoids. In fact, the data in (2) appears at first glance as a strong argument in favor of the non-moraic status of prevocalic glides. Notice that postulating that prevocalic glides do not contribute to syllable weight suffices to explain the asymmetry: the sequence [kwar] in *cuarto* contains two moras, whereas the *[kawr] counterpart contains three, thus surpassing a bimoraic limit per syllable. However, this maneuver challenges the otherwise straightforward explanation for the stress facts in (1): now we cannot explain why antepenultimate stress is prohibited in [desgráθya].

The most plausible explanation for the incompatibility of a postvocalic glide and a closing consonant within the same syllable seems to be that the factor responsible for the impossible words in the (b) column of (2) is a constraint imposing a bimoraic limit per syllable. In some Quantity Sensitive languages, given a sequence of either (C)VC. or (C)VG., the unit following the syllable peak is assigned a mora by the principle of Weight by Position (Hayes 1989). The non-words in (2b) constitute a violation of this constraint, and therefore are ruled out since they contain a tautosyllabic sequence of vowel, glide, and consonant, giving raise to a trimoraic structure.

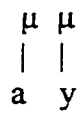
The words in the (a) column of (2) should, in principle have the same problem: if the pre-vocalic vocoid corresponds to an underlying high vowel, it must be assigned a mora, and a sequence such as "trial" in *industrial* should be banned by the same reason that the non-existing words are. To overcome this difficulty we are forced to postulate that vocalic sequences of raising sonority constitute light, monomoraic diphthongs, whereas sequences of falling sonority are bimoraic. Thus [ya] would have the representation in (3a) and [ay] would have the prosodic arrangement in (3b).

(3) The prosodic organization of Spanish diphthongs

a. rising sonority



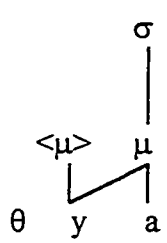
b. falling sonority



A proposal along these lines has in fact been adopted for Rotuman and Spanish respectively, in McCarthy (1995) and Rosenthal (1994); the latter complemented with some additional mechanisms as we shall see in (4). This solution suffices to account for the asymmetry displayed by pre and postvocalic glides. It is clear why a sequence such as (3a) has room for a coda consonant in a language where BI-MAX is highly ranked. In (3b), on the other hand, BI-MAX does not allow for an additional mora.

The solution just sketched does not suffice to serve the purpose in Spanish. If a [ya] sequence is monomoraic, why does it have an effect on stress? The only possible solution would be to claim that in a form such as *carícia*, there is an "unparsed" mora at the right edge of the prosodic word whereby the high vocoid projects a mora that is not parsed, and the segment links to the adjacent mora. This is formalized in Rosenthal (op. cit.: 21) as in (4), where the [θya] sequence of *caricia* is considered.

(4) unparsed mora analysis



Resorting to representation (4) creates a kind of mora inconsistency. Recall that sequences such as /θya/ are thought of as monomoraic for purposes of syllable well-formedness (*cuarto* vs. **caurto*), but bimoraic for stress assignment. Subscribing to recent developments in OT (c.f. McCarthy and Prince 1995), I will not grant phonological role of unparsed elements. Constraints look at output forms, and whatever material is not contained in those representations are understood not to be part of any evaluation, i.e., alignment or BI-MAX.

Spanish presents some facts that may compromise the BI-MAX solution. As seen in chapter 3, sequences of [-high] vowels are parsed into one syllable under certain circumstances—especially after the stressed syllable or when the second vowel bears stress. Roca (1991), Hualde (1991a) provide examples of such syllabic configurations. Some of their examples are reproduced in (5) and parallel the approach presented in chapter 3.

(5) Tautosyllabic sequences of [-high] vowels

a. Across word boundaries (Roca's examples)

un qui[zá e]vasivo	an evasive perhaps
una heri[da ho]rrible	a terrible wound
se lo [dio a Eu]sebio	s/he gave it to Eusebio

b. Within words

[leal]tad	loyalty
baca[lao]	codfish
[caen]	(they) fall

The data in (5), in line with syllable merger presented in chapter 3, challenges the explanation provided by the bimoraic limit per syllable, since the tautosyllabic sequences just mentioned seem to clearly have more than two moras. Even interpreting the data in [dioaeu] in *se lo dio a Eusebio* as a monomoraic sequence [ioa] due to its rising sonority character, does not solve the problem. If we substitute the third word in the first example of (5a) *un quizá evasivo* (where the sonority factor can not be invoked) by, for instance, *entendió* ([he] understood), we have *quizá entendió* [zá en]. At the lexical level, *caen* would have three moras, since sonority consideration do not allow for a monomoraic, light, diphthong. (Recall that light diphthongs are those in which the first element is less sonorous than the second.)

The asymmetry displayed by pre vs. postvocalic glides finds a much more straightforward explanation if we consider another aspect of Spanish syllable structure, namely the prohibition against complex codas, briefly illustrated in (6) for the reader's convenience.

(6) Cluster reduction

recibir/receptor	(to receive/recipient)	esculpir/escul<>tor	(sculp/tor)
inscribir/inscripción	(to register/registration)	absorver/absor<>ción	(absorb/tion)

The facts illustrated in (6) open the possibility to look at the asymmetry from a perspective other than the bimoraic limit per syllable. If post-vocalic glides are analyzed as coda elements by syllabification processes, a $[...GC]_{\sigma}$ sequence is ruled out by the same forces that militate against $[...CC]_{\sigma}$ configurations.

A brief comparison of some syllabification aspects of English and Spanish will help us clarify the issue at hand. In English, an input [govern + ment] yields [government] as the optimal output. This is the consequence of CORRESPONDENCE >> *COMPLEX CODA. Spanish follows the reverse rank ordering, with *COMPLEX CODA superseding correspondence constraints, thus requiring deletion of an input segment (/p/ in *escultor*).

We are now in a position to explain the paradox in (1,2) and account for the apparent moraic character of pre-vocalic glides with respect to stress assignment but not in syllable well-formedness. The effect that prevocalic glides have on stress assignment will be explained by the language-particular constraint ALIGN ONSET, forcing the left edge of the foot to be aligned with onsets with the feature [+high]. The fact that a post-vocalic glide cannot be followed by a coda consonant is the consequence of a violation of the high-ranked constraint *COMPLEX-CODA.

4.2.2 Glides, palatal consonants, and stress assignment: resolving the paradox

Palatal consonants exhibit a puzzling behavior in determining the landing site of stress. A noun containing a palatal consonant in the onset of the penultimate or final syllable cannot have antepenultimate stress, as illustrated in (7).

(7) Spanish nouns with palatal consonants in penultimate or final position

a.	cuchára	spoon	*cúchara
	cuñádo	brother in law	*cúñado
b.	cucarácha	cocaroach	*cucáracha
	Espáña	Spain	*éspaña

The examples in (7) parallel the pattern illustrated in (1). Additional examples are provided in (8) for the reader's convenience. Both environments in (7, 8) prohibit antepenultimate stress.

(8) Nouns with prevocalic glides in penultimate or final position

a.	sosiégo	calm	*sósiego
	abuélo	grandparent	*ábuelo
b.	Galícia	Galicia	*Gálicia
	pirágua	canoe	*píragua

When the palatal or GV sequence occurs in the final syllable, stress can fall on the penultimate syllable if the final is open, but has to be final if this syllable is checked by a consonant. [1]

(9) Palatals and prevocalic glides in final syllable

a.	espácio	(space)	*éspacio	b.	Daniél	(Daniel)	*dániel
	estúdio	(study)	*éstudio		especiál	(especial)	*espécial
	guadáña	(scythe)	*guádaña		señál	(sign)	*séñal
	despácho	(office)	*déspacho		señór	(mister)	*sénor

This peculiar characteristic of Spanish stress may be understood as a gap caused by historic evolution. In fact, some researchers (in particular, Roca) claim that this is indeed the case. Latin had antepenultimate stress, and a word such as *patricia* would be syllabified as [pa.tri.θi.a], since high vowels did not diphthongize with the following vowel. In addition, many palatal consonants in Spanish correspond to sequences of C+[high V] in Latin, which would explain the facts by the same reasoning.

If, on the other hand, this is a synchronic characteristic of Spanish (which started, as many other aspects of the language, as the result of historic evolution), it needs a formal

[1] An important caveat is in order here. Spanish has, to my knowledge, two counterexamples to this generalization: *cónyuge* (spouse) has a palatal segment in the onset of the penultimate syllable and yet has antepenultimate stress. Another counterexample to this alleged pattern is *álguien* (somebody), where the [glide][vowel] sequence of the last syllable should not allow penultimate stress because this syllable is heavy.

explanation. The behavior of palatals with respect to stress assignment has been explained (Dunlap 1991) in terms of considering them as the surface reflex of an underlying consonantal sequence. Therefore, orthographic "ch" would correspond to underlying /ty/[2]. The first element of the sequence would close the preceding syllable, and the second would be the onset of the syllable that contains the palatal. Under this analysis, every palatal consonant hides an extra mora attached to the preceding syllable.

The approach just outlined accounts for the nouns exemplified in (7a, 9a). A form such as *despacho* cannot have antepenultimate stress simply because it has a heavy penultimate. However, such an analysis does not suffice to rule out antepenultimate stress in the forms in (7b, 9b). A word such as *cuchara* (7a)would have /kut.ya.ra/ as its underlying representation, and that noun offers no structural description to prohibit stress in the antepenultimate syllable: forms such as *vértigo, cántabro, tártaro, pérfido,cántaro, cóncavo*. . . are marked but perfectly permissible, even though they have an antepenultimate closed syllable. The same reasons that prohibit antepenultimate stress in hypothetical /kut.ya.ra/ should apply to *vértigo*, yet antepenultimate stress is possible in the latter.

The claim that palatal consonants are the surface representation of underlying consonantal sequences is rejected here. Instead, my contention is that palatal consonants and prevocalic glides are best analyzed under the same motivation, which requires a constraint forcing the alignment of the left edge of the foot with a segmental feature that palatals and glides share. This constraint will be called ALIGN ONSET.

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[2] /ty /represents a sequence of t followed by a palatal.

(10) ALIGN ONSET: (AL. ONSET L, FT L) The left edge of the foot must coincide with the onset if it has a [+high] feature associated with it.

Onset sensitivity for stress assignment has been discussed in the literature by Davis (1988), Takahashi (1994), and Goedemans (1994), among others. Perhaps one of the most clear examples of the onset as a determinant factor in stress assignment comes from Western Aranda. In this language, stress is invariably assigned to the penultimate syllable, unless the antepenultimate contains an onset. As the examples in (11) illustrate, the presence (or not) of an onset plays an important role in determining the stress bearing syllable.

(11) Stress Assignment in Aranda (examples from Takahashi 1994)

(a) C-initial words		(b) V-initial words	
'balkala	in vain	a'ratja	straight
'pmaRala	in the camp	i'to:a	wild turkey
'tarama	to laugh	u'litna	forehead

These facts were explained by Davis in terms of projecting grid marks from syllables containing onsets and making the last syllable extrametrical. This explains why the words in the (b) column have penultimate stress: the first syllable cannot be a possible landing place because no grids are projected from that syllable. Spanish is different in that the relevant constraint does not evaluate the presence or not of an onset consonant, but its feature content. Davis analyzes the data by means in part of projecting a grid mark from a syllable if and only if it has an onset. This is not an attractive solution because it violates

the well supported universal that onsets do not contribute to syllable weight. It is particularly unattractive for Spanish because such a solution would entail projecting a grid mark (or a mora) for onsets just in case they are palatal; melodic content does not usually determine the placement of grid marks or moras.

A question remains as why the alignment constraint in (10) is violated in such an abundant number of cases (c.f. cucarácha, espácio). In fact, stress invariably falls to the right of a palatal onset on the penultimate syllable, but to the left if the palatal is the onset of the final syllable (except if it is heavy). Thus, in *cucaracha, hucha*, with penultimate stress, the main foot is not aligned with the palatal consonant, whereas in *señor, señal,* ALIGN ONSET is respected, yielding final stress.

The same pattern applies to prevocalic glides: if they occur in the last syllable, ALIGN ONSET is respected only when the syllable is heavy (*Manuel, especial*), but violated if the GV sequence is not followed by a tautosyllabic consonant ([ré.θyo], [xu.í. θyo]). In penultimate position, ALIGN ONSET is never violated.

Both in [espáθyo], [kóce], violation of ALIGN ONSET is forced by satisfaction of a constraint higher in the hierarchy for stress assignment in Spanish (and perhaps in most languages), namely FOOT BIN. In the examples just mentioned (and in general, the paradigm illustrated in (7b, 8b), aligning the main foot with the prevocalic glide / palatal, would give raise to a monomoraic foot. Therefore, penultimate stress is preferred in these forms.

On the other hand, forms such as [kučára], [aβwélo] have no motivation to violate ALIGN ONSET. In fact, it is possible to align the main foot with the feature palatal

without incurring a violation of FOOT BIN. Identical reasoning applies to [señál], [danyél]. Here, stress has no reason to move to the left of the last syllable. Final stress in these words comply both with FOOT BIN and AL. ONSET. Words such as **séñal, *Dániél* would be impossible to justify and in fact, there are no type B nouns under this category. The reason for such an nonexistence is that ALIGN ONSET is ranked above NON-FINAL. The following tableaux illustrate this claim.

(12) /koce/

koce	FOOT BIN	AL. ONSET	NON FINAL
a. ko.(cé)	*!		*
b. ☞(kó.ce)		*	

(13) /señor/

señor	FOOT BIN	AL. ONSET	NON FINAL
a. (sé.ñor)		*!	
b. ☞se.(ñór)			*

Once an explanation for the paradox has been advanced, the discussion moves now to an examination of glides as they interact with syllable structure. First, we will discuss the syllabic nature of these segments.

4.3.1 Syllabic affiliation of glides

This section focuses on output glides only. The discussion of their opposition with respect to surfacing high vowels is postponed until the syllabic affiliation of glides is determined. An analysis of the constraint interaction responsible for the syllable parsing of the two last vocoids in *caricia* will constitute evidence in determining the syllabic affiliation of prevocalic glides. (14) presents the possible analyses of [cia] with the constraints violated by each candidate. Underlined segments in (14) are understood to be attached to the same node: (14a) represents a complex onset, (14b) indicates attachment of the glide to the mora projected by [a], in (14c) the glide projects a mora.

(14) Possible analyses of [θya] in [karíθya]

a. [θ<u>ya</u>] *COMPLEX ONSET, {i} Peak

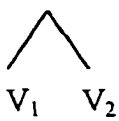
b. [θ<u>ya</u>] *BRANCH μ, *COMPLEX NUC, {i}Peak

c. [θya] *COMPLEX NUC, {i}Peak

(15) Constraints affecting the syllabification of glides

Branching Mora (*BRANCH-μ)

*μ



*COMPLEX ONSET: Consonant clusters are prohibited . (*[CC...]$_\sigma$)

{i} Peak: Project a syllable node from a segment with a sonority level of [i] or higher.

*COMPLEX NUC: The syllable peak is a single element.

The Cancellation Lemma of Prince and Smolensky (1993) allows us to exclude {i}Peak from consideration for the cases at hand, since all three forms violate it. It also allows us to determine that candidate (c) is better-formed than (b) regardless of the rank-ordering; (14b) violates *BRANCH MORA, by which (14c) will be the optimal candidate in any scenario. The tableaux in (16) illustrate this discussion.

(16) Possible rankings of relevant constraints

16a	*COMP. ONS	*BR. MORA	*COMP. NUC
a. [θ͡ya]	*!		
b. [θ͡ya]		*!	*
→ c. [θya]			*

16b	*COMP. ONS.	*COMP. NUC.	*BR. MORA
a. [θ͡ya]	*!		
b. [θ͡ya]		*	*!
→c. [θya]		*	

16c	*COMP. NUC	*BR. MORA	*COMP. ONS.
→a. [θ̲ya]			*
b. [θ̲ya]	*!	*	
c. [θya]	*!		

16d	*BR. MORA	*COMP NUC.	*COMP. ONS
→a. [θ̲ya]			*
b. [θ̲ya]	*!	*	
c. [θya]		*!	

The heart of the discussion is the relative rank ordering of *COMPLEX NUCLEUS and *COMPLEX ONSET. There is no data to establish a direct relative rank ordering of these two constraints.[3] Therefore, indirect evidence needs to be incorporated into the discussion.

The syllabification of [su.blí.me], [ká.bra] indicates that NO CODA is ranked above *COMP. ONSET, otherwise the optimal parsing would be [sub.li.me]. Additionally, plural formation in forms such as *ley / leyes* (law, laws), *rey / reyes* (king, kings) is the consequence of the glide receiving a consonant parsing (plural marker -es is attached to consonant-final nouns), therefore being attached to the coda.[4] If these glides are part of

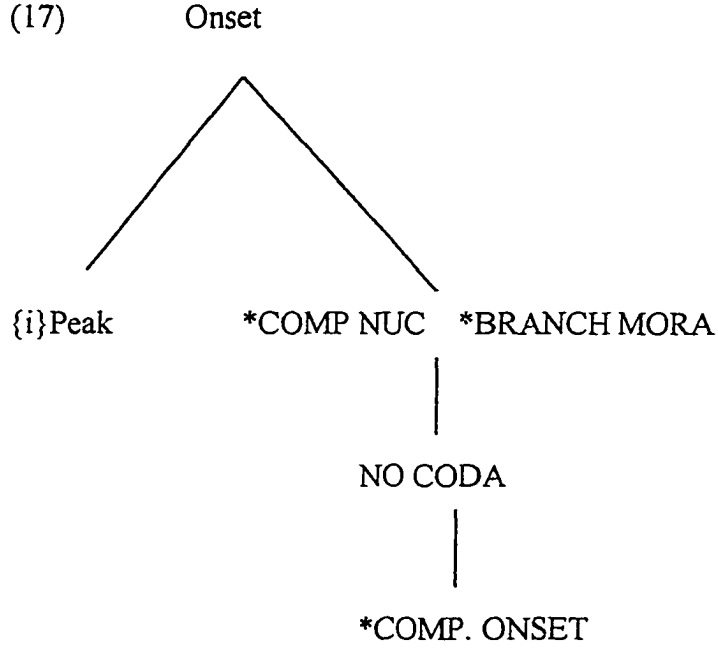
[3] Any rank ordering would be arbitrary: whatever candidate violates one of the constraints complies with the other.

[4] Recall from chapter 3 that vowel-ending stems make their plural by adding an [s] to the singular (casa / casas), whereas those stems ending in a consonant add [es] to the singular (papel / papeles).

the coda rather than second members of a complex nucleus, we can conclude that *COMPLEX NUC. is ranked above NO CODA. The resulting rank-ordering is *COMP. NUC >> NO CODA >> COMP. ONSET, yielding [θ̲ya] as the optimal representation for glide-vowel sequences.

The relative rank-ordering of constraints discussed so far is presented in (17), where some highly-ranked constraints such as FTBIN, FT.TYPE have been omitted. Lines indicate domination relation. Constraints in the same level dominated by the same line are understood as not being in hierarchical order.

(17)



The property of being a peak or a margin is not inherent in the segment: any segment can be either peak, margin, or neither, depending on the segments adjacent to it (Sagey 1986:279). A sequence of vocoids such as in (18a) may be syllabified as in (18b) provided that language-particular requirements allow for it.

(18) Syllabification of high vocoids (Sagey example) R = rime, O = onset.

a. u u u u

| | | |

x x x x

| | | |

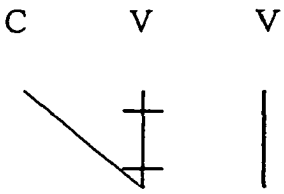
b. O R O R

w u w u

The natural, unmarked linkage between the timing tier and the segmental tier consists of one-to-one linking between [-cons] segments and V-units, and between [+cons] segments and C-units. However, there are, in addition to these natural mappings, linkages between [+cons] segments and V-units (syllabic consonants) and between [-cons] segments and C-units (semi-vowels).

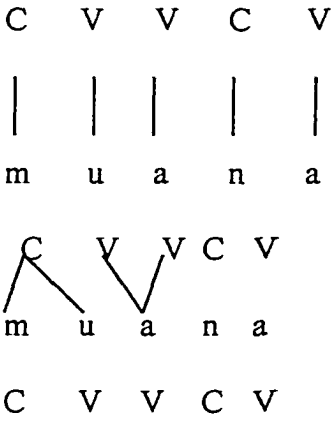
LuGanda (Clements 1986) shows the opposition *uola* (lend) / *mbuzi* (goat), where the [-cons] segment [u] is linked to either a V or a C slot depending on the environment--vowel if preceded by a consonant, consonant if followed by a vowel. Clements proposes a glide formation rule whereby an underlying high vowel becomes a glide if followed by another vowel.

(19) Glide formation rule



In LuGanda, Compensatory Lengthening causes lengthening of the vowel when the preceding high vocoid attaches to the onset, thus preserving the number of moras. This is illustrated in (20).

(20) Glide formation with subsequent CL in LuGanda



Since Spanish does not have long vowels, CL does not occur, but similar mechanisms for onset formation may be applied here. This approach to characterize prevocalic glides facilitates an explanation of the paradox illustrated in (1, 2). However, the choice of onset affiliation of pre-vocalic glides opens the possibility of having onsets with three elements (such as in *industrial*, *patria*), whose existence is not confirmed

elsewhere in the language. Additionally, this move contradicts the claim that the consonants in complex onsets in Spanish need to have a sonority difference of, at least, value 2, which would be violated in a liquid + glide sequence. Sonority has been claimed the reason why an obstruent can only be followed by a liquid, and not by a nasal. By the same token, both nasals and liquids cannot be followed by any element in the onset because it is impossible to achieve the required sonority difference.

Sonority difference may also be interpreted in terms of constraints restricting the kind of segments that can be part of a complex onset. The critical element of the discussion are nasal consonants. This fact could be accounted for by a generalization stating that nasal cannot be a member (first or second) of a complex onset unless the second element is a glide. This is indeed a clumsy statement, since it presuposes onset affiliation of pre-vocalic glides. We could also claim that the sonority scale is not a homogeneous spectrum, allowing a greater difference between e.g. liquids and glides than the one existing between liquids and nasals or any other two classes of consonants. This amounts to postulating two different scales for consonants and vowels. We should keep in mind that output glides are vowels given consonantal character by the processes of syllabification.

The syllabic nature of glides so far presented has been theoretical in nature because the choice between onset or nucleus affiliation is purely representational. Some empirical support for the onset analysis may be found in co-occurrence constraints of palatal consonants and prevocalic glides. Although there are examples of [w] following a palatal consonant, such as *pañuelo* (scarf), *llueve* (It rains), there are no palatal consonant-front

glide sequences. However, a palatal consonant may be followed by a front high vowel (*cochino, gallina, niñito*). The *[Pal.G_{front}V]$_\sigma$ / ✓[PHigh V]$_\sigma$ asymmetry can best be explained if the glide is attached to the onset and a constraint is formulated which prohibits the co-occurrence of two [-back] [+high] segments within the onset.

The definitive test to determine whether prevocalic glides are best represented as part of a complex nucleus or directly linked to the syllable node (and therefore as part of the onset) may be provided by syllabification across morpheme boundaries in Spanish. The puzzling data there offer the grounds to validate the onset hypothesis as the most appropriate.

4.3.2 Syllabification across morphemes

As in English, prevocalic glides in Spanish do not behave like vowels, at least in initial position. Davis and Hammond (1995), although claiming nuclear status for the front glide in English, admits that at the syntactic level, they behave as onset segments. Thus, *universal,* takes the indefinite "a" rather than "an" as it would be the case with a vowel-initial word. Similarly, in Spanish, the word *hielo* (ice) preceded by the preposition *con* (with) has the syllabification in (21b)[5]. If the prevocalic glide had nuclear status, it should force resyllabification of the coda consonant of *con*, as the examples in the (a) column do. However, the glide behaves exactly as the true-palatal consonant of *yema* (yolk).

(21) Resyllabification in Spanish[6]

a.	con amor	[ko.na.mór]	b.	con hielo	[kon.yé.lo]
	con interés	[ko.nin.te.rés]		con yema	[kon.yé.ma]

The conditions on syllabification in Spanish interact with morphology in an interesting way. Chapter 3 analyzed syllabification of monomorphemic *sublime* versus prefixed *suboficial, sublunar* Hualde (1991a:487). These words syllabify respectively as [su.bli.me], [[su.b]o.fi.cial], [[sub.]lu.nar] (square brackets indicate morpheme boundaries).

As we saw in [[sub]oficial], the coda consonant of the prefix becomes the onset of the first syllable of the stem. Chapter 3 showed interaction of the constraints ONSET, AL. SYLLABLE (the edges of the syllable and the stem must coincide) and NO CODA. These constraints will produce the desired results for the cases at hand.

The syllabification across word boundaries will be considered first. The examples are *con interés* [ko.nin.te.rés] and *con hielo* [kon.ye.lo] (with interest, with ice)

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[5] The letter h has no value in Spanish other than in writing.
[6] Glosses:
with love with ice
with interest with yolk

(22)

kon interes	ONSET	AL. SYLLABLE	NO CODA
a. kon.‖ in.te.rés	*!		*
b.☞ko.n‖in.te.rés		*	

(23)

kon Ielo	ONSET	AL. SYLLABLE	NO CODA
e. ko.n‖ye.lo		*!	
f.☞kon. ‖ ye.lo			*

The same set of constraints is responsible for assigning syllable boundaries to *deshielo, desinterés*, and monomorphemic *desierto.*

(24)[7]

desIelo	ONSET	AL. SYLLABLE	NO CODA
a. [[de.s]ye.lo]		*!	
b.☞ [[des.]ye.lo]			*

[7] Output [des.ye.lo] could also be obtained through output-output correspondence constraints by considering [des][yelo] the candidate form. I prefer to consider input forms without morphological structure, all done at one level.

(25)

desinteres	ONSET	AL. SYLLABLE	NO CODA
a. [[des].in.te.rés]	*!		*
b.☞ [[de.]sin.te.rés		*	

(26)

desIerto	ONSET	AL. STEM	NO CODA
a. [des.yer.to]			*!
b.☞ [de.syer.to]			

A crucial opposition comes from the comparison of the candidate set ([[des]yelo]) with ([[des]interes]) and ([desyerto]). The only reason why candidate (b) in (24) is better formed than (a) is because in the former, ONSET is also satisfied, thus leaving Al. SYLLABLE as the final arbiter. Two facts confirm the hypothesis that [ye] satisfies ONSET: the first one comes from the analysis of [[sub]oficial]. There, we saw that ONSET is ranked higher than ALIGN SYLL. (24) also shows that when ONSET is satisfied within the morpheme, as it was the case in [[sub]lunar], the selected output is the one that keeps the syllable boundary within the domain of the morpheme.

A final comment is in order regarding the candidate set in (26). Since [desyerto] is a monomorphemic word, ALIGN SYLLABLE, STEM is not at play. ONSET is satisfied regardless of the syllabic affiliation of the last consonant of the prefix. Therefore, we

have to wait for the third, otherwise non-operative, NO CODA. Candidate (b) in (26) is the selected output by the same reason [sublime] in chapter 3 was, namely because the language avoids codas whenever possible.

Summarizing so far, sections 4.2 and 4.3 demonstrate that prevocalic glides must receive a treatment along the lines of palatal consonants with respect to stress assignment. This fact constitutes a first piece of evidence in support of their affiliation to the onset rather than to the syllable nucleus. It was also shown that a [VGC] sequence is ruled out by violation of the high-ranked constraint *COMPLEX CODA. The discussion now centers on the distinction between glides and high vowels.

4.4.1 The distribution of glides

Spanish shows an opposition between glides and high vowels at the phonetic level. The difference emerges mainly when the high vocoid receives stress. The high vocoids in the (a) column of (27) surface as glides and are part of the same syllable as their adjacent vowel, whereas the ones in (b) receive main stress and constitute a separate syllable.

(27)	a			b	
caricia	[ka.rí.θya]	(caress)	policí.a	[po.li. θí.a]	(police)
estadio	[es.tá.αyo]	(stadium)	espía	[es.pí.a]	(spy)
averiguo	[a.βe.rí.γwo]	(I find out)	acentúo	[a.θen.tú.o]	(I put stress)
boina	[bóy.na]	(bonnet)	oído	[o.í.do]	(inner ear)

The data also offer examples of both glides and high vowels appearing in similar environments in different lexical items (Harris 1969, Hualde 1991a). The high vocoids in the (a) column of (28) surface as phonetic glides, whereas the ones in column (b) contain a heterosyllabic sequence of high vocoid and vowel in identical environments.

(28)	a [y/w]		b [i/u]	
	i.dió.ta	idiot	pi.ó.jo	louse
	ra.dió.lo.go	radiologist	bi.ó.lo.go	biologist
	cia.nú.ro	cyanide	pi.á.no	piano
	cam.biá.do	changed	a.cen.tu.á.do	stressed
	cuá.tro	four	a.du.á.na	customs

There are basically two hypotheses to explain the source of glides in Spanish. One is to consider them as the surface reflex of underlying high vowels. When these high vocoids do not carry main stress, they surface as glides if adjacent to a vowel. If, on the contrary, these segments receive main stress, they surface as full vowels. From this perspective, the presence of glides is accounted for in terms of a mechanism of complex nucleus formation, provided that the high vocoid does not carry main stress (see Roca 1991 and Rosenthal 1994 for detailed explanations). This solution is contradicted by the examples in (28b).

The second hypothesis argues for an underlying distinction between high vowels and glides. This hypothesis maintains that the presence of phonetic glides cannot be

accounted for in terms of rules derived from the position of stress, claiming that glides and high vowels have an unpredictable distribution. This hypothesis encounters strong support in (28) and in the conjugation of some verbs, where the glide / high vowel alternation seems to resist a straightforward account.

4.4.2 Unstressed high vowels vs. glides

The data in (29) challenge the idea of input identity of the segments in question, since both environments are identical.

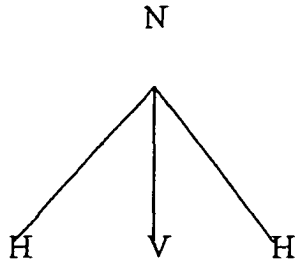
(29)	a	[y/w]		b	[i/u]	
idiota		[i.dyó.ta]	idiot	piójo	[pi.ó.xo]	louse

The words in (29) seem to speak for a phonemic vowel/glide contrast, since identical evironments give rise to either one. This idea receives support from the fact that in order to account for the opposition between the (a/b) patterns in (29), we need to attribute some pecularity to either group. I will first make an attempt to motivate the heterosyllabic parsing illustrated in (29b) under the assumption of input identity and later argue against underlying differences between glides and high vowels.

As discussed in the previous chapter, Roca (1991: 613) accounts for the tautosyllabic parsing in the (a) column by means of a rule of complex nucleus formation, by which two adjacent vocoids (V_1V_2) become tautosyllabic *if neither V bears the stress peak, or* V_1 *bears the stress peak and is more sonorous than* V_2. Keeping in mind that this approach rests on the claim that all output glides correspond to input high vowels,

the rule just mentioned cannot account for the tautosyllabic parsing of some of the examples in (28a), since the sequences do not meet the requirements for tautosyllabicity (examples *radiólogo, idióta, cambiádo, cuátro*). The rule of complex nucleus formation needs thus be extended in a way such that high vocoids are incorporated into the nucleus node of their adjacent vowel. Roca's rule takes the form of (30) (op.cit.:619):

(30)



Now we need to explain why the forms in (29b) are not subject to the mechanism described in (30). Roca suggests that these apparent exceptions may be reduced to rule: heterosyllabicity would be confined to the beginning of the word or at morpheme boundaries. This solution accounts for [*pi.á.no*], [[*a.cen.tu*][*.á.do*]], but not for [*a.du.á.na*]. However, there are numerous cases which escape the effects of (30), challenging any attempt to reduce some sequences to rule.

Although syllable merger has unequivocal effects in Spanish phonology, it encounters serious difficulties when it is applied to sequences containing a high vocoid. Therefore, if syllable merger is in fact operative, as it seems to be, the behavior of glides needs an explanation outside the effects of such rule.

There is no consensus among speakers and researchers as to what the exact parsing is for many of the forms under consideration. Spanish nouns that show a tendency towards hiatus in normal speech include: *diário, diána, diúrno, brióso, riáda, viáje, fiánza* (Navarro-Tomás 1982:159). Other Spanish words with heterosyllabic parsing of unstressed high vowels include: *jesuíta, huída*; versus *circuíto, fortuíto*, the latter with tautosyllabic parsing. The syllable boundaries in some of the words in (28) are subject to dialect and individual variation. In particular, *acentuádo*, (but not *piójo, biólogo*) can be claimed to have a tautosyllabic sequence of glide plus vowel.

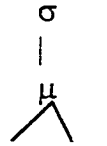
These inconsistencies may lead us to think of some of the sequences of high vocoid plus vowel as standing in free variation, with the high vocoid surfacing as either glide or high vowel. In fact, some of the forms just mentioned are not uniformly analyzed in the literature, and they receive different treatments depending on which analysis we consider.

The theoretical repercussion of the lack of uniformity just alluded to (both idiolectical and context-bound, i.e., formal versus colloquial speech) is that the constraints responsible for one or the other configuration need to be ranked not in a very rigid fashion. A constraint enforcing heterosyllabic parsing of high vocoid and a neighboring vowel is one requiring all syllabic moras to project their own syllable. This constraint is {i} Peak (a segment with the sonority value of [I] is a syllable peak). In addition to {i} Peak, the other constraint at play is ONSET, which forces tautosyllabic parsing of the sequences in question.

The interaction of ALIGN FOOT (left edge of the foot coincides with the head mora), {i} Peak, and ONSET yields the correct syllabification of [i.ó] in [pi.ó.jo]. The following tableau illustrates the marked (less abundant) scenario in which the rank-

ordering of constraints renders {i}Peak superseding ONSET. The unmarked ordering is the opposite, where satisfaction of ONSET requires [i] to be a margin. This markedness relation is provided by the fact that the monosyllabic parsing in forms such as *ciégo, diáblo, viénto, nuévo, cuátro* is much more abundant than the —disyllabic— *piójo, piáno, biómbo*. To simplify matters, (higher ranked) constraints forcing the stress pattern of *piójo* are not presented and only [ió] sequences will be considered, without implying that stress has been assigned in the lexicon, as the graphic convention in (31) might lead the reader to think.

(31) /Io/ sequence in piojo [pi.ó.jo]

Ió	AL. FOOT	{i}Peak	ONSET
a. ☞ 			*
b. 	*!	*	
c. 		*!	

Notice that candidates (31 a, c) satisfy AL. FOOT. Candidate (c) satisfies it vacuously: once the glide is attached to the syllable node, the head mora of the moraic trochee is aligned with the syllable and with the left edge of the prosodic foot. Candidate

(b) fails with respect to AL. FOOT because the head mora does not coincide with the edge of the foot. For reasons stated on chapter 3, this resource is not available to non-high vowels in the cases in which syllable merger takes place.

Different rankings of these constraints in syllable formation give rise to one or other output. Those dialects for which *{i}Peak is ranked above ONSET will choose candidate (a) as the optimal output. The reverse scenario will trigger the choice of candidate (c) as the surfacing form, as in [dyá.blo], [tyén.da] (evil, store). The latter is the unmarked, most productive pattern in Spanish. This ranking is responsible for the invariable parsing in sequences where the high vocoid follows a stressed vowel [bóy.na], [péy.ne]. Here, higher-ranked ONSET prevents disyllabic parsing. The fact that AL FOOT is not at play in these cases facilitates the tautosyllabic analysis. This cases contrast with [ca.í.da], [o.í.do], with an stressed high vocoid as the second member and mandatory syllable break.

We have seen two types of words in which the syllabification of prevocalic glides is concerned. For some oppositions (*pi.á.no* vs. *dyá.blo* and in general, the opposition in 29a-b), alternative orderings of ONSET and {i}Peak captures the differences in parsing.

Different parsings are subject to dialect and individual variation (a.du.á.na vs. a.dwá.na). The second group, with stress away from the sequence (*cianúro, aduanéro, estádio*), requires ONSET on the top of the hierarchy.

A comparison with sequences of non-high vocoids may clarify this point and provide an explanation for why monosyllabic parsing is optimal and exceptionless in *cianúro, estádio*. In (32), underlined segments are parsed tautosyllabically.

(32) Parsing of vocalic sequences

a.	to.á.lla	b. to<u>a</u>.llé.ro	towel, towel holder
	cam.pe.ón	cam.pe<u>o</u>.ná.to	champion, championship

In the examples in (32a), hiatus is forced by stress on the second element. As discussed in chapter 3, the optimal parse is the one in which the stressed mora is foot-initial. When stress is removed from the sequence by, i.e., suffixation (32b), such alignment constraint is no longer at play and the sequence is parsed as a diphthong. There is no room for the (*pi.á.no / dyá.blo*) alternation in forms such as *cianúro*, *negócio*, where the high vocoid surfaces always as a glide, because AL FOOT is irrelevant.

(33) /Ia/ sequence in cianuro [θya.nú.ro]

Ia	AL. FOOT	ONSET	{i}Peak	*BRANCH-μ
a. σ σ | | μ μ | | i a		!*		
b. σ | μ y a			*	!*
c. ☞ σ μ | y a			*	

A case can still be made for representation (33b) yet being in a position to explain the fact that a [...CGV...] has an influence in stress assignment. Attachment of a prevocalic high vocoid to the mora projected by the vowel still allows the glide to act as secondary articulator of the preceding consonant, which would then acquire a palatal character, being sensitive to the effects of ALIGN ONSET (a constraint against this representation, FEAT. SPREAD would need to be ranked low in the hierarchy). Various facts would support this claim. Co-occurrence constraints banning sequences of [PALATAL + GLIDE + VOWEL] could be explained by OCP considerations, forcing a disyllabic parsing in i.e., [ñia], as in [kom.pa.ñí.a] (company) and a few other cases in which a palatal is followed by a heterosyllabic sequence of [HV –HV].[8]

The syllabic affiliation of pre-vocalic glides just presented poses a problem for the syllabification of [des.ye.lo] (des + Ielo). Now there would be no reason to ban the [de.sye.lo] parsing, because [y] no longer belongs to the onset and the morpheme boundary needs to be crossed by syllabification in order to satisfy ONSET (cf. su.bo.fi.cyal). Output-output relations need to be established to preserve the syllabification of monomorphemic [yelo], whereby attachment of a prefix cannot alter previous syllable structure. Notice that this consideration is not at stake in [su.bo.fi.cyal], where initial parsing [o.fi.cyal] remains intact.

The choice of onset affiliation over attachment to the mora projected by the following vowel is motivated by satisfaction of *BRANCH MORA in the former as opposed to compliance with *COMPLEX ONSET, achieve by the latter. Onset affiliation

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[8] Chiapas could be explained as spelling pronunciation. Vernacular [čapas] pronunciation is common in colloquial speech.

is maintained here for simplicity, although the issue, representational in character, is open to discussion and clearly deserves further research. Notice further that this caveat does not have crucial repercussions to our discussion of glides, since we are analyzing surface forms. Adoption of (33b) and of input glides does not compromise the major claims made here: prevocalic glides attach to the onset, stress is sensitive to the nature of the onset consonants (palatals, glides). On the other hand, oppositions such as *pi.á.no* / *pya.nis.ta* could easily be captured by establishing that input vowels glide in some contexts.

4.5 Stressed high vowels vs. glides (caricia / policía)

This section examines the vowel / glide alternation in cases where the high vocoid is assigned main stress. Contrary to the variation observed in unstressed high vocoids as discussed in the previous sections, the data in this section is straightforward: when a high vocoid receives stress, it surfaces as full vowel; when stress is away from the sequence (as in 33), the surfacing element is always a glide.

The aim of this section is to offer a characterization of the opposition observed in *policía* vs. *carícia*; the former illustrating the context of a high vowel, the latter of a glide. Section 4.5.1 discusses the solution offered by the approach labeled here as "unparsed mora analysis," whereby the high vocoid in *carícia* projects a mora that is not incorporated into syllable structure. Section 4.5.2 discusses the markedness implications of this analysis. The relation between stress and syllable structure in the cases at hand is

examined in 4.5.3. Section 4.5.4 offers a unifying account of the stress and syllable structure facts.

4.5.1 The unparsed mora analysis

The class of nouns exemplified by *vértigo* or *bolígrafo* belong to type B: the right edge of the main foot does not coincide with the right edge of the word. This holds also true for nouns with a heavy ultima: a word such as *papél* (paper) with final stress, is a type A noun, whereas *árbol* (tree) with penultimate stress, belongs to type B. However, forms with either final or penultimate syllable (or both) containing a prevocalic high vocoid seem to resist such a straightforward treatment. This section examines the oposition po.li.cí.a / ca.ri.cia from the perspective put forward in Rosenthal (1994), labeled here "unparsed mora analysis." I present the facts first and then try to argue against the claim that such opposition is due to affiliation of these words to type-A and type-B respectively.

Attaching prevocalic glides to the mora projected by the vowel entails that the nouns in the (a) column of (34) belong to type A (NON-FINAL superseded by ALIGN R, FT, PrWd), whereas the ones in the (b) column are type B nouns (main foot removed from final position).

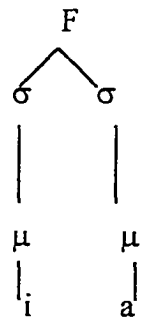
(34) Spanish nouns with pre-vocalic high vocoid in final position

a.Type A		b. Type B	
policía	police	carícia	caresse
ganzúa	picklock	trégua	cessation of hostilities
gentío	crowd	ódio	hate

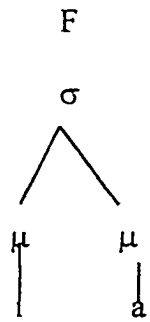
The unparsed mora analysis maintains that the last two segments of *policía* and *carícia* are identical in underlying representation. The difference between them comes only from a different mechanism for stress assignment. The tableaux in (36) and (38) illustrate both typologies (for a detailed explanation, see Rosenthal 1994:161 and ff.). The representations in (35) are two possible prosodic arrangements of the two last vocoids in the word. Note that neither onset affiliation of the [i], nor linking it to the mora projected by [a] is possible because it is the stress-bearer segment.

(35) possible representations of [ia] in *policía* [po.li.θí.a]

a. p o.l i.c i. a



b. p o. l i. c i a



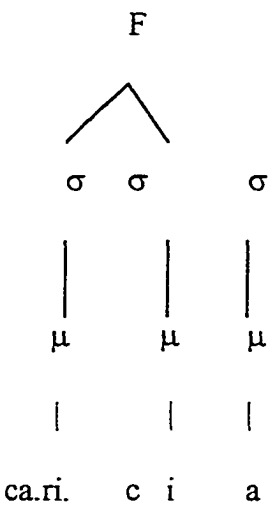
(36) Type A. Input /poliθIa/[9]

poliθIa	ALIGN R., FT, PWd	SON FALL
a. ☞ po. li. (θí. a)		
b. po. li. (θía)		*!

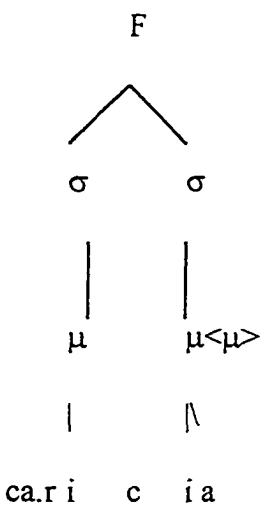
[9] SON FALL (*$[V_iV_j]_\sigma$ if $V_i < V_j$]) is used here to mirror Rosenthall's analysis.

For the type B nouns, the facts appear to be more complicated. The word *caricia* [ka.rí.θya] has the two possible representations in (37). The high vocoid in (37b) is linked to the same mora as the last segment of the word, so the sequence is monomoraic. Note that in (37), we cannot adopt the same mechanism that applies to *policía*, where the high vocoid receives stress and therefore its moraic status would be unquestionable.

(37) a) ca.(ri.ci.)a



b) ca.(ri.cia)



(38). Type B. Input /kariθia/

kariθIa	NON-FINAL	ALIGN RIGHT	ONSET
a. ka.(rí. θi.) a		μ	*!
b. ☞ ka.(rí.θya)<:>		μ	

(36, 38) would suffice to account for the difference between type A and type B words in forms containing a sequence of raising sonority in the last syllable. Although

appealing, this solution is not viable because the "unparsed" mora should not play any role in constraint evaluation: the last high vocoid in [karíθya] is either attached to a mora of its own, attaches to the following mora, or is directly linked to the onset. The first solution does not account for the asymmetry of pre and post-vocalic glides[10]. The second alternative does not explain the stress facts, since two segments attached to a single mora do not render the host syllable heavy. Therefore, onset affiliation is the most plausible solution.

In addition to the mora inconsistency, another source of controversy in the unparsed mora approach is the characterization we make of the data in terms of establishing the criteria for markedness, which will be addressed first as a strong argument against the [poliθía] / [karíθya] distinction as a result of type A / B affiliation. The study turns later to the analysis of nouns with glides in the penultimate syllable to account for the [bóy.na] / [o.í.do] opposition.

4.5.2 Criteria for markedness

In terms of numbers, marked forms in any language are less abundant than the regular, unmarked ones. According to Harris (1995), penultimate stress in words with light ultimas occurs in 90% of the eligible words. In Quilis (1981:336) penultimate stress in Spanish is reported in 36.01% of the cases, final stress in 7.98% (and this includes regular consonant-ending nouns such as *papel)* and antepenultimate stress in 1.22% of

[10] Recall that one argument to account for the CGVC / *CVGC asymmetry is that the first contains two moras (nucleus, coda), whereas the latter has three. If the hypothesis put forward in this chapter is correct, the asymmetry is due to violation of *COMPLEX CODA by the vowel + glide + consonant sequence.

the cases (the rest of the database is comprised by monosyllables). What this means is that words such as those in column (a)—type A—of (39) are much more common than those of column (b)—type B.

(39) a. Type A words

paséo	walk
maréo	dizziness
canóa	canoe

b. Type B words

férreo	made of iron
aéreo	aereal
petróleo	petroleum

The forms in (40) should also accommodate to this pattern. The words in the (a) column should be, according to markedness, more abundant than those of the (b) column — in a ratio of 10 to 1.

(40)

a. Type A		b. Type B.	
policía	police	carícia	caress
mercancía	merchandise	licéncia	license
ganzúa	gridlock	estátua	statue
rocío	dew	rádio	radio

However, the prediction that the (a) column should have more members than the (b) column is not confirmed by the data. The "Diccionario invertido de la lengua española" (Inverse Dictionary) shows that the (b) type words outrank those of the (a) column. In a

data base of 4,600 items ending in [Ia], a total of 1,853 end in a [ía] sequence (40% of total sample). If we take out of the database the words that contain the highly productive *-ía* suffix (meaning place to make or sell, or pertaining to), the actual number of words ending in a -ía sequence is reduced to 1,153 (29%). The dictionary also contains 148 words ending in a [Ua] sequence. Of those, only 27 (18.2 %) have stressed [u] at the end of the word. For words ending in [Uo] sequences, there is a total amount of 55 entries, of which only 3 (5.4%) end in [úo] sequence. For words ending in [Io], a random database (the first ones) of 160 monomorphemic forms[11] shows 150 ending in [io] and 10 (6%) ending in [ío].

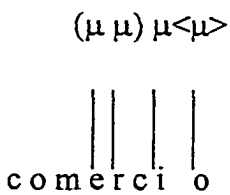
As these figures show, the difference between the *caricia* and *policía*-type words does not seem to come from their different affiliation to type B and A respectively, since they are just in the opposite relation of what is expected for these words. We should then consider reasons for the *caricia/policía* opposition other than the stress typology.

Before moving into a discussion of the verbal, a last account against a type A - B difference for *caricia / policía* will be presented. The new set of data is used to discuss syllable structure and stress assignment of forms with final glide-vowel sequences preceded by vowel-glide configurations. We should note that, in words such as *comércio* [y], *mercancía* [i], paralleling *caricia/policía*, according to the "unparsed mora" approach, there is a difference between type A and type B, which otherwise is neutralized

[11] I randomly stopped at this number due to the overwhelming amount of entries.

for nouns with heavy penultimas and open last syllables (*car.ta, gor.do, bar.ba...*), which may belong to either category (both in constraint-based approaches and Grid Theory, as put forward in Harris 1995). Moreover, we have *comercio*, type B; and *mercancía*, type A.

(41) a. Input: /comercio/ Type B.



b. Input: /mercancia/ Type A.

The analysis of *co(mer)cio* would be similar to that of *(vér)tigo*: the main foot is two moras away from the right edge of the prosodic word, but that is the only possibility, given the type B status of the noun. These forms are marked as having Non-Final ranked above ALIGN. To achieve that result, stress is forced to move to the penultimate syllable, where only one segment—the vowel—can bear stress.

On the other hand, the analysis of nouns such as *desáhucio, Cláudia, Bráulio*, posits a serious problem for the unparsed mora analysis. Although this type of word is not very abundant, their pronunciation offers no doubts, and stress is placed on the first vocoid of the penultimate syllable. (42) shows the mechanisms for stress assignment in these forms. Since they belong to type B (otherwise they would be pronounced **deshaucío, *claudía, *braulío*), the main foot cannot coincide with the right edge of the prosodic word—a consequence of NON-FINAL ranked above ALIGN R., FOOT PrWd).

(42) Input /klaUdIa/ . Type B.

klaUdIa	NON-FINAL	ALIGN
a. kla. (ú. dya)<:>		μ
b. (kláw.)dya<:>		μμ

The selected output should be cla.ú.dia, since it entails a minimal violation of ALIGN, although producing an onsetless syllable. However, the actual form is [kláw.dya], contrary to the predictions of this analysis. Since ALIGN supersedes ONSET, there is no reason for [kláw.dya] to have stress on the pre-antepenultimate vocoid instead of on the antepenultimate. Therefore, having an onsetless syllable should not be an obstacle for placing stress on the antepenultimate vocoid.

The [aw] sequence seems to have a peculiar behavior with respect to stress assignment in Spanish. Nouns such as *náufrago, cáucaso, náusea, áurea* . . . receive stress to the left of what would be the normal position for type-B words. This led some researchers to consider the [aw] sequence as a special case in Spanish. There is opposition, however, between stressed and unstressed [U] following [a]. These oppositions are exemplified by the pairs: *saúco/sáuce, aúpa/cáusa,* where the first elements of the pair should not exist if [aw] always had a special character in Spanish.

Unfortunately, there are not many examples with a [..VG.CGV] structure, but native speakers react unanimously when presented with nonce forms. An informal study conducted among twenty native speakers of Spanish showed that there is absolute consensus pronouncing e.g., *ANEICIA as [a.néy.θya], rather than *[a.ne.í. θya]

(provided they considered the word a regular type-B form) or *[a.ney.θí.a], as it would be expected if judged as a type-A form. The words were presented separately and written in capital letters, where Spanish does not use accent marks. The test included ten words with twenty fillers. The latter included very common Spanish nouns requiring accent marks (but presented without them to the subjects). Nouns such as CAFE, PANAMA, VERTIGO (spelled café, Panamá, vértigo) were included to give subjects the idea that accent marks were not supplied.

Recall from the discussion of [pi.á.no] vs. [θyá.nu.ro] that analyzing high vocoids as consonants entails violation of {i}Peak to satisfy ONSET. We also saw that these two constraints are not ordered in a rigid ranking, although ONSET is finding its way up in the hierarchy, especially in colloquial speech. The consonantal character of /U/ in /saUθe/, syllabified as [sáw. θe] triggers a neutralization in terms of affiliation to type A or B for stress assignment. Recall that both [ka.nás.ta] (basket) or [a.cén.to] (accent), may belong to either category for stress. Words such as [bóy.na], [báy.le] [sáw. θe] can be so analyzed, their difference with respect to [o.í.do], [sa.ú.ko] being attributed to the different ranking of ONSET and {i} Peak. The former group (probably the unmarked, definitely more abundant) has ONSET superseding {i} Peak, the second group is marked as responding to the opposite rank-ordering. Therefore, the forms represented by [kláw.dya] seem to escape a well-motivated account based on type-A / type-B opposition. Instead, if we consider that both glides in this word come from input high vowels and that this is a canonical word in the sense that ONSET is higher-ranked than {i}/{u} Peak, the form receives a type-A analysis with [y] attaching to the onset without being attached to a mora.

Summarizing, the unparsed mora analysis makes the wrong predictions in terms of determining the marked forms of the language, placing the *policía*-type nouns as the unmarked case and the *caricia*-type as marked, a claim not supported by the data. On the other hand, it encounters difficulty when faced with nouns containing a postvocalic glide in penultimate position in a word ending in a raising sonority diphthong (*Cláudia*, nonce *neicia).

4.6 Towards a unifying solution.

So far,it has been shown that the type A or B affiliation is insufficient to explain the difference between *policía/carícia, oído/boina*. This section will show that those differences are due to syllabification rather than stress assignment. Assuming for the moment that the difference between the high vocoids in [cía] and [θya] are not caused by differences in the input, different ranking of syllable structure constraints will prove to be responsible for the observed difference.

(43) shows the interaction of the constraints ALIGN RIGHT, ONSET, {i} Peak and AL. ONSET

In these tableaux, an underlined sequence means that both segments belong to the same syllable constituent (onset or nucleus). Constraints such as FOOT BIN and FOOT FORM are not included, since they are irrelevant to the discussion.

(43) Input /kariθIa/

/cariθIa/	AL.RIGHT	ONSET	{i}Peak	AL. ONSET
a. ☞ka.(rí. θya)			*	*
b. ka.ri.(θí.a)		*!		

(44) Input /poliθIa/

/poliθIa/	AL. RIGHT	{i}Peak	ONSET	AL. ONSET
a. ☞po.li.(θí.a)			*	
b. po.(lí.θya)		*!		

The constraint ranking just presented explains the differences in syllabification presented by the pair *ra.dió.lo.go / car.di.ó.lo.go* and the other cases of (4). Identical analysis will be applied to the different parsings of the present tense of the first conjugation verbs addressed in the next section. Cophonologies, understood as domain-specific rank-ordering of ONSET and i{Peak} explain the different parsings.

The advantage of this approach is that it allows us to maintain input identity for surfacing glides and high vowels with no need to appeal to mora inconsistency, markedness reversal, or extending the type A-B characterization to the verbal paradigm, which finds no evidence in the entire conjugation other than when it applies to prevocalic high vocoids.

4.7 Against input differences

A piece of evidence in support of an underlying distinction between glides and high vowels could be provided by the verbal paradigm. Harris (1969, 1985) shows a difference in the behavior of high vocoids in the first conjugation of Spanish verbs. As shown in (45), the present indicative of Spanish verbs invariably receives penultimate stress, regardless of any weight considerations.

(45) Infinitive and present indicative

preguntár/pregúnto	(to ask/I ask)
prometér/prométo	(to promise/I promise)
escribír/escríbo	(to write/I write)
paseár/paséo	(to take a walk/I take a walk)

When the verb ends in a [+high] [-high] sequence, the facts become rather intricate. In some cases the high vocoids surface as glides, whereas in others they surface as full vowels, carrying main stress.

(46) Glides in Spanish present indicative[12]

a. Infinitive	Present tense	b. Infinitive	Present tense
cam.biár [y]	cám.bio [y]	es.pi.ár [i]	es.pí.o [i]
o.diár [y]	ó.dio [y]	ro.ci.ár [i]	ro.cí.o [i]
men.guár [w]	mén.guo [w]	si.tu.ár [u]	si.tú.o [u]
a.ve.ri.guár [w]	a.ve.rí.guo [w]	ac.tu.ár [u]	ac.tú.o [u]

Rejecting an underlying distinction between glides and high vowels seems to require the verbs in the (a) column be granted stress retraction character, thus integrating type B group of forms with stress placed in antepenultimate position. This solution is poorly motivated in Spanish for no verbs other than the ones ending in a [high vocoid][vowel] sequence display such behavior.

The data in (46) led Harris to postulate underlying glides for the verbs in column (a) and high vowels for those in (b). This approach will be modified here in such a way that it will not be necessary to grant underlying status to surfacing glides in Spanish. The choice of input identity is doubly justified: on the one hand, the requirements for the phonemic status of [y] are not completely met; and two, output differences can be accounted for via interaction of constraints. Alarcos (1965: 152-155) shows that [i], [y] meet rule III of Trubetzkoy whereby two acoustically or articulatorilly-related sounds

[12] Glosses:

change	spy
hate	sprinkle
diminish	place
find out	act

may be considered as variants of the same phoneme if they never appear in the same context. This is indeed the case with [i], [y] in that the latter appears only in tautosyllabic sequences of vowels and is never a syllable peak. Rule of IV of Trubetzkoy also points at input identity: There are no combinations of [y] [i]. Identical reasoning applies to the [u], [w] opposition.[13] However, the input-identity approach must face the [ó.dyo] / [es.pí.o] differences of the present indicative.

The mechanisms adopted here to account for the different parsings of [pi.á.no] / [dyá.blo], based on the relative rank ordering of the constraints ONSET and {i}Peak, can be easily applied to the verbal paradigm. Therefore, we do not need to appeal to underlying distinctions postulating an extra input element otherwise unnecessary. Nor do we need to claim affiliation to either type A or B, which is a genuine characteristic of Spanish nouns not operative in verbs. The Type A / Type B distinction cannot apply to verbs because stress feet align to different morphological entities in verbs than in nouns; therefore, there is no sense in which we can expect a co-phonology in verbs as in nouns for this type of phenomenon. However, the cophonology here is perfectly expectable in verbs as well as nonverbs.

An additional piece of evidence in support of input identity between surfacing glides and high vowels may be found on the alternation displayed by high vocoids in short words as opposed to their analysis after suffixation creates a longer string. The term "short" has been intentionally chosen to make the case of the influence of word size in

[13] For earlier discussions of this matter, see Bowen and Stockwell (1955) and Saporta (1956). For a reinterpretation of these analyses, see Cressey (1978).

the analysis of high vocoids. The examples in (47) show different syllabic arrangements depending on the size of the word.

(47) Short words with post-vocalic high vocoids[14]

Raúl	[ra.úl]	Raulito	[raw.lí.to] / [ra.u.lí.to]
maíz	[ma.íθ]	maizal	[may.θál]
baúl	[ba.úl]	baulero	[baw.lé.ro] / [ba.u.lé.ro]

Notice that once the word is enlarged and stress is removed from the [vowel] [high vocoid] sequence, both vocoids attach to the same syllable. (47) is a clear illustration of how input high vowels receive different interpretations depending on syllable well-formedness conditions. Forms such as *[ráwl], *[máyθ] are impossible because they violate *COMPLEX CODA, which is, as we saw, a highly ranked constraint. When the processes of suffixation create an environment in which *COMPLEX CODA is no longer at stake, the high vowel of the input receives its preferred interpretation: that of a glide as dictated by ONSET. A similar case is made in (48). The alternations shown in the second column of (49, 50) will be addressed in a moment.

[14] Glosses:

proper name	diminutive
corn	corn field
trunk	trunk carrier

(48) More "short" words[15]

día	[dí.a]	diario	[dyá.rjo] / [di.á.rjo]
río	[rí.o]	riachuelo	[rya.cwé.lo]
vía	[bí.a]	viaducto	[bya.dúk.to]

Two closely related facts converge to make [dí.a] the only possible output for input /dIa/. (49) shows the interaction of FOOT BIN, WORD MINIMA (words must have a minimum size—two moras), and ONSET. WORD MIN imposes a minimum of two moras per prosodic word (cf. Prince & Smolensky 1993, chapter 2). Notice that the effects of FOOT BIN suffice to achieve the desired results.

(49) Input /dIa/

dIa	FOOT BIN	WORD MIN.	ONSET
a.☞ (dí.a)			*
b. (dyá)	!*	!*	
c. di.(á)	!*		

Notice that [dyá.ryo] or [di.á.ryo] do not offer the structural description to challenge either FOOT BIN or WORD MIN., thus facilitating the glide analysis of the input high vowel. The second possible parsing ([di.á.ryo]) follows the same mechanism

[15] Glosses:
day journal
river small river
track railroad bridge

as [pi.ó.xo]: {i}Peak ranked above ONSET. In these cases, in addition to {i}Peak, there is another factor in favor of the heterosyllabic parsing: the input form is [dí.a] [rIo]. Output-output CORRESPONDENCE constraints could lead to a syllable break between both vocoids as present in the input. Identical mechanisms are responsible for the alternations in (47).

4.8 Conclusion

Syllable structure and stress are two closely-related phenomena in Spanish. A set of constraints for stress and syllable structure account for both phenomena in a principled way. First stress assignment was shown to be the consequence of the constraint ranking FOOT BIN, FOOT TYPE>>ALIGN R, FOOT, PrWd>>NON-FINAL. The marked paradigm of Spanish nonverbs, with stress placed one syllable to the left of its canonical position, emerges as the consequence of assigning a domain-specific constraint ranking to a set of stems and suffixes.

Cophonologies, understood as the result of re-ranking of constraints, also proved to be effective explaining idiolectal and free-variation patterns in some aspects of Spanish syllable structure. Syllabification of vowel sequences depends on the position of stress. When the second member of a [VV] sequence receives stress, it forces heterosyllabic parsing. However, when stress falls on the first member of a sequence of mid vowels, there is no homogeneous parsing, which we explained in terms of a "weak" rank-ordering of the constraints ONSET and {e}Peak. The effects of this rank ordering is decisive when other constraints are not at play (specially ALIGN FOOT).

Syllabification of prevocalic glides is largely dependent on the relative rank ordering of ONSET and {i}Peak, even when the vowel following the high vocoid receives main stress (*pi.á.no* vs. *dyá.blo*). We saw, however that the syllable boundaries in [HV] sequences are not rigid in some words. It is important to note that [VH] sequences are always analized with a disyllabic parsing in those cases in which the high vocoid does not receive main stress (*bói.na, vai.ní.lla*).

Pre vocalic glides in Spanish are best analyzed as onset components rather than members of a complex nucleus. The basic idea of the present analysis rests on the fact that, at least in Spanish, the features [CONSONANT] or [VOWEL] need not be specified for prosodic purposes. A vowel is traditionally defined as a syllabic nucleus, whereas a consonant is not assigned this role. However, I have shown in this chapter that any input segment may act as syllable peak or margin, depending on the neighboring segments. Spanish high vocoids are neither consonants nor vowels. What counts for syllable structure is their sonority level as compared to the preceding and following element: when followed by a vowel, the preferred affiliation is that of part of the onset; when surrounded by two segments with lesser sonority value, they surface as full vowels.

Onset affiliation of pre-vocalic glides facilitates a parallelism between these segments and palatal consonants as they relate to stress assignment. The formulation of the language-particular constraint AL. ONSET, forcing the left edge of the main foot to coincide with a palatal / glide in onset position, accounts for the otherwise difficult to explain ban on antepenultimate stress in nouns with any of these segments in the onset of the last or penultimate syllable.

The distribution of glides and high vowels has been shown to emerge as the consequence of different rank-ordering of constraints for syllable structure. The unmarked, more abundant paradigm, as illustrated in [ka.rí.θya], results from the requirement that syllables have an onset. Onset satisfaction is challenged by {i}Peak, whereby vowels must be granted syllable head status, favoring the hiatus parsing illustrated in [pi.ó.xo]. The hypothesis put forward in this chapter states that a weak relative order of these constraints gives rise to one or other output.

The present analysis of Spanish glides is restrictive in what it considers the algorithm for stress assignment and syllabification strictly based on mora counting. Second, it derives the actual outputs by means of the interaction of constraints of universal character for both syllabification and stress. The only language-specific constraint used here is ALIGN ONSET, which accounts for a peculiar aspect of Spanish prosodic phonology.

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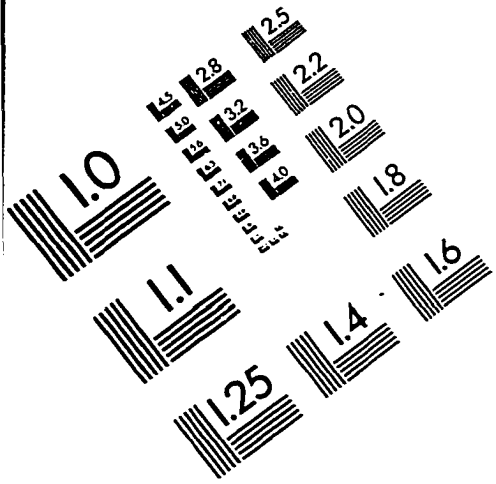
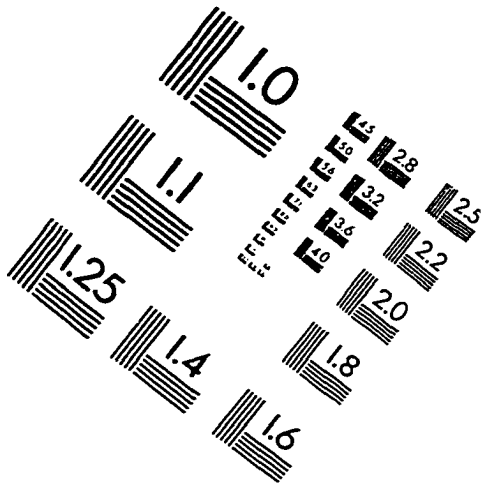
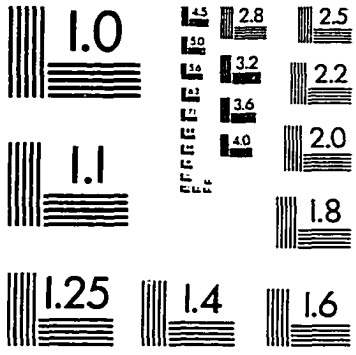
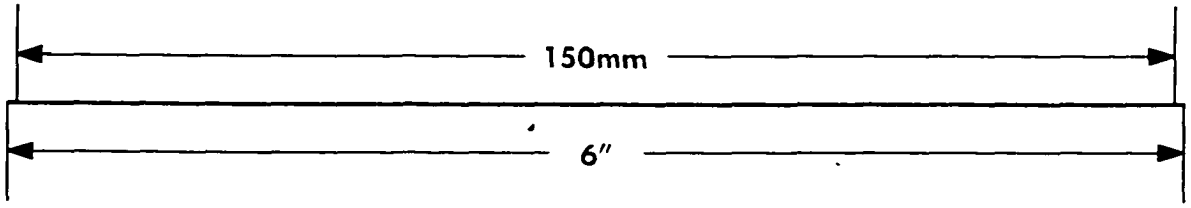
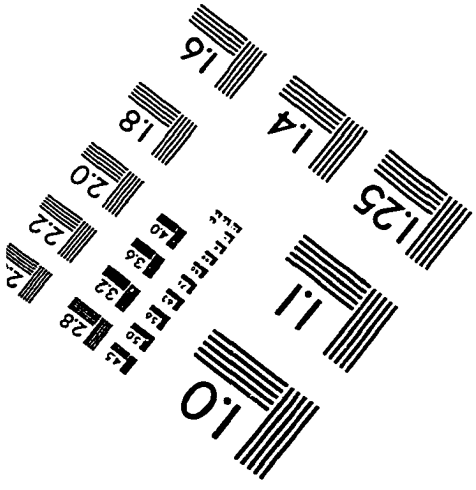
IMAGE EVALUATION TEST TARGET (QA-3)

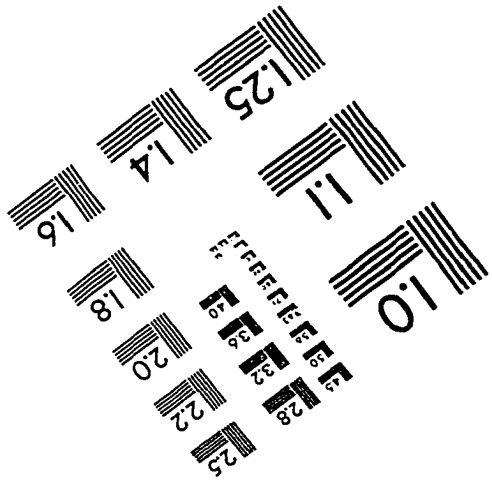












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