32. Projection and Edge Marking in the Computation of Stress in Spanish

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0 Introduction

In the period deemed "current" in this *Handbook*, theoretically committed studies of Spanish phonology have investigated a broad spectrum of language-particular phenomena, including but not limited to[1] aspiration of /s/; cliticization; morphophonology of diminutivization; diphthongization of high and mid vowels; glide-vowel and glide-obstruent alternations; interpretation of early Spanish orthography; intonational discourse signals; liquid assimilation and vocalization; nasal assimilation, velarization, and deletion; distribution, structure, and depalatalization of palatal consonants; varieties and distribution of *r*-type segments; low-level vowel sandhi (reduction and deletion); phrasal stress; primary word stress; spirantization of voiced obstruents; syllabic effects in hypercorrection; text-to-music accommodation; voicing and continuancy assimilations of voiceless stops; vocalic height alternations; vowel and consonant epenthesis; vowel harmony/metaphony.

Because of the richness and variety of these studies of Spanish, I have found it impossible to squeeze into the space allotted a comprehensive review from which, in my opinion, a substantive and durable contribution to our understanding of some aspect of phonology can be derived. Therefore, as an alternative to scattering my shots unproductively, I have chosen to concentrate on the one topic that has all but overwhelmed the field of Spanish phonology in the last decade, namely, stress assignment. This topic has dominated the attention of investigators not only by the measure of pages of print in major publications but also in terms of concern with theoretical underpinnings.[2] It is decidedly odd that so much paper and energy have been invested in a subject which everybody thinks is easy, which children catch on to quickly (Hochberg 1988; Lee 1989), and for which Halle and Vergnaud (1987, pp. 93–95), for example, toss off an analysis in a few sentences. This disparity begs for an explanation.

Having narrowed my focus to stress assignment, I aim to do more than simply provide a critical survey of the literature. My goal is to confront certain issues that have been either ignored or treated equivocally in available analyses (including my own), and to do so within the framwork of a more explicit and more restrictive metrical theory than has been employed heretofore.[3] If the endeavor is successful, it will establish a benchmark for the assessment of both present and future studies of Spanish stress.

1 Spanish Word Stress, Basic Observations[4]

It seems at first glance that the location of primary stress in Spanish words is subject to a bizarre restriction: it can fall on any one of the last five syllables, but not on the sixth (seventh, etc.) from the end. This is illustrated in (1), where periods mark syllable boundaries:

(1)

. . . 6 5 4 3 2 1	(position counting from right)
a.na.li.**zó**	"(s)he analyzed"
a.na.**lí**.za	"(s)he analyzes"
a.na.**lí**.ti.co	"analytic"
a.na.**lí**.za.me.lo	"analyze it for me"
a.na. **lí**.ce.se.me.lo	"have it analyzed for me"
*a.**ná**.li.ce.se.me.lo	

These data are not really odd, however: the words with stress in the two most remote positions (4 and 5) are penultimately stressed verb forms followed by two or three pronominal enclitics (e.g., *se, me, lo*). It is clear that these clitics lie outside the domain of word stress assignment in Spanish, since their attachment to the right edge of a word never triggers rightward migration of stress. In this respect clitics differ crucially from ordinary suffixes, as can be seen from countless sets of words like those in (2):

(2)

(a)	Clitics	
	prepáre	"prepare"
	prepáre-me	"prepare me"
	prepáre-me-lo	"prepare it for me"
	prepáre-se-me-lo	"let it be prepared for me"
(b)	Suffixes	
	pár+o	"stop"
	par+**ád**+o	"stopped"
	par+a+**dór**	"stopping place"
	par+a+dor+**cít**+o	"*id.*, dim."

The domain of Spanish word stress is thus the constituent that I will call the "M(orphological) word" (with suffixes, without clitics), as opposed to the "P(honosynatactic) word" (M word plus clitics). In Spanish M-words (hence-forth, simply "words"), stress is confined without exception to a three-syllable window at the right edge. This limitation finds a deep explanation in the assumption that antepenultimate stress is the theoretical maximum leftward displacement that can be measured – as a leftheaded foot followed by an unparsed or extrametrical syllable: *si.* (***lá****.bi.*) co-that is, if metrical theory provides no representation for the inadmissible type **sí.la.bi.co* in a right-edge-oriented system that parses binary feet.

Phonologically minimal stress contrasts like those illustrated in (3) are by no means rare in Spanish:

(3)

. . . 3 2 1	
so.li.ci.**tó**	"(s)he solicited"
so.li.**cí**.to	"I solicit"
so.**lí**.ci.to	"solicitous"
(***só**.li.ci.to)	

Obviously, morphological factors and / or lexical idiosyncracy must play a role in the location of

stress within the three-syllable window. In essence, the system works as follows. Stress on the penult is canonical in Spanish in the sense that it is found in about 90 percent of the lexical stock of nouns, adjectives, and adverbs and in around 75 percent of the forty-odd inflected forms of each verb stem.[5] In the remaining cases, antepenultimate stress is triggered by specifically designated morphemes. In nouns, adjectives, and adverbs, both stems and affixes can be triggers, as illustrated in (4a); in verbs only certain inflectional affixes play this role, as illustrated in (4b):[6]

(4)

	Canonical		Special triggers	
(a)	noun/adjective/adverb			
	obó+e	"oboe"	**HÉRO**+e	"hero"
	numer+ós+o	"numerous"	**numér**+IC+o	"numerical"
(b)	verb			
	llama+**ré**+mos	"we will call"	lla**má**+RA+mos	"we should call"

Final stress in vowel-final words occurs predictably, under morphological control, in two verb paradigms (5a) and in a small residue of nonverbs, mostly borrowed nouns (5b):

(5)

(a)	pas+**ó**	"(s)he passed" (past perfective)
	pas+a+**rá**	"(s)he will pass" (future)
(b)	**menú**	"menu"
	rabí	"rabbi"

The three-syllable stress window is not available unconditionally. Segmental and prosodic restrictions shrink it to two, or in the extreme case, a single syllable, as illustrated in (6):

(6)

Two-syllable window		
(a)	penult rhyme = GV: No.**ryé**.ga	(*C**V́**.CGV.CV)[7]
(b)	penult rhyme = VG: Ja.**máy**.ca	(*C**V́**.CVG.CV)
(c)	penult rhyme = VC: a.**lár**.ma "alarm"	(*C**V́**.CVC.CV)
(d)	final rhyme = GV: ca.**rí**.cya "caress"	(*C**V́**.CV.CGV)[8]
(e)	final rhyme = VC: ca.**ní**.bal "canibal"	(*C**V́**.CV.CVC)
One-syllable window		
(f)	final rhyme = VG: ca.**ráy** (interjection)	(*C**V́**.CVG)

The disallowed forms are not simply fortuitous lexical gaps. Rather, they reflect robust native judgments. For example, hypothetical nouns such as **cá*. *nas*. *ta* and **tí*. *nam*. *bo*, which violate (6c), are consistently judged to be strongly deviant.

The generalizations illustrated in (6) seem to constitute prima facie evidence that consonants and glides are syllabic weight units in Spanish, i.e., that they make "heavy" syllables: if stress assignment in Spanish were entirely "quantity insensitive", then all of (6) would be a mystery. For example, *á*. *la*. *mo* "poplar" and *cá*. *ma*. *ra* "chamber" are stressed on the antepenult while the class of words like *a*. *lár*. *ma* (6c) cannot be. It is hardly obvious what this limitation could plausibly be attributed to other

than the heavy penult closed by C in all the words of the latter class. Similarly, ***cá***. *ra* "face" is stressed on the penult while words like *ca*. ***ráy*** (6f) cannot be. Again, it is hard to plausibly attribute this limitation to anything other than the final glide of all the words in the latter set. But if both C and G contribute to syllable weight, then they do so in a puzzling and apparently inconsistent way. For example, why does VG (6f) but not VC (6e) attract stress to the final syllable? On the other hand, if rhymal C is not a weight unit, why do VC rhymes in the penult (6c) attract stress just as VG rhymes (6b) do? And why does final VG attract stress to the final syllable (6f) while final GV only limits stress to the penult (6d) as does penult VG (6b)? Finally, if G is counted as a unit in stress placement, how are some words – e.g., ***lá***^{4} *w*^{3} *da*^{2} *no*^{1} "laudanum", *terapé*^{4} *w*^{3} *ti*^{2} *co*^{1} "therapeutic" – stressed on the *fourth* vocoid from the right word-edge – evidently outside the *three*-position window?[9]

In the face of (6), there is incontrovertible evidence that stress is assigned to some classes of Spanish words in a "quantity-insensitive" mode – i.e., to the heads of syllables without regard to their internal makeup. As illustrated by the verb form *so*. *li*. ***cí***.*to* in (3) and countless others like *pla*. ***tí***. *ca* "(s)he chats", *cir*. ***cú***. *lo* "I circulate", stress is assigned without exception to the penultimate syllable in polysyllabic present tense verb forms – there is no verb like **so*. ***lí***. *ci*. *to*, ****plá***. *ti*. *ca*, ****cír***. *cu*. *lo* – despite the availability of antepenultimate stress in segmentally identical *so*.***lí***.*ci*.*to* (adjective), ***plá***.*ti*.*ca* "chat", and ***cír***.*cu*.*lo* "circle" (nouns). Now, the placement of stress in numerous contrasting verb forms like those illustrated in (7a) versus (7b) confirms that it is precisely the penultimate *syllable*, not the penultimate *vocoid* or *mora* (italicized in (7)), to which stress is uniformly assigned in these cases.[10]

(7)

(a)	envídya	"(s)he envies"	acarícya	"(s)he caresses"
(b)	varía	"(s)he varies"	vacía	"(s)he empties"

In sum, we are left with an unresolved tension between quantity-sensitive (6) and quantity-insensitive (7) modes of stress assignment in Spanish.

A related tension arises in the choice of the word (the "M word", of course) versus the "stem" as the domain of stress assignment.[11] A strong argument in favor of the word as the relevant domain is that if segments outside the stem did not count, we could not give a principled explanation for the "window" facts (though, uninterestingly, we could of course stipulate them). For example, in words like [{misce**lá**ne}o] "miscellaneous" (whose final *o* is an inflectional class marker) the stem could be parsed as {mis.(**cé**.la.)ne} to yield the inadmissible word contou **X* σ (**mis*.***cé***.*la*.*ne*.*o*). On the other hand, as noted in the preceeding subsection, exclusion of this contour (in favor of correct [{mis.ce.(**lá**.ne.)}o]) can be explained by universal metrical theory without language-particular stipulation if the whole word is included in the parse.

An independent, theory-neutral argument that also shows the necessity of parsing syllables external to the stem is provided by countless examples like [{**có**.me}]/[{co.***mé***.mos] "(s)he eats/we eat". The rightward "shift" of stress in the stem {come} in the latter form is transparently due to addition of the inflectional suffix –*mos*. If the stress rules scanned only the stem, this constituent would have to be stressed identically – either {**có**me} or {co**mé**} – in all inflected forms. In short, it is obvious that stress rules scan the entire word.[12]

The stem, however, may appear to play some role in stress assignment. Recall window condition (6e): stress cannot appear on the antepenult if the final rhyme is *VC* (****CV***.*CV*.*CVC*). But it seems to be the final rhyme of the *stem* that matters, not rhymes of inflectional suffixes. For example, [{ca.**ní**.ba.1}es] (–*es* is the plural inflection), [{a.**ná**.li.s}is] (–*is* is an inflectional class marking suffix), [{so.li.ci.**tá**.}–ba.mos] (–*ba*– marks imperfective aspect, –*mos* is the first person plural verb inflection).

In short, some generalizations of stress assignment in Spanish clearly hold over the domain of the entire word while others seem to require reference to the subword stem constituent.

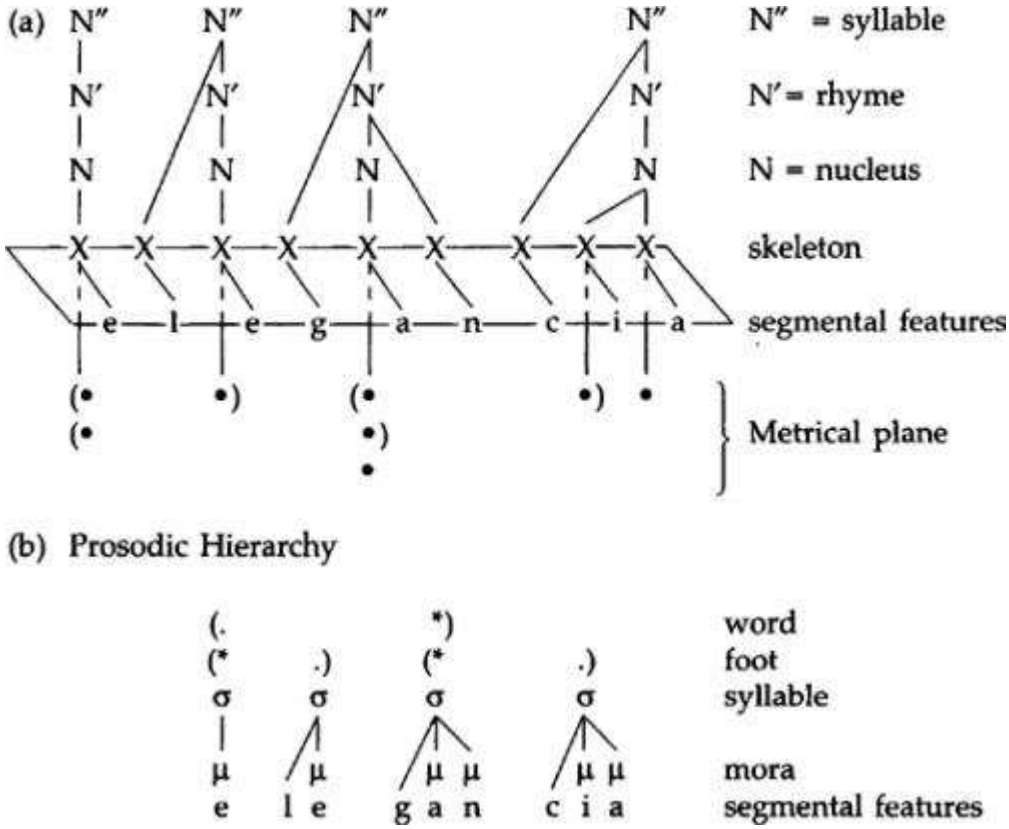
Summarizing, the present section has laid out the basic facts of Spanish word stress and introduced

certain stress-related puzlements. This brief sketch suffices to show that deceptively simple (though essentially correct) generalizations like "Spanish stress is basically penultimate" conceal hard questions involving the most fundamental issues, such as the identification of units of computation, domains of scansion, and conditions on extrametricality. Small wonder that researchers find ample fuel here for extended controversies.

2 The Theoretical Framework

Following the tradition of Halle and Vergnaud (1987) and much related work, I take the position that metrical prominence (in particular, stress) is computed and represented on a special autosegmental plane – the "metrical grid" – as illustrated in (8a) with the word *è.le.**gán**.cia* "elegance":

(8)



In the present context, the most important property of (8a) is that syllabic and metrical units are distributed on distinct, autonomous planes of representation. These two planes are autonomous in that X slots and N-bar structure are used in the expression of generalizations about segmental organization and are not elements of metrical structure, while grid marks and boundaries are used in the expression of generlizations about metrical organization and are not elements of syllable structure. For reasons that will become increasingly clear as the exposition proceeds, I explicity reject the view of metrical structure illustrated in (8b), whereby the word (Wd), foot (F), syllable (σ), and mora (μ) levels constitute a single Prosodic Hierarchy.[13] As we will see below, it is not unusual for a given segmental string with a given syllabic organization in a given phonological environment to be systematically associated with different metrical structures in different morphological contexts. There is thus no otiose duplication of representational units in (8a).

The character and construction of the metrical plane is tightly constrained.[14] The vocabulary of elements that appear in metrical grids is limited to left and right boundaries "(",")" and undifferentiated unit markers "•". Weight diacritics like H(eavy) versus L(ight), and their notational equivalents, are disallowed.[15] The projection of elements onto the grid is strictly "local": baseline

(line-0) grid marks are projected only from the X-tier of segmental/syllabic structure; elements on grid line *n+1* are projected only from line *n*. Projection of line-1 "accents" from syllable structure is disallowed.[16]

The projection of ·s onto grid line 0 is executed by a parameter of universal grammar of the form shown in (9):

(9) Project · for each X_m

where particular languages can choose from a small set of values for X_m, the metrically-relevant skeletal Xs; for example, X that is a syllable head, [-consonantal] X, all Xs dominated by N'.

Metrical boundaries may or may not be projected onto line 0 in accordance with a parameter of universal grammar of the form shown in (10):

(10) Project (or) at the corresponding edge of ∑

where ∑ stands for a small set of "closed" or "heavy" syllable types; for example, "σ[...$X_N X_{Son}$]" (an informal notation for a syllable containing a postnuclear sonorant). This parameter is inoperative in quantity-insensitive systems (where syllable-internal structure is metrically irrelevant).

After projection of · - and in some cases "(" or")" - boundaries may be inserted under the control of two universal mechanisms. One is the Edge-Marking parameter shown in (11)[17]

(11) Edge: place a{L(eft)/R(ight)} boundary to the{L/R} of the {L/R}- most·

The other boundary-inserting device is the so called Iterative Constituent Construction parameter (ICC), which particular language may or may not set, shown in (12):

(12) Iterative Constituent Construction (ICC): Insert a boundary every two ·s starting from the {L/R}

The ICC (if employed) forms binary feet iteratively from an edge or an existing boundary; it inserts left parentheses when moving from right to left, and right parentheses when moving from left to right.

Languages sometimes disallow particular metrical configurations under special conditions. For example, it is well known that in Latin, complex rhymes contribute to metrical weight but not in word-final syllables. Metrical theory must therefore provide an appropriate filtering device for such cases. In Latin a filter with the effect shown in (13a) blocks operation of parameter (10) in word-final syllables (# = end of grid line 0):[18]

(13)

(a) *(•#
(b) a.maa.bun.tur
• (• (• •

Thus, as shown in (13b), of the three segmentally complex rhymes in a Latin word like *a.maa.bun.tur* "they will be loved", the first two but not the last project as metrically heavy. The eventual result is *a.maa.**bún**.tur* rather than **a.maa.bun.**tú**r*.

The parsing of a grid line is completed by application of the Head parameter, an instance of projection:

(14)

Head: Project the {L/R}-most • of each foot on line *n* (onto line *n*+1)

3 Parameter Settings in Spanish: Core Cases

I will now present basic examples in Spanish that exemplify the descriptive apparatus just sketched and provide primary evidence regarding language-particular settings of the various parameters. Refinements and extensions to more complex cases appear in subsequent sections.

The Spanish values for the projection parameter (9) are given in (15), and the setting for the boundary parameter (10) is shown in (16):

(15) (a) Project · for each syllable head in verbs

(b) Project · for each nuclear X elsewhere

(16) project (for $_{\sigma}$[...X$_{N}$X...] in nonverbs

These two line-0 parameters together instantiate the claim that stress assignment is quantity insensitive in verbs but quantity sensitive in all other morphosyntactic categories. In verbs, syllables project exactly one · (15a) and no boundary (16), regardless of their internal structure. In nonverbs, simple and complex nuclei project · and ··, respectively (15b).[19] Furthermore, a left boundary is projected at the left edge of every syllable made heavy by a post-nuclear segment (16).

In Spanish, complex rhymes in nouns / adjectives / adverbs do not project as metrically heavy (i.e., they do not attract stress) in word-final syllables. For example, words like *Ca.**Gá**.les* "Wales", ***dé**.fi.cit*, etc., have complex word final rhymes that do not attract stress. The identical rhyme structure inexorably attracts stress to the penult; that is, it cannot be "ignored" by (10) = (16) in word-internal position: *car.**rás**.ca* "type of oak" (versus **cár*.*ras*.*ca*), *mo.**lés***to "annoyed" (versus ****mó***.*les*.*to*), etc. Evidently then, Spanish, like Latin, utilizes filter (13a).

I show in (17) the Spanish settings for parameters that complete the construction of metrical grids:

(17)

(a)	Edge: RRR	cf. (11)
(b)	ICC: R to L	cf. (12)
(c)	Head: L	cf. (14)

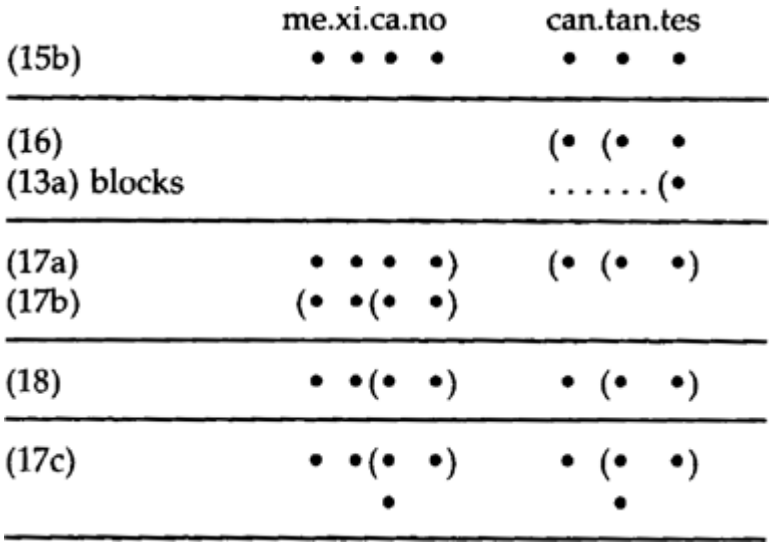
Edge parameter (17a) places a right boundary")" to the right of the rightmost · on line 0 of the grid; the ICC (17b) then parses binary feet leftward from the right edge; finally, Head parameter (17c) identifies the · on the immediate right of each "(" as the head of the foot by projecting a · onto line 1 of the grid.

The parameters discussed so far yield, for a given input, exactly one right boundary (at the right edge of line 0) but more than one left boundary in some cases, since (16b) and (17a) can both insert a "(" at more than one site. For example, every syllable but the last of *des.con.cer.**tán**.te* "disconcerting" is heavy and thus projects a "(" by (16b), and *pa.ra.le.le.**pí**. pe.do* "parallelepiped" has enough light syllables for two iterations of (17b) to the left of the syllable that bears main stress.[20] Unpaired left boundaries to the left of the rightmost foot obviously play no role in locating primary word stress; futhermore, they are irrelevant as well for the placement of secondary stress, which is assigned at the phrase level in Spanish after the operation of segmental rules at that level (Roca 1986; Harris 1991b). We can simply remove the irrelevant "(" s from the grid by the following housekeeping operation:[21]

(18) Delete unpaired (

Derivations are given in (19) that illustrate (15–18). The word *me.xi.**cá**.no* represents the huge class of words with "canonical" penult stress; this word also provides an example of an unpaired "(" inserted by (17b); *can.**tán**.tes* "singers" provides examples of internal and final syllables closed by a consonant.

(19)



Given that postvocalic glides and consonants occupy the same position in syllable rhymes (8), the operation of (16) in *can.**tán** tes* illustrates both of the window-narrowing cases (6b) *Ja.**máy**.ca* (*CV.CVG.CV) and (6c) *a. **lár**.ma* (*CV.CVC.CV). We proceed now to reconcile the apparent conflicts among descriptive generalizations sketched in section 1.

4 Elaboration

A significant metrical fault line bifurcates the vocabulary of Spanish. Verbs lie on one side; nouns, adjectives, and adverbs ("substantives") on the other. In verbs, each inflectional paradigm has a characteristic fixed stress pattern that admits no variation at all among individual lexical items. But in substantives the location of stress is subject to lexical idiosyncracy within certain limits, as illustrated in section 1. Accordingly, I discuss verbs and substantives separately.[22]

4.1 Verb Forms[23]

We focus first on the claim that stress assignment in Spanish verb forms is quantity insensitive (QI): the only projection from segmental/syllabic structure onto grid line 0 is from X positions that are syllable heads, which project one •; parameter (10) does not operate in verbs.

Unmistakable positive evidence for QI is provided by the class of verbal inflectional morphemes that trigger antepenultimate stress, illustrated in (4b). In a subset of dialects scattered over both Spain and Latin America,[24] the present subjunctive marker belongs to this class: for example, subjunctive ***cán**.t*+E.+*mos* "we sing" and ***lím**.py+E.+mos* "we clean" versus indicative *can.**t+á**mos* and *lim.**py+á**.*+*mos*.[25] Subjuctives like ***lím.py+E.+mos*** are the crucial examples since only a QI parse is possible for them:

(20)

(a) Quantity insensitive
lím.pye.mos
(• •) •
•

(b) *Quantity sensitive
*lím.pye.mos
•• (••) •
•

The conclusion that Spanish verb inflections entil QI does not rest solely on dialect-particular facts; it is supported as well by the following completely general, dialect-neutral argument. Consider the present indicative verb forms represented in (21), which are common to all dialects:

(21)

(a) "(s)he cleans"
lím.py+a
(• •)
•

(b) "we clean"
lim.**py**+**á**.+mos
• (• •)
•

(c) "(s)he applauds"
a.**pláw**.d+e
• (• •)
•

(d) "we applaud"
a.plaw.**d**+**í**.+mos
• • (• •)
•

We see that the nonhead vocoids (glides) /y w/ and the rhyme consonant /m/ have no effect on stress placement, regardless of their position in the segmental string or the position on the grid they would occupy if projected. Now compare the representations in (22):

(22)

(a) "(s)he continues"
con.ti.**nú**.+a
• • (• •)
•

(b) "we continue"
con.ti.nu.+**á**.+mos
• • • (• •)
•

(c) "(s)he annoys"
a.mo.**í**.n+a
• •(• •)
•

(d) "we annoy"
a.mo.i.**n**+**á**.+mos
• •• (• •)
•

The morphological structures in (21) and (22) are parallel, and the grids are equivalent in that they all have a rightmost binary QI foot, as expected. The segmental representations, on the other hand, differ in that (22) has a nuclear vowel in very position where (21) has a glide. We thus learn from the comparison not only that glides and high vowels are lexically distinct (which we knew indenpendently) [26] but also that the accentual contrasts *conti**núa*** versus ***lím**pia* and *amoína* versus *a**pláu**de* would be impossible to express in a quantity-sensitive system: if the penultimate *mora* (rhyme segment) rather than the penultimate *syllable* were stressed in every case, then **lim**píde***, etc, would be inevitable. The QI character of Spanish verb paradigms is thus securely established for all dialects.

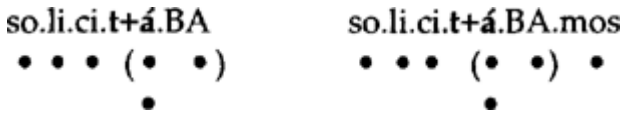
Let us now look more closely at how antepenultimate stress is assigned in verbs. The special subset of triggering mood/ aspect inflections contains those illustrated in (23), and a few others:

(23)

(a)	Nonfinal syllable		
	so.li.ci.t+á.+BA.+mos	"we solicited"	(imperfective)
	so.li.cí.t+E.+mos	"we solicit"	(subjunctive)
(b)	Final syllable		
	so.li.ci.t+á.+BA+s	"you solicited"	(imperfective)
	so.li.cí.t+E+s	"you solicit"	(subjunctive)

As shown, these morphemes trigger antepenultimate stress when they are followed by another syllable but not when they are word final. Thus the inflectional morpheme itself does not exhibit the familiar syndrome of extrametricality. Rather, the trigger morpheme excludes from the line 0 parse the syllable to its right, if there is one, while allowing itself to be included in the parse. For example:

(24)

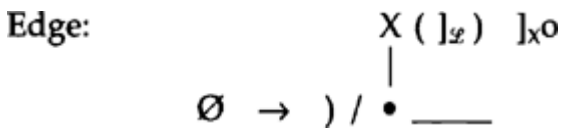


This pattern requires a very awkward formal statement in most accentual frameworks (cf. Den Os and Kager 1986, pp. 37–40; Harris 1987, p. 74), but finds a straightforward formalization in the theory sketched above:

(25) Edge: RRR for specially marked morphemes

Edge Rule (25), followed by the ICC (17b), has exactly the effect shown in (24). Rule (25) stands in a disjunctive relationship with the general Edge Rule (17a), whose effect is illustrated in (19). In other words, (25) places a ")" at the right edge of an idiosyncratic triggering morpheme like imperfective *ba* and present subjunctive *e* (in some dialects) if such a morpheme is present; otherwise, the general rule (17a) places a ")" at the right edge of the word. The formal basis for the disjunctivity of these two rules can be brought out clearly in the restatement shown in (26):

(26)



Let / (mnemonic for "leftward displacement" of accent) mark the morphological bracket at the right edge of the items that trigger insertion of a special right metrical foot boundary; $]_x$o is the word edge. It is easy to see then that the observed disjunctivity follows in the normal way from proper inclusion of (17a) in (25).

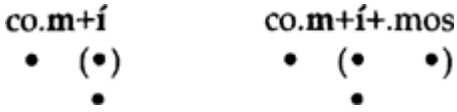
Spanish verb inflection also contains a subset of morphemes that trigger the metrical pattern illustrated in (27):

(27)

(a)	Final syllable		
	com+e+**ré**	"I will eat"	(future)
	com+**í**	"I ate"	(preterit = past perfective)
(b)	Nonfinal syllable		
	com+e+**ré**+mos	"we will eat"	(future)
	com+**í**+mos	"we ate"	(preterit)

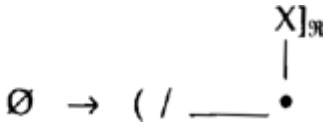
In a sense, these morphemes are the metrical converse of those illustrated in (23): the future and preterit morphemes trigger word-final stress when they themselves are in final position, but they allow canonical penultimate stress when they are followed by another syllable in the word. In other words, the peculiarity of the future and preterit morphemes is that they head a foot regardless of their position in the word. This is illustrated in (28):

(28)



The formal account of the future and preterit inflections is parallel to that of the set illustrated in (24): I propose that the final-stressing inflections are subject to the special rule (29):

(29)



Edge Rule (29) places "(" to the left of the rightmost • in morphemes whose right bracket is identified with the diacritic ℜ (mnemonic for "rightward displacement"). This rule and the general Edge Rule (17a) lead to the grids shown in (28). These two rules do not form a disjunctive pair, as do (25)/(17a). This is exactly the familiar disjunctivity syndrome: (25)/(17a) are incompatible in that they compete to place the rightmost ")" in the word (and are thus related by proper inclusion), while (29)/(17a) are compatible in that they insert different boundaries in different locations (thus neither is properly included in the other).

In short, a certain subset of verb inflections triggers rule (29), another subset triggers rule (25); otherwise, the general rules set out in section 3 apply. The characteristic fixed metrical patterns of verb paradigms follow from three independently determinable facts: (a) quantity insensitivity, (b) the location of inflectional morphemes in the outermost layer of suffixation in verb forms, and (c) the right word-edge orientation of the general metrification rules of Spanish.

To close this section, I observe that there seems to be no persuasive argument that stress assignment in verbs in Spanish is cyclic; more specifically, that a metrical grid is constructed and parsed in the domain of the verb stem alone prior to application of parsing rules to the entire word. I assume that noncyclic construction of the metrical palne is universally the default case: some positive evidence must be offered to support the claim that parsing operates cyclically. I therefore conclude that the metrical plane of Spanish verbs is parsed in a single pass, at the level of the word.

4.2 Substantives

4.2.1 Antepenult Stress

The set of special morphemes that trigger antepenult stress in Spanish nouns, adjectives, and adverbs ("substantives") constitutes only about 10 percent of the vocabulary but is composed of a variety of stems and derivational suffixes. For example:

(30)

Stems		Suffixes	
MISCELÁNE+o	"miscellaneous"	demó+CRAT+a	"democrat"
LIBÉLUL+a	"dragonfly"	kiló+METR+o	"kilometer"
CÉLEBR+e	"famous"	fonó+LOG+o	"phonologist"
SÁBAN+a	"sheet"	bené+FIC+o	"beneficial"
ÍDOL+o	"idol"	áwr+E+o	"golden"

I propose that rule (25) – collapsed with (17a) as (26) – is responsible for antepenult stress in substantives as well as in verb forms. Illustrative derivations are given in (31), where "canonical" *pe.rí.t+o* "expert" is shown together with special *MÉRIT+o* for contrast:

(31)

	[[pe.rí.t] o]	[[mérit]$_{\mathcal{L}}$ o]
(15b)	• • •	• • •
(26)	• • •)	• •) •
(17b)	•(• •)	(• •) •
(17c)	•(• •)	(• •) •
	•	•

Words like */DÓL+ATR+a* "idolater", *demo+CRÁT+IC+o* "democratic", and many others, show that antepenult stress–triggering suffixes can attach both to triggering stems and to other triggering suffixes (as well as to ordinary nontriggering stems and affixes). Rule (25), as embodied in (26), handles such cases correctly: a ")" is projected for the *rightmost* trigger only, not for *every* trigger in the word. Therefore, no additional mechanism is needed to rectify derivational false starts of the sort shown in (32), which do not arise on our current analysis:[27]

(32)

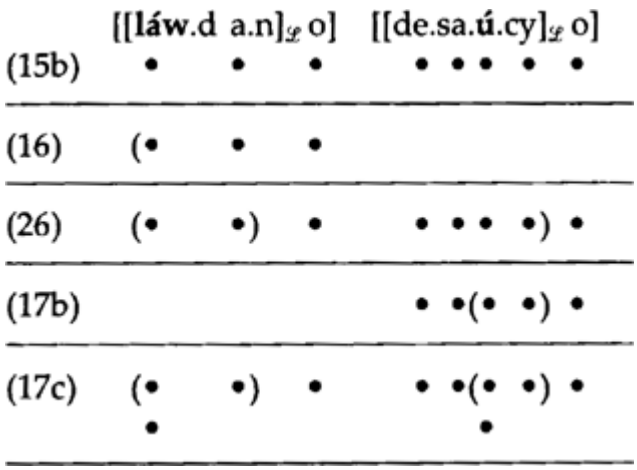
	[[[idol]$_{\mathcal{L}}$ atr]$_{\mathcal{L}}$ a]
(15b)	• • • •
*(26)	• •) •) •

4.2.2 Quantity Sensitivity

A preliminary argument for quantity sensitivity (QS) in Spanish substantives is presented in sections 1 and 3, with illustrations in (6) and (19). To continue, unequivocal evidence for QS in Spanish substantives comes from the fact that strings of the form *X.CV.C(C)V* – that is, words with a single rhyme segment in the penult (followed by a complex onset or not) – permit stress on either the penult or the antepenult (***múl****.ti.ple* "multiple" or *ma.**nó**.pla* "brass knuckles") while strings of the form *X.CVC.CV* and *X.CVG.CV* – that is, words with complex rhymes in the penult – allow only penultimate stress (*e.**clíp**.se* "eclipse" and *a.**céy**.te* "oil" versus ****CV***.*XVG.CV* and ****CV***.*XVG.CV*). These data are accounted for with the help of projection rule (16), as illustrated in (19) above.

As further illustration of (16), we may note that the current analysis solves the puzzle presented by words like ***láw****dano* and *tera**péw**tico* (cf. first long paragraph between (6) and (7)) without new mechanisms. This is shown in (33), where I include a derivation of *de.sa.**ú**.cyo* to illustrate the underlying contrast between /aw/ and /au/:[28]

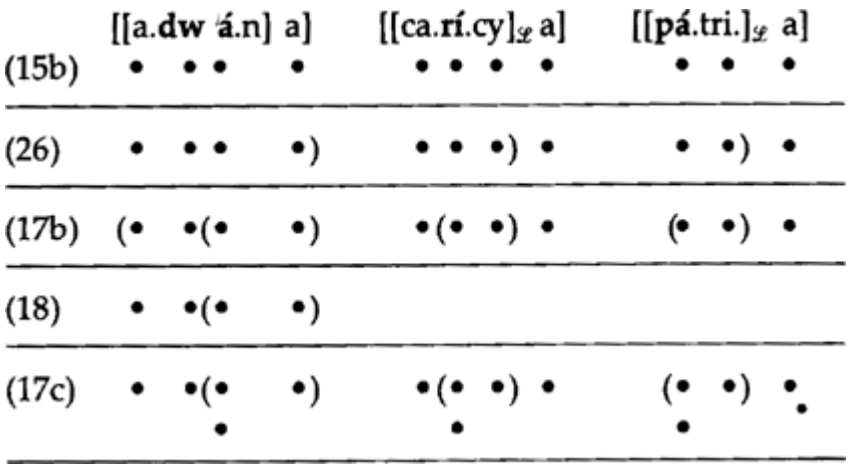
(33)



In words like ***láw****.da.no*, rules (16) and (25/26) insert the left and right boundaries, respectively, of the stressed foot, which therefore contains the fourth as well as the third vocoid from the right edge. Words like *de.sa.**ú**.cyo*, on the other hand, have no syllable with a postnuclear rhyme segment; thus (16) is inoperative and every vocoid projects •, with the result that the stressed foot contains the second and third vocoids from the end.

Spanish syllables may have complex nuclei as well as complex rhymes, as we have seen (note 19, (21), etc.). Complex nuclei also make heavy syllables. This fact is responsible for window-narrowing cases (6a) and (6d). Examples of (6a) are *a.**dwá**.na* "customs" and *an.**cyá**.no* "aged" versus ****CV***.*CGV.CV*; examples of (6d) are *ca.**rí**.cya* "caress" and *per.**pé**.two* "perpetual" versus ****CV***.*CV.CGV*. These data are accounted for with the help of projection rule (15b), as illustrated in the following derivations (ignore ***pá****tria* "homeland" for a second):

(34)



Given that (15b) projects a • for each nuclear vocoid, including those of complex nuclei as in *dwa* and *cya*, there is no way that stress can be assigned leftward of the penultimate syllable in words like *a.**dwá**.na*, *ca.**rí**.cya*, etc.

An additional (desirable) consequence of this property of (15b) is that an underlying distinction can be maintained between the stem-final glide /y/ of substantives like *ca.**rí**.cya* versus the stem-final vowel /i/ of substantives like ***pá**tr/i/a* – despite the fact that the latter, too, surfaces with a glide: ***pá**.trya*. As we saw in (21) and (22), underlying vowel versus glide contrasts play a crucial role in the QI stress placement in verb forms. And indeed present-tense verb forms with the same roots as *ca.**rí**.cya* and ***pá**.trya* reveal the contrast which remains covert in the substantives: *a.ca.**rí**.cya* "carresses" versus *re.pa.**trí**.a* "repatriates". In short, though QI (15a) projects only one • per syllable, (15b) reflects the makeup of complex nuclei, as we expect in a QS subsystem.[29]

We have now covered all of the puzzlements in section 1 except for those involving certain substantives that do not end in a vowel. We turn to these next.

4.2.3 Substantives with No Class Marker

I have given no explicit account yet of the accentual contrast between the very large "canonical" class of consonant-final words with final stress like *fis.**tól*** "tie pin", *ha.**rén*** "harem", *us.**téd*** "you", etc., versus the minority class of consonant-final words with penult stress like *a.**pós**.tol* "apostol", ***Cár**.men*, ***wés**.ped*, "guest", etc. All of these form a morphological natural class, as illustrated in (35):

(35)

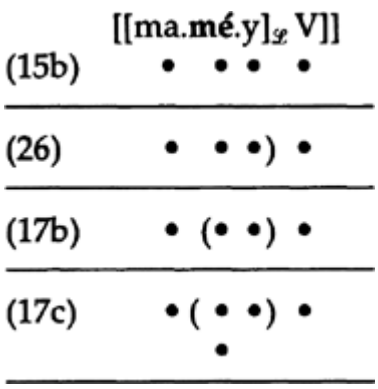
Class A:		**a**v**á**ro	p**á**jaro	"stingy"	"bird"
Class B:		sab**á**na	s**á**bana	"savanna"	"sheet"
Class C:	(i)	jar**á**bV	**á**rabV	"syrup"	"Arab"
		empátV	trámitV	"tie"	"transaction"
	(ii)	anim**á**lV	can**í**balV	"animal"	"canibal"

The stems of all native Spanish substantives belong to one of three declension classes, which we can label A, B, and C. These are identified by the class-marking vowels ***o, a,*** and **V**, respectively.[30] **V** is realized phonetically as [e] (the maximally underspecified, epenthetic vowel of Spanish) in all but one special context. The examples marked C(i) represent the general case; they are phonetically *ja**á**b*[e], ***á**rab*[e], *emp**á**t*[e], ***trá**mit*[e]. The examples marked C(ii), like those in the previous paragraph, illustrate the special context in which the class marker **V** has no phonetic realization: word-finally (i.e., in singulars) after unclustered voiced or continuant coronals – the only word-final codas allowed in Spanish. Thus phonetic *ani**mál***, *can**í**bal*, *us**téd***, ***wés**ped*, etc.

All morphological class marker vowels play the same role in stress assignment. This follows from the strict "locality" of projection, which can access only syllabified X positions and thus cannot in principle "know" or "care" about feature distinctions among nuclear vocoids. In particular, the grids for canonical *a.ni.**má**.lV*, *us.**té**.dV*, etc., and special *ca.**ní**.ba.lV*, ***wés**.pe.dV*, etc., are constructed exactly as illustrated for canonical *pe.**rí**.to* and special ***mé**.ri.to* in (31). The essential difference is that the class marker *-o* of *pe.**rí**.to* and ***mé**.ri.to* is realized phonetically while the -V of class C(ii) substantives is not, plus the fact that the segment preceding -V is incorporated into the rhyme on its left in phonetic representations. In short, the reason that the word-final consonants in class C(ii) substantives do not have the metrical properties of syllable codas is simply that they are onsets rather than codas in the phonological representations relevant to the construction of the metrical grid.

Words like *Pa.ra.**gwáy***, *com.**vóy***, *ma.**méy***, etc., that illustrate the extreme window-narrowing case (6f) are also class C(ii) substantives (cf. plural *ma.**mé**.y*[e]+s, etc.) The metrically relevant phonological representations are thus essentially as in (35), that is, *ma.**mé**.yV*, etc., where *yV*, as always, is a complex nucleus. These words are thus the class C counterparts to class A words like *en.**sá**.yo* "essay" and class B words like *e.po.**pé**.ya* "epic poem", which systematically reject antepenult stress - there are no words like **én**.sa.yo*, **e.**pó**.pe.ya*. Metrical grids for the words in question are identical in all relevant respects to those of *ca.**rí**.cya* and ***pá**.tri.a* in (34), as is shown in (36):

(36)



All substantives with stress on the penultimate vocoid in the stem belong to the special */* class; *Pa.ra.**gwáy***, *con.**vóy***, *ma.**méy***, etc., are no different. The unpredictable morphological property of such words is that they belong to class C, and their one relevant phonological peculiarity is that their stems end in the sequence *VG*. Given these properties, their stress contour could not be other than what it is, on our account. In other words, the seemingly odd window property (6a) requires no ad hoc addition to our proposals; it is a direct consequence of them.

We have now covered every detail of section 1 except for the marginal words like *me.**nú*** (5b). These are "marginal" in that they are few in number and not solidly integrated into native patterns. By this I mean that in addition to their unexpected final stress, their plurals show great intra- and inter-dialectal variation; for example, *me.**nú**.e+s* in competition with *me.**nú**+s*. Variants like *me.**nú**.* (*e+s*) can be analyzed as ordinary class C substantives, with the same metrical structure as, say, (class B) *ca.**nó**.a*(+*s*) "canoe(s)". But both these and the *me.**nú***(+*s*)-type variants can also be handled as substantive stems with the same metrical properties as the future and preterit verb inflectional morphemes illustrated in (27) and (28), which trigger the special Edge Rule (29). I cannot devote more space to these forms.

5 Summary

For easy reference I place together in (37) the rules/parameters that determine the metrical grids that support the phonetic realization of primary word stress in Spanish:

(37)

	Substantives		Verbs
Projection:	• for nuclear Xs	• for syllable heads	(15)
	(for $_{\sigma}[\ldots X_N X \ldots]$		(16)
	General		
Edge:	LLL for $\mathfrak{R}$ class morphemes		(29)
	RRR for $\mathfrak{L}$ class morphemes		(25)
	RRR		(17a)
Parsing:	ICC R to L		(17b)
	Delete unpaired (		(18)
	Head L		(17c)

Display (37) summarizes this study's endeavor to give an explanatory account of the metrical properties of Spanish words. The analysis entails recognition of interactive modules of lexical properties, syllabification, projection of baseline marks onto the metrical plane, and imposition of foot structure on this plane. Each of these modules is governed by autonomous and highly restrictive principles. In this framework, every Spanish word is associated with a metrical plane on which prominence is assigned to a single left-dominant foot formed by right-to-left scansion of undifferentiated baseline marks plus the boundaries supplied by (i) a general projection rule and (ii) one general and two lexically triggered Edge rules. No other information is necessary or allowed.

The one notable characteristic of (37) is that Spanish has separate projection subsystems for substantives (quantity sensitive) and verbs (quantity insensitive). Otherwise, (37) is quite unremarkable; all of its other properties are shared by numerous languages of the world. The apparent conundrums and complexities described in section 1, which have puzzled generations of scholars, arise out of the interactions among the component modules, each of which, like the metrical module, is basically unremarkable but has a particular quirk. For example, the morphological module houses several declension classes (an unremarkable fact), one of which, class C, provides a suffixal vowel with particular properties related to the fact that it is the default vocoid of Spanish; and the syllabification module offers the independently verifiable twist of complex nuclei with syllable-internal hierarchical structure distinct from that of complex rhymes. In many languages all vocoids project a • onto the grid, and in many languages complex rhymes project a boundary; Spanish happens to do both. In short, once these mild quirks are spotted and their interactions recognized, the apparent conundrums and complexities are unmasked as parts of a relatively simple and very orderly whole.

1 This literature is “theoretically committed” in the sense that it has made direct and explicit ties with virtually every one of the general theoretical topics surveyed in this *Handbook* (the obvious exceptions being tone and manual signing) I hereby express deep gratitude for the generous advice and bibliographical help received from 31 knowledgeable participants in the field of Spanish phonology. Special thanks go to those who presciently warned me to narrow the focus radically, and to Tom Green, Morris Halle, José Ignacio Hualde, and Bill Idsardi for discussion of particular issues. I presented a version of some of this material at the 1992 Summer School in Linguistics, Universitat de Girona (Spain), and am indebted to the participants for numerous insights.

2 Substantial works published (or quasi-published by the Indiana University Linguistics Club) in the last decade of which I am aware are, in chronological order: Solan 1981 (A metrical analysis of Spanish stress); Harris 1983 (*Syllable Structure and Stress in Spanish*); Núñez Cedeño 1985 (Stress assignment in Spanish verb forms); Den Os and Kager 1986 (Extrametricality and stress in Spanish and Italian); Otero 1986 (A unified metrical account of Spanish stress); Roca 1986 (Secondary stress and metrical rhythm); Harris 1987 (The accentual patterns of verb paradigms in Spanish); Harris 1988/1992 (Spanish stress: The extrametricality issue); Roca 1988 (Theoretical implications of Spanish word stress); Harris 1989a (How different is verb stress in Spanish?); Harris 1989b (The Stress Erasure Convention and cliticization in Spanish); Farrell 1990 (Spanish stress: A cognitive analysis); Roca 1990a (Diachrony and synchrony in

Spanish stress); Roca 1990b (Morphology and verbal stress in Spanish); Halle, Harris and Vergnaud 1991 (A reexamination of the Stress Erasure Convention and Spanish stress); Harris 1991b (With respect to accentual constituents in Spanish); Roca 1991 (Stress and syllables in Spanish); Roca 1992 (On the sources of word prosody).

3 As usual, I will draw on the variety of Spanish that I know best, educated central Mexican. Dialect variation will be pointed out where relevant.

4 For more detailed exposition of data, see the works listed in note 2, especially Harris (1988/1992).

5 Exact numbers depend on dialect and other factors.

6 I write these special morphemes in uppercase in (4) and subsequently where it will contribute to clarity.

7 An unexpected set of wellformed words of the form CVA.CGV.CVC in certain dialects is discussed in section 4.1.

8 For clarity I depart from standard orthography by using periods to indicate syllable breaks, by marking all primary stresses with an acute accent, by writing all glides (nonpeak high vocoids) as *y* and *w*, and by omiting "silent" (purely orthographic) *h* when it might be taken for a phonological segment.

9 It is not possible to make an end run around a potential window violation in words like ***l[áw.]da.no*** by deriving them from e.g., *l*[a.**ú**.]*da.no* by automatic contraction of *a.ú*. The reason is that there is a basic phonological contrast between *VH* (H a high vocoid) and *VAG*, even when these are the third and fourth vocoids from the end of the word (e.g., *v*[e.**í**]*culo* "vehicle, *des*[a.**ú**]*cyo* "dispossession, loss of hope", etc.).

10 These examples – like the preceeding note and much other evidence – also make it clear that the syllabicity of high vocoids is lexically contrastive in Spanish.

11 I henceforth enclose stems in {} and words in [] where this will contribute to clarity. The stem – or "derivational stem" as it is often called in the literature – is a familiar and indispensible unit in Spanish morphonology and phonology. Briefly, the stem consists of the root plus derivational affixes (if any are present) but not inflectional affixes. In the noun [{am+or}es] "loves", for example, *am* is the root and *am+or* is the stem (*es* is the inflection for plural nouns whose stem ends in a C); in the verb [{am+a}mos] "we love", *am* is the root and *am+a* is the stem (*mos* is the inflection for first person plural verbs). Both {amor} and {ama} – but not [amores] or [amamos] – can serve as input for further derivational affixation. Harris 1988/1992, section 2.4.1, and Harris 1991a provide detailed discussion.

12 Harris, 1988/1992, section 2.4.2, gives additional arguments that converge on the same conclusion.

13 Cf. McCarthy and Prince (1986, 1990) and much other current work, as well as Chapters 9 and 15, this volume.

14 The remainder of this subsection owes much to Idsardi (1992); see also chapter 11 of this volume.

15 Critical discussion can be found in Green (1991).

16 This device is utilized extensively in Halle and Vergnaud (1987), Halle, Harris, and Vergnaud (1991), and much other recent work, which must now be reexamined.

17 This parameter, which (among other things) can isolate a single peripheral grid element from inclusion in a metrical constituent, is the only implementation of extrametricality in the theory of Idsardi (1992).

18 The Latin setting of (10) is equivalent to "project (for $_{N'}$[…XX…]" (= any complex rhyme). Idsardi (1992) provides extensive motivation and exemplification for filters of the sort illustrated in (13a).

19 Prevocalic glides in Spanish are elements of complex nuclei while postvocalic glides occupy the same rhyme position, outside the nucleus, as coda consonants. For example, in words like *bwéy* and *cyén*, the nuclei are *wé* and *yé*, and the rhymes are *wéy* and *yén*. Detailed arguments can be found in Harris (1989c) and Hualde (1991).

20 I assume that a general condition on wellformedness of grid representations prevents (16b) and (17b) from both inserting "(" s at the same site.

21 This is the functional equivalent of the conflation operation of Halle and Vergnaud (1987); Halle, Harris,

and Vergnaud (1991); and much other work.

22 Not accidentally, a morphological bifurcation parallels the metrical one: On one side, verbs are highly inflected, with affixation that manifests tense, mood, aspect, person, and number in finite forms. On the other side, substantives bear at most one specific inflectional affix (for number), but are distributed over several form classes similar to (and largely inherited from) the Latin declensional classes.

23 "Verb" and "verb form" are to be understood henceforth as "inflected verb form"; that is, as excluding infinitive, participle, and gerund, which lack inflections for tense/ mood/aspect and person/number.

24 Cf. Harris (1987) and references therein for a review of the dialect situation.

25 Normative dialects have penultimate stress in subjunctives (*can**té**mos, limp**ié**mos*) as in indicatives (*can**tá**mos, limp**iá**mos*). These dialects are thus irrelevant to the issue at hand.

26 Any attempt to avoid this conclusion by deriving glides from high vowels via a syllable coalescence or mora deletion rule runs into an impasse: a lexically arbitrary set of exceptions to such rules would have to be marked. The attempt is thus empirically indistinguishable from an overt lexical glide/vowel distinction in any event.

27 The target of the comment is the Stress Erasure Convention (SEC) of Halle and Vergnaud (1987) and Halle, Harris, and Vergnaud (1991). The SEC can be dispensed with on the present proposals, which (unlike the SEC) explain the fact that the "erased" stresses have no known empirical consequences.

28 See notes 9 and 10.

29 "Canonical" substantives whose stems end in a high vowel are of course stressed on the penult as expected, like the corresponding verb forms with the same root; for example, *va.**cí**.o* "empty" (adjective), *va.**cí**.o* "I empty" (verb).

30 Cf. note 11 and for fully detailed discussion, Harris (1991a). Many readers will recognize in (35) the "epenthesis versus apocope" controversy of the late 60s and 70s, which is reviewed in Harris (1991a) in the light of current theories of morphology and syllabification.

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