

Syllable-Based Phonology of Ibero-Romance Languages

J. C. Williams

2107 Ellington Road, Upper Arlington OH 43221-4156 USA

catita@columbus.rr.com

ABSTRACT

As an Ibero-Romance exemplar, this syllable-based synchronic Spanish phonology specifies five vocalic nuclei /a, e, o, i, u/, respectively, by {low}, {front}, {back}, {high, front}, {high, back}. Coda features are tense, lax, nasal, lateral, rhotic, palatalized, and labialized, without place specification, usually limited to a single manner feature. Onset manner features include complex (spirantized), interrupted, continuant, lax, nasal, lateral, rhotic, palatalized, and labialized. The first five (obstruent) manner features require concomitant place specification (labial, apical, dorsal). The last four are approximant. Up to three manner features may co-occur in onset (obstruent, liquid, glide). In Ibero-Romance languages, complex features occur only morpheme-initially. Word-initially, phonetic implementation of a complex feature creates a preceding epenthetic syllable with the default (front) vowel as nucleus and the friction event of the complex feature as coda. Syllable-based analysis provides robust representation of underlying phonological forms for effectively describing dialectal, idiolectal, and cross-language variation, and prosodic variability.

1. SYLLABLE-BASED REPRESENTATION

A syllable-based phonological description of a language should represent all the meaningful oppositional patterns, with minimal redundancy, within the domain of each syllable. This approach requires a more powerful system of phonetic implementation than traditional phoneme-based concatenation and coarticulation. The C/D model [1, 2] may satisfy this requirement. For an effective phonology/phonetics interface, phonetics must be, in part, abstract and must be language specific. Boundary information, such as morpheme, word, and phrase boundaries, must be available in phonetic description [3]. Both intra- and inter-syllabic organization may undergo changes in the process of phonetic implementation, including resyllabification, weakening of gestures, neutralization of phonological contrasts, and creation of epenthetic syllables. The phonological representation must be parsimonious enough to encompass phonetic variation found in normal discourse for a given language, including dialect and register, simply by adjusting phonetic implementation system parameters. These include abstract symbolic variables, such as features and boundary

categories, integrated with continuous numeric variables, such as syllable and boundary magnitudes.

Syllable features, which phonologically specify individual syllables, phonetically evoke (1) onset consonantal gestures, (2) coda consonantal gestures, (3) vocalic gestures (phonetic status contour) of the syllable, and (4) consonantal gestures for syllable affixes, *i.e.*, p-fixes and s-fixes, if any in the language. In the case of Spanish, consonantal features can be categorized into three general classes: (1) obstruents (place-specified in onset), (2) liquids, and (3) glides (see Section 3). Spanish and other Ibero-Romance languages have no syllable affixes (p-fix or s-fix). This brief report limits its synchronic phonological analysis to the intrasyllabic domain.

2. ONSETS VERSUS CODAS

The C/D model defines onset gestures and coda gestures independently by different impulse response functions corresponding to the same feature. We use different phonemoidal symbols, often lower case, such as //m, n//, for onset, and upper case, such as //N//, for coda, in order to suggest that the phonological paradigms, and therefore feature specifications, for onset and coda are different. By considering the particular intrasyllabic context, such as syllable component distinction and concomitant feature specifications in the same component, we can reduce redundancy, representing phonological information more succinctly.

Syllable-based phonological analysis of Spanish highlights the striking differences between onsets and codas. For example, the word 'sastre' (tailor) //saS-tre//, is represented by an unordered set of feature specifications: {continuant^o, apical^o, tense^c, low} {interrupted^o, apical^o, rhotic^o, frontⁱ}. The feature {continuant} is a manner feature in the obstruent class (see Fig. 1), which requires a concomitant place feature specification (see Table 1). In syllable onset, {continuant^o, apical^o} is phonetically manifested as a robust fricative consonantal gesture [s], whereas in coda, {tense^c} may be realized as a weak [s] or [h] or may have no apparent manifestation as a phonetic gesture, depending on the discourse situation (dialect, speaker, speaking style, etc.). In Spanish syllable onset, place-specified obstruent features are simplex or complex (tense, lax, or nasal). Tense onset features include {interrupted}, implemented with an oral closure, or {continuant}, without closure. If the

obstruent is not tense, then it is either {lax} or {nasal}, and in either case in Spanish, there is no opposition between {interrupted} and {continuant}. However in coda, the feature {tense}, {lax}, or {nasal} can completely specify coda without any other feature or any place specification. The feature names used for specifying a syllable onset or coda in this paper are shown in bold face or italic, respectively, in Fig. 1. The complex features {interrupted}, {continuant}, {lax}, and {nasal} can be specified only for onset in Spanish.

Allowable dialectal phonetic variation in Spanish is much larger in syllable codas than in onsets. For example, liquid coda features, {lateral} and {rhotic}, appear to be substituted for each other in some dialects, e.g., ‘puerta’ (door) may be realized phonetically as [pwel ta] when the underlying phonological representation is //pweR-ta//, or ‘bolsa’ (purse) may be realized as [βor sa] for //BoL-sa//. Such substitution does not occur in normal speech production in syllable onsets, e.g., [rej] for ‘ley’ (law) //leJ// or [pa la] for ‘para’ (for) //pa-ra// are not observed.

2.1. ONSET CONSTRAINTS

For Spanish and Ibero-Romance languages generally (among many others), syllable onset features are limited to no more than one representative from each of the three classes, obstruent, liquid, and glide. Therefore, the maximum number of manner features in onset is three, when redundant features are suppressed (see Fig. 1). The simplex feature {continuant} is an obstruent feature that opposes {interrupted} in onset. This phonological opposition occurs in Spanish only when the onset is implicitly {tense}, e.g., ‘paca’ (bale of goods) //pa-ka// vs. ‘faja’ (band/sash) //fa-ha//. If the onset is specified for {lax}, opposing {tense} as an oral obstruent, there is no distinction between {interrupted} and {continuant}, and the feature specification is just {lax}, ‘vaga’ (roaming) //Ba-Ga//. The phonetic implementation is bilabial or labiodental, dental or interdental, and dorsal, velar, or glottal, according to the place specification {labial}, {apical}, and {dorsal}, respectively, and the concomitant manner feature specification determines the phonetic detail by the selection of the elemental gesture (see [2]). Onset {nasal⁰} features may not co-occur with {liquid⁰} ({lateral⁰} or {rhotic⁰}) */ml, nl, mr, nr//. Onset oral {obstruent⁰, apical⁰} may not co-occur with {lateral⁰} */Stl, SDl, tl, sl, Dl//. Onset {continuent⁰, apical⁰} and {continuent⁰, dorsal⁰} may not co-occur with {liquid⁰} ({lateral⁰} or {rhotic⁰}) */sl, sr, hl, hr//.

Obstruent complex features occur in Spanish only morpheme-initially, in syllable onset, described by the manner features {complex-interrupted} and {complex-continuant} and more rarely {complex-lax} and {complex-nasal}. Each complex feature evokes two obstruent events: (1) frication produced by the tongue tip/blade and (2) (according to the concomitant place feature) an articulator-specified obstruction in the vocal tract [4]. If a complex feature occurs word-initially in Spanish and other Ibero-Romance languages, there is a very strong constraint against the phonetic implementation

of this feature as an ordinary syllable onset. Thus, phonetic implementation creates a preceding epenthetic syllable with the default (front) vowel as nucleus and the frication event of the complex feature as coda (realized as [s], [h], or apparent deletion, i.e., //S//). This conforms to the general phonetic constraint of Spanish that two obstruent events cannot co-occur in word-initial position. This coda manifestation of a weak and variable frication gesture is consistent with the normal coda fricative in Spanish, as in ‘mas’ (more) //maS//, specified simply as {tense^C} with no place specification. Examples of complex onsets are: ‘espina’ (spine) {complex-interrupted⁰, labial⁰, high, front} {nasal⁰, apical⁰, low}, ///Spi-na###, [es pi na]; ‘estado’ (state) {complex-interrupted⁰, apical⁰, low} {lax⁰, apical⁰, back}, ///Sta-Do###, [es ta do]; ‘escala’ (scale) {complex-interrupted⁰, dorsal⁰, low} {lateral⁰, low}, ///Ska-la###, [es ka la]; and ‘esfera’ (sphere) {complex-continuant⁰, front} {rhotic⁰, low}, ///Sfe-ra###, [es fe ra]. Complex features are similar in Catalan, ‘es-pi-na’; Portuguese ‘es-pi-nha’; French ‘é-pine’, etc. However, Italian and Latin *do* permit direct phonetic implementation of word onset complex features, manifesting the frication+stop sequence of elemental gestures, e.g., ‘spi-na’ (and Romanian ‘spin’), producing disyllabic words. When a complex feature occurs word medially (in morpheme-initial position), its phonetic implementation depends on the preceding syllable structure. If the preceding syllable has no coda (an open syllable), the frication event is phonetically implemented in the coda position as in ‘aspirar’ (aspire) {low} {complex-interrupted⁰, labial⁰, high, front} {rhotic⁰, rhotic^C, low}, ///a#Spi-raR###, typically pronounced as [as pi rar] or [ah pi rar]. In the second syllable of ‘inspirar’ (inspire) {nasal^C, high, front} {complex-interrupted⁰, labial⁰, high, front} {rhotic⁰, rhotic^C, low} ///iN#Spi-raR###, where the preceding syllable has a coda specification {nasal^C}, the phonetic manifestation of this feature is tautosyllabic apical frication and a bilabial stop, [in spi rar], just like English {spirantized⁰}. In our analysis, these forms are phonologically specified by the complex manner feature (without specifying the epenthetic vowel /e/ in the lexicon in the word initial case). Not all Spanish words beginning with ‘es-’ +{obstruent} have complex onsets, but we cannot address these marginal cases here.

2.2. CODA CONSTRAINTS

Spanish codas in our analysis are generally specified completely by only one (privative) manner feature: {tenseⁱⁱ}, {lax}, {nasal}, {lateral}, {rhotic}, {palatalized}, or {labializedⁱⁱⁱ}.

3. SYLLABLE INVENTORY OF SPANISH

3.1 NUCLEI

Spanish has a 5-vowel system: //i// {high, front}; //e// {front}; //a// {low}; //o// {back}; and //u// {high, back}. There can be a phonetic distinction of vowel quality in open versus closed syllables. If the syllable has a coda, as in ‘sed’ (thirst), the vowel is lower than in ‘se’ (itself). Diphthongs are treated as nucleus+coda or onset+nucleus. The word ‘buey’ (bullock), considered phonemically as a

triphthong, is analyzed as {lax⁰, labialized⁰, labial⁰, palatalized^C, front} //BweJ//, usually realized as [bwe]. Phonetic details are handled properly within phonetic implementation of the syllable.

				Onset			Coda	
		manner	place			manner		
			lab	ap	dor			
obstruent	complex	interr	Sp	St	Sk			
		cont	Sf					
		lax	SB	SD	SG			
		nasal	Sm	Sn				
obstruent	simplex	interr	p	t	k	S	tens	
		cont	f	s	h	D	lax	
		lax	B	D	G	N	nas	
		nas	m	n				
approximant	simplex	lat		l		L	lat	
		rhot		r		R	rhot	
		pal		j		J	pal	
		lab		w		W	lab	

Table 1: Spanish consonantal syllable features with phonemoidal symbolic approximations

3.2. ONSETS

Manner features are {complex-interrupted, complex-continuant, complex-lax, complex-nasal, interrupted, continuant, lax, nasal, lateral, rhotic, palatalized, labialized}. For example, ‘prueba’ (test) //prwe-Ba// is represented as {interrupted⁰, labial⁰, rhotic⁰, labialized⁰, front} {lax⁰, labial⁰, low} with no temporal order specified within each syllable. Phonetically, the glide gesture is often obscured by other stronger concomitant gestures, resulting in, approximately, [pre va].

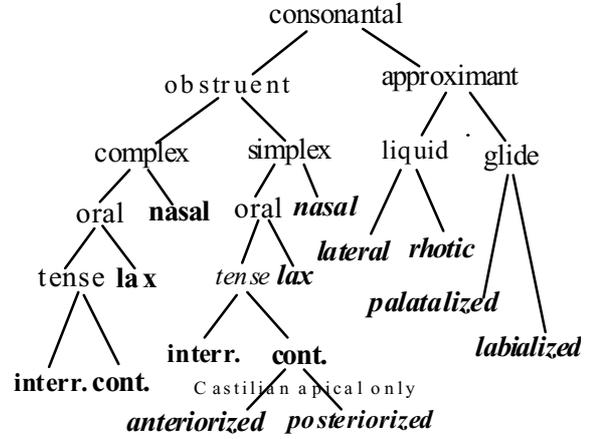
3.2.1. Complex (Spirantized)

Complex features, that must have an (obstruent) place specification, are most commonly manifested as {complex-interrupted}: //Sp// ‘esponja’ (sponge) ///Spon-ha###//, [es poŋ ha], {complex-interrupted⁰, labial⁰, nasal^C, back} {continuant⁰, dorsal⁰, low}; //St// ‘estilo’ (style), ///Sti-lo###//, [es ti lo], {complex-interrupted⁰, apical⁰, high, front} {lateral⁰, back}; //Sk// ‘esclavo’ (slave) ///Skla-Bo###//, [es kla βo], {complex-interrupted⁰, dorsal⁰, lateral⁰, low} {lax⁰, labial⁰, back}. For {complex-continuant}, e.g., //Sf// ‘esfinge’ (sphinx) ///SfiN-he###//, [es fiŋ he], {complex-continuant⁰, nasal^C, high, front} {continuant⁰, dorsal⁰, front}, place is not specified because it occurs with {labial} only.

3.2.2. Interrupted

//p// ‘papa’ (potato) //pa-pa// {interrupted⁰, labial⁰, low} {interrupted⁰, labial⁰, low}; //t// ‘tanto’ (much) //taN-to// {interrupted⁰, apical⁰, nasal^C, low} {interrupted⁰, apical⁰, back}; //k// ‘coco’ (coconut), //ko-ko//, {interrupted⁰, dorsal⁰, back} {interrupted⁰, dorsal⁰, back}. The interrupted palatalized obstruent onset, as in the first syllable of ‘chapa’ (veneer) //tja-pa//, is specified

phonologically as {interrupted⁰, apical⁰, palatalized⁰, low} {interrupted⁰, labial⁰, low}, in parallel with ‘piano’ (piano) //pja-no// {interrupted⁰, labial⁰, palatalized⁰, low} {nasal⁰, apical⁰, back}, and ‘quieto’ (quiet) //kje-to// {interrupted⁰, dorsal⁰, palatalized⁰, front} {interrupted⁰, apical⁰, back}.



bold: onset feature specification
italic: coda feature specification
bold italic: specification for both onset and coda

Figure 1: Spanish consonantal feature tree

3.2.3. Continuant

//f// ‘filfa’ (fib) //fiL-fa//, {continuant⁰, labial⁰, lateral^C, high, front} {continuant⁰, labial⁰, low}; //s// ‘sosa’ (soda/NaOH), //so-sa// {continuant⁰, apical⁰, back} {continuant⁰, apical⁰, low}; //h// ‘jengibre’ (ginger) //heN-hi-Bre//, {continuant⁰, dorsal⁰, nasal^C, front} {continuant⁰, dorsal⁰, high, front} {lax⁰, rhotic⁰, labial⁰, front}. In a few dialects, primarily Castilian, there is a phonological distinction between orthographic ‘s’ vs. ‘z’, ‘ci’, and ‘ce’. For these speakers, the feature {posteriorized} is used for ‘s’, while ‘z’, ‘ci’, and ‘ce’ must be specified by {anteriorized} to reflect the interdental articulation, e.g., ‘zozaso’ (lisp) //θo θa so//, {anteriorized⁰, back} {anteriorized⁰, low} {posteriorized⁰, back}.

3.2.4. Lax

Lax obstruents have no phonological distinction between interrupted and continuant manner. Phonetically, they are most frequently implemented as fricatives, but in absolute initial position or after a syllable with certain coda features, depending on dialect, a stop may be produced. //B// ‘barba’ (beard) //BaR-Ba//, {lax⁰, labial⁰, rhotic^C, low} {lax⁰, labial⁰, low}; //D// ‘dados’ (dice) //Da-DoS//, {lax⁰, apical⁰, low} {lax⁰, apical⁰, tense^C, back}; //G// ‘gringo’ (North American) //GriN-Go//, {lax⁰, dorsal⁰, rhotic⁰, nasal^C, high, front} {lax⁰, dorsal⁰, back}.

3.2.5. Nasal

//m// ‘mima’ (mime) //mi-ma//, {nasal⁰, labial⁰, high, front} {nasal⁰, labial⁰, low}; //n// ‘nana’ (grandmother) //na-na//, {nasal⁰, apical⁰, low} {nasal⁰, apical⁰, low}. The apical palatalized nasal onset, as in the second syllable of ‘caña’ (cane) or ‘cania’ (small nettle) //ka-nja//, is specified as {interrupted⁰, dorsal⁰, low} {nasal⁰, palatalized⁰, apical⁰, low}, in parallel to ‘miedo’ (fear) //mje-Do// {nasal⁰, palatalized⁰, labial⁰, front} {lax⁰, apical⁰, back}.

3.2.6. Lateral and Rhotic (Liquids)

//l// ‘lila’ (lilac) //li-la//, {lateral^o, high, front} {lateral^o, low}. The sonorant onset, as in the second syllable of ‘pollo’ (chicken) //po-ljo//, is specified phonologically as {interrupted^o, labial^o, back} {lateral^o, palatalized^o, back}. This word is phonetically realized variably as [po jo], [po ljo], [po ʒo], etc., depending on the dialect.

//r// ‘raro’ (rare) //ra-ro//, {rhotic^o, low} {rhotic^o, back}; ‘perro’ (dog) //pe-ro//, {interrupted^o, labial^o, front}^x{rhotic^o, back}; ‘pero’ (but) //pe-ro//, {interrupted^o, labial^o, front} {rhotic^o, back} (see [2] for a discussion of the inter-syllabic rhotic distinction, i.e., trill versus tap).

3.2.7. Palatalized and Labialized (Glides)

//j// ‘yaya’ (lancewood tree) //ja-ja//, {palatalized^o, low} {palatalized^o, low}. The {palatalized^o} feature (/j/) co-occurs with /e, a, o, u/.

//w// ‘guagua’ (trivial thing) //Gwa-Gwa//, {lax^o, labialized^o, dorsal^o, low} {lax^o, labialized^o, dorsal^o, low}. The {labialized^o} feature (/w/) co-occurs with /i, e, a, o/.

3.3. CODAS

Syllable codas in Spanish are restricted to a small class, which are phonologically specified only by a manner feature without place specification.

3.3.1. Tense and Lax (Oral)

//S// ‘pes’ (fish) //peS//, {interrupted^o, labial^o, tense^c, front} The feature {tense} is an obstruent feature in onset, but without place specification in coda. In Castilian, a distinction may be made between {anteriorized^c} ‘voz’ (voice) //Boθ// and {posteriorized^c} ‘vos’ (you) //BoS//. //D// ‘sed’ (thirst) //seD//, {continuant^o, apical^o, lax^c, front}. The feature {lax^c} only occurs morpheme-finally.

3.3.2. Nasal

//N// ‘pan’ (bread) //paN//, {interrupted^o, labial^o, nasal^c, low}.

3.3.3. Rhotic and Lateral (Liquids)

//R// ‘par’ (pair) //paR//, {interrupted^o, labial^o, rhotic^c, low}. //L// ‘sel’ (salt) //seL//, {continuant^o, apical^o, lateral^c, front}.

3.3.4. Palatalized and Labialized (Glides)

//J// ‘rey’ (king) //reJ//, {rhotic^o, palatalized^c, front}. The {palatalized^c} feature (/J/) co-occurs with /e, a, o, u/.

//W// ‘aula’ (lecture hall) //aW-la//, {labialized^c, low} {lateral^o, low}. The {labialized^c} feature (/W/) co-occurs with /e, a, o/.

4. CONCLUSIONS

Describing the phonology of Spanish by an analysis of the structure and features of its syllables reveals information that has either not been observed in the traditional phoneme-based phonological analysis or has required elaborate explanation. Syllable-based phonology lessens alphabetic/orthographic bias because it employs a system of unordered features to describe the meaningful patterns of opposition. Underspecification, as a general notion for avoiding specification of non-contrastive differences within the syllabic domain, allows for parsimony of description and provides a framework in which to capture dialectal variation of phonetic implementation in natural discourse.

ACKNOWLEDGEMENTS

This study would not have been possible without access to the online lexicographical data of the Real Academia Española (<http://www.rae.es/>) and the *Diccionario Inverso de la Lengua Española* of Ignacio Bosque and Manuel Pérez Fernández (1987), and owes much to critical discussions with O. Fujimura.

REFERENCES

- [1] O. Fujimura, “Phonology and phonetics -- A syllable-based model of articulatory organization,” *J. Acoust. Soc. Jpn.*, vol. (E) 13, pp. 39-48, 1992.
- [2] O. Fujimura and J.C. Williams, “Syllable concatenators in English, Japanese, and Spanish,” in *Item Order: Proceedings of LP’98*, O. Fujimura, B. Joseph, and B. Palek, Eds., pp. 461-498. Prague: Charles University Press, 1999.
- [3] R. Sproat and O. Fujimura, “Allophonic variation in English /l/ and its implications for phonetic implementation,” *J. Phonetics*, vol. 21, pp. 291-311, 1993.
- [4] O. Fujimura, “An analysis of English syllables as cores and affixes,” *Zs. Phonetik, Sprachwiss. u. Kommunikationsforschung*, vol. 32, pp. 471-476, 1979.

ⁱ The superscripts ^o and ^c indicate that the feature in question is specified for onset and coda syllable components, respectively. Vocalic feature names are distinct from consonantal features and are given for the entire syllable without any syllable component designation. A pair of curly brackets surrounds the unordered set of features specified for each syllable. For conventions on feature specification, see [2].

ⁱⁱ There are a few instances of codas, word-medially, at morpheme boundaries, with the manner feature {tense^c}, which is accompanied by a place feature, e.g., ‘apto’ (apt) /##ap#to##/ {tense^c, labial^c, low} {tense^o, apical^o, back} versus ‘acto’ (act) /##ak#to##/ {tense^c, velar^c, low} {tense^o, apical^o, back}. In words such as ‘doctor’ /##Dok#toR##/, where there is no phonological opposition (*‘doptor’) but the feature {tense^c, dorsal^c} is conserved orthographically as ‘c’, the phonetic implementation tends to delete the coda [do tor].

ⁱⁱⁱ Exceptions are rare cases of codas combining {palatalized^c} with {tense^c} as in ‘seis’ (six) /seJS/. Complex codas of {palatalized^c} or {labialized^c} and {nasal^c}, i.e., ‘treinta’ (thirty) /##tre#JN-ta##/ and ‘aun’ (even) /##a#WN##/, historically had two syllables with a morpheme boundary in place of the current single syllable.