LING 490/690 - local language assignment: part 1 Ilhana Vele and Saja Alburaik

Castilian Spanish Segment inventory and Syllable Structures

There are various discrepancies between Castilian Spanish phonologists in how they distinguish phonological differences between Castilian and other Spanish dialects. The most prominent linguist and widely cited scholar is Dr. Eugenio Martinez Celdran. His linguistic interpretation is the foundation by which other linguists refine and debate how Castilian Spanish is defined. One such linguist Jose Hualde analyzed Martinez's work in his 2004 paper "Quasi-phonemic contrasts in Spanish" looking at Castilian Spanish translations to determine if Celdran's rule applied. Quilis and Fernández's transcriptions of "The north wind and the sun" was analyzed by Hualde (2004) who found that it did not include glides in their phonological transcriptions of Castilian Spanish. Hualde also found that high vowels and glides are in complementary distribution except in the case of [i]-[j], [u]-[w]. Hualde concluded that non-paired high vowels and glides are a rare case in Castilian Spanish however since they do occur they should be included. There are some disagreements between Castilian Spanish phonologists over unique and rare components however the main points stay unaltered from Celdran's analysis.

International Phonetic Alphabet (IPA) symbols for Castilian Spanish consonants

The Castilian Spanish or the Old Spanish has 18 consonants.

	Bilabial		Labio-dental		(Inter-) dental		Alveolar		Palato-alveolar		Velar		Glottal	
Stop	p	b			t	d					k	g		
Fricative			f		θ		s				x			
Affricate							t͡ʃ			ʄ͡ʝ				
Nasal		m						n		ɳ				
Tap or flap								r						
Trill								r						
Lateral								l		ʎ				

Shaded = voiced Unshaded = voiceless

ʄ͡ʝ - /j/ voiced palatal affricate and t͡ʃ - /tʃ/ Voiceless palato-alveolar affricate

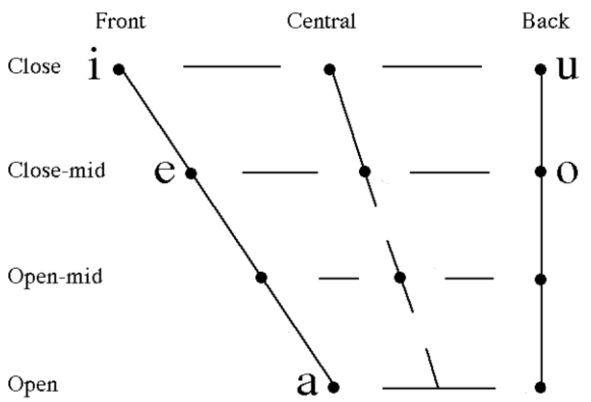
Castilian Spanish is unique among other Spanish dialects in many particular pronunciations. The most widely cited study of Castilian Spanish is Mart´ınez-Celdran, et. al (2003). In this publication they translated the Spanish dialect into IPA comparing it with other Spanish dialects. In Castilian Spanish the sounds /ce/ /de/ and /ze/ are pronounced as [θ] Whereas the sounds [j] and [g*j*] before [*i]* and [*e*] are pronounced as a stronger velar fricative /x/. According to Mart´ınez-Celdran (2003) the sounds \b\, \d\ and \g\ are complete stops only after a pause or after a nasal consonant and, in the case of \d\, after a lateral too. In other positions they are pronounced as their approximant variants [β], [ð] and [ɣ]. The place of articulation of nasal consonants in syllable codas is always the same as that of any following consonant where we can find sounds such as [n]. The handful of unique sounds to Castilian Spanish make this dialect stand out amongst the sea of Spanish speaking dialects.

Palatalization

In Castilian Spanish the nasal sounds are the same for the following consonants and are therefore palatalized; one example is the sound [ŋ].

Vowels

Castilian Spanish is distinct in the way the speaker pronounces the five-vowel system. When any of these vowels is preceded or followed by nasal consonants they become nasalized (Martínez-Celdrán,et.al, 2003). Vowels also appear in stressed and unstressed syllables. Vowels in Castilian Spanish can be described according to their height and backness. They can also be described as weak and strong vowels. Strong or open vowels are /a/, /e/, and /o/. Weak or closed vowels are /i/ and /u/. (Salcedo, 2010). The characteristics of vowel pronunciation give a unique feature to Castilian Spanish.



Diphthongs:

Castilian Spanish follows regular Spanish diphthong structure when a strong vowel is followed by a weak vowel. When a vowel followed by one of the glides [j] or [w], it called rising diphthong. On the other hand, if the vowel followed by [i ̯] or [u̯] it is falling diphthong (Martínez-Celdrán et el., 2003). Martínez-Celdrán et el., (2003) also states that there is a vowel reduction that causes a syllabic reduction in fast speech. The chart below shows some of the diphthongs examples as given by Martínez-Celdrán et el., (2003).

je	'pjel	*piel*	'skin'	ei̯	'pei̯ne	*peine*	'comb'
ja	'aθja	*hacia*	'towards'	ai̯	'ai̯re	*aire*	'air'
jo	'raðjo	*radio*	'radio'	oi̯	'soi̯	*soy*	'I am'
ju	'bjuða	*viuda*	'widow'				
wi	'fwimos	*fuimos*	'we went'				
we	'bweno	*bueno*	'good'	eu̯	'neu̯tro	*neutro*	'neutral'
wa	'kwaðro	*cuadro*	'picture'	au̯	'pau̯sa	*pausa*	'break'
wo	'kwota	*cuota*	'quota'	ou̯	'bou̯	*bou*	'seine fishing'

In Castilian Spanish, there is a general rule regarding the syllable structures. The rule of syllabi structure in Castilian Spanish according to Hualde (2005) is that the consonant followed by nuclei is always considered as one syllable. In case of V-CV the word should be syllabified as V-CV as is demonstrated in word *amor* or [a.mo]. According to Hualde diphthongs are syllabified as one syllable such as *periodo* [pe.ɾi̯ ó.ðo]. Two adjacent vowels are diphthongs and are in one syllable e.g [dwe.lo]. If the both vowels are low or if one of the vowels is non-high and stressed it is syllabified as hiatus. Examples of such a hiatus are [po.'e.ta] and [ka'iða] (Hualde, 2005). The syllable structure of Castilian Spanish can have only two consonants in the onset cluster and maximum of two consonants in the coda (Núñez-Cedeño, 2016).

1. **Onsets.**

onsets	**Examples (IPA)**
Ø	Yes, [aˈmo]
C	Yes, [‘kasas]
CC	Yes, [fruta]
CCC	No
CCCC	No
CCCCC	No

The onset cluster in Castilian Spanish can have up to two consonants (Hualde, 2005). The onset consists of the stops /p/,/t/,/k/,/b/./d/,/g/ and the fricative /f/ + /l/&/r/, and nasal sounds are allowed too (Núñez-Cedeño, 2016). According to Núñez-Cedeño, (2016) no one yet has completely understood why only the fricative /f/ is chosen among the other fricative sounds besides obstruent. This is also evident in the work of Martínez-Gil, (2001) who noted that the Castilian follows the sonority sequencing constraint, as the first consonant in Spanish onset cluster should be more obstruent and the second consonant should be less obstruent. Hualde (2005) states that the /SC/ onset cluster is disallowed in Castilian Spanish, Therefore, onset clusters are always divided into different syllables. Similarly, the /sp/ cluster is not allowed. The vowel /e/ is usually used to divide the disallowed consonants clusters (Núñez-Cedeño, 2016) for example /es.pe.ˈθjal/. Complex onset cluster is found in Castilian Spanish when the first consonants are different in the sonority degrees.

Obstruents	Nasals	Liquids	Glides	Vowels
p, b, t, d, k, g, f, θ, s, h, x, tʃ, dʒ	m, n, ɲ	l, r, ɾ	j, w	a, e, i, o, u

The Spanish sonority degree according to Núñez-Cedeño, (2016)

2.**Nuclei:**

Nuclei	Example (ipa)
Ø	No

V	Yes, [wer.ta], [te'le.fo.no], [baŋo]
VV	Yes, [pjel], [ˈbwe.no]
VVV	Yes, ['bweɨ̯]
VVVV	No
VVVVV	No

The nucleus in Castilian Spanish is obligatory. The nucleus contains a vowel and sometimes a semivowel [y or j] or [w] such as /yu/, /ye/, /ya/, /yo/, or /we/, /wa/, /wo/. Spanish is composed of five vowels /i/{high, front}; /e/{front}; /a/{low}; /o/ {back}; and /u/ {high, back} where when these vowels are combined with glides they create diphthongs (William, 2003). J.C. Williams explains that in Castilian Spanish a high importance is placed on the phonetic distinction of vowel quality in open versus closed syllables. In Spanish when we have a syllable that is composed of a coda "as in 'sed' (thirst), the vowel is lower than in 'se' (itself)" (Williams, 2003, pg. 708). According to Martínez-Celdrán, Fernández-Planas, & Carrera-Sabaté, (2003), the nuclear structure of Castilian Spanish is that the nuclei is always on the last stressed syllable (Martínez-Celdrán et al., 2003). The nuclear pitch movement is spread across any following weak syllables in the cases where a nuclei is not the last syllable in the group.

3.**Codas:**

Coda	Example (ipa)
Ø	No
C	Yes, [‘baŋ.ka]
CC	Yes, [kons.tiˈpa.ðo]
CCC	No
CCCC	No
CCCCC	No
CCCCCC	No

In Castilian Spanish Syllable codas are restricted to a small class. In a coda it is possible to have up to two consonants, limited to /r/, /n/, /θ/and the stop sounds /p/, /t/. /k/, /b/, /d/, /g/. Fricative sounds /f/ and /s/ can also occur in a coda cluster. In the case of two coda consonants /s/ is always placed as a second consonant such as /kon**s**.tiˈpa.ðo/ (Hualde, 2005). Lastly, nasal sounds are allowed in coda clusters at both medial and final positions (Hualde, 2005).

Conclusion:

Syllable Contact Law is a notion that there is a cross linguistic preference to avoid rising sonority

across a syllable boundary. Given the inventory of the Castilian Spanish onsets, nuclei, and coda described in this paper we can conclude that Castilian Spanish follows *Syllable Contact Law* as this language prefers codas to be less obstruent than the onset. In Castilian Spanish, syllable structure is constructed from right to left. The onset is formed with consonants to the left of the nucleus as long as it creates a possible onset. Nucleus can be either vowels, diphthongs, or triphthongs. In Roman languages the *Sonority Sequencing Constraint* which outlines the structure of the syllable by sonority only the /s/ violates the rule. Castilian Spanish like other Roman languages follows the universal rule of the *Sonority Sequencing Constraint* except for the /s/ sound.

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Appendix A

ILLUSTRATIONS OF THE IPA

Castilian Spanish

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Spanish is by far the most widely spoken Romance language, used by about 350 million people mainly in the Iberian Peninsula and Latin America. The language variety described below is formal Spanish spoken in Castile (Central Spain) by educated middle-aged speakers.

Consonants

	Bilabial	Labiodental	Dental	Alveolar	Palatal	Velar
Plosive	p b		t d			k g
Affricate					t͡ʃ ɟ͡ʝ	
Nasal	m			n	ɲ	
Tap or flap				ɾ		
Trill				r		
Fricative		f	θ	s		x
Lateral approximant				l	ʎ	

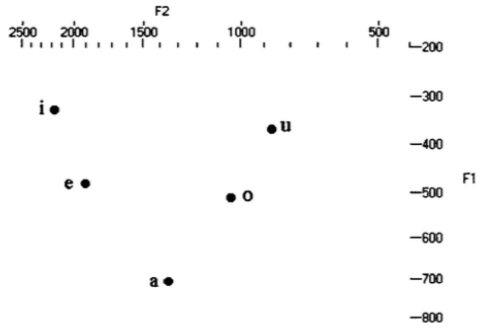
p	'pelo	*pelo*	'hair'	t	'topo	*topo*	'mole'	k	'kasa	*casa*	'house'
b	'boka	*boca*	'mouth'	d	'daɾ	*dar*	'to give'	g	'gato	*gato*	'cat'
								t͡ʃ	'kot͡ʃe	*coche*	'car'
								ɟ͡ʝ	'ɟ͡ʝate	*yate*	'yacht'
m	mã'ma	*mamá*	'mother'	n	'nuka	*nuca*	'nape'	ɲ	'kaɲa	*caña*	'cane'
				ɾ	'pero	*perro*	'dog'				
				ɾ	'peɾo	*pero*	'but'				
f	'feo	*feo*	'ugly'	θ	'θona	*zona*	'zone'	x	xa'ron	*jarrón*	'vase'
				s	'sola	*sola*	'alone'				
				l	'luθ	*luz*	'light'	ʎ	a'ʎi	*allí*	'there'

Appendix b

Vowels

Spanish has five vowels, which may occur in both stressed and unstressed syllables: /i/, /e/, /a/, /o/, /u/. Navarro Tomás (1918) described open variants of /i/, /e/, /o/, /u/ in some contexts. In the case of the open central vowel, he distinguished palatal and velar variants in certain contexts. However, later experimental studies do not seem to confirm such variants.

Vowels have nasalized variants when they appear between two nasal consonants or followed by a nasal consonant in syllabic coda.



Stressed vowels				Unstressed vowels			
i	ˈpiso	*piso*	'I step'	i	piˈso	*pisó*	'S/he stepped'
e	ˈpeso	*peso*	'I weigh'	e	peˈso	*pesó*	'S/he weighed'
a	ˈpaso	*paso*	'I pass'	a	paˈso	*pasó*	'S/he passed'
o	ˈposo	*poso*	'I pose'	o	poˈso	*posó*	'S/he posed'
u	ˈpuso	*puso*	'S/he placed'	u	puˈχo	*pujó*	'S/he struggled'

Diphthongs

Spanish has rising diphthongs, formed by the glides [j] or [w] plus a syllabic nucleus, and falling diphthongs, formed by a syllabic nucleus plus the glides [i̯] or [u̯]. In fast speech, sequences of vowels in hiatus reduce so that one becomes [–syllabic]. If both vowels have the same timbre they fuse: *la Alhambra* [la ˈlambra]. There are also triphthongs, like *buey* 'ox' [ˈbwei̯]. Some examples of diphthongs are:

je	ˈpjel	*piel*	'skin'	ei̯	ˈpei̯ne	*peine*	'comb'
ja	ˈaθja	*hacia*	'towards'	ai̯	ˈai̯re	*aire*	'air'
jo	ˈraðjo	*radio*	'radio'	oi̯	ˈsoi̯	*soy*	'I am'
ju	ˈbjuða	*viuda*	'widow'				
wi	ˈfwimos	*fuimos*	'we went'				
we	ˈbweno	*bueno*	'good'	eu̯	ˈneu̯tro	*neutro*	'neutral'
wa	ˈkwaðro	*cuadro*	'picture'	au̯	ˈpau̯sa	*pausa*	'break'
wo	ˈkwota	*cuota*	'quota'	ou̯	ˈbou̯	*bou*	'seine fishing'

Appendix C

Besides, when two non-close vowels clash in the string, one of them becomes non-syllabic. In the following examples, theoretical three-syllable words become two-syllable words: *poeta* 'poet' ['pǫeta], *maestro* 'teacher' ['maęstro].

Prosody

Lexical stress

Lexical stress is distinctive. Stress provides very productive contrasts, such as those between the first person singular of the present tense and the third person singular of the past in verbs of the first conjugation, like: *amo-amó* 'I love-s/he loved', *lavo-lavó* 'I wash-s/he washed', *cambio-cambió* 'I change-s/he changed', etc. It is also possible to contrast three words, a noun and two verbal forms, such as *límite-limite-limité* 'boundary-limit (imperative)-I limited', *depósito-deposito-depositó* 'deposit-I deposit-he deposited', etc. In these cases the need for the written accent is evident so as to mark these differences in the spelling.

Most Spanish words bear the stress on the penultimate syllable but any of the three final syllables may be stressed. In verb forms with enclitic personal pronouns, even the fourth syllable, starting from the end, can be stressed, which is the case of *cuéntaselo* (cuenta-se-lo) 'tell that to him/her', *acábatelo* (acaba-te-lo) 'finish it off', etc.

Rhythm

Spanish can be considered, in general, a syllable-timed language without an outstanding vowel reduction in unstressed syllables: 'stresses separated by different numbers of unstressed syllables will be separated by different intervals of time' (Abercrombie 1967: 98).

Intonation

The nuclear tone is situated on the last stressed syllable in the intonation group. When the nuclear syllable is not the last syllable in the group, the nuclear pitch movement is spread across any following weak syllables.

The low fall is generally the neutral tone for statements and *wh*-questions, and the high rise is the tone for yes/no questions.

The most common pre-nuclear pattern found for declarative and interrogative sentences is the progressively descending pattern. The pitch begins rather high and it progressively steps down at each peak until it reaches the tonal baseline with the final low fall.

In the pre-nuclear contours, the stressed syllable is frequently low, followed by a high tone on the subsequent unstressed syllable, even across words and syntactic phrases (Sosa 1999).

Conventions

The stops /t/ and /d/ are laminal denti-alveolar and not purely dental. To represent this faithfully, the diacritic [̪] would be necessary, but their place of articulation remains unambiguous without it.

The sounds /b/, /d/ and /g/ are complete stops only after a pause or after a nasal consonant and, in the case of /d/, after a lateral too. In other positions they are pronounced as their approximant variants [β], [ð] and [ɣ], respectively. The approximant [ð̞] is interdental.

[ɣ] / [ɯ̞]: the symbol [ɯ̞] is not adequate for Spanish because it represents an unrounded semivowel that requires spread lips. This semivowel does not exist in Spanish. There are plenty of words in Spanish with a velar approximant as in *la gorra* 'the cap', *algo* 'something', *este*

Appendix D

gusano 'these worm', *el guante* 'the glove', etc. Before back vowels or the semivowel [w], the sound is rounded through coarticulation. Therefore it is impossible to pronounce Spanish *algo* as *['aluɰo], ['alɣo] being more phonetically feasible because the approximant [ɣ] is not marked for the rounded/unrounded feature, like the approximants [β̞] and [ð̞].

In Spanish there are two voiced palatal variants of the phoneme /ʝ̞/ (which Alarcos (1950) transcribed as /y/ and Quilis (1993) as /ǰ/): an affricate variant [ʄ̞], after a nasal, [l] or a pause, and an approximant [ʝ̞] in all other contexts: [elʲ ˈʄ̞ate] *el yate* 'the yacht', [mi ˈʝ̞ate] *mi yate* 'my yacht'.

It is possible to suppress the diacritic from approximants in broad transcription because these consonants do not exist as fricatives.

/p/, /t/ and /k/ are unaspirated. They are fortis in syllabic onset and lenis in syllabic coda and in this position they can be voiced.

/b/, /d/ and /g/ in syllabic codas have several realisations: *absurdo* 'absurd' [aβ̞ˈsuɾðo] [aβˈsuɾðo] [aˈsuɾðo].

[θ] has an interdental place of articulation. This fricative, like [s], becomes voiced before a voiced consonant. For instance, *rasgo* 'feature' ['razɣo], *jazmín* 'jasmine' [xaθ̬ˈmĩn]. The alveolar fricative [s], on the other hand, often becomes dental before a denti-alveolar consonant. The velar fricative [x] can be pronounced uvular before a back vowel and the semivowel [w]: *junio* 'June' ['χunjo].

The trill appears in word onset and after [l], [n] and [s] and in intervocalic position where it contrasts with the tap: *caro-carro* 'expensive-car' ['karo]-['karo]. In other contexts, the tap is usual.

The place of articulation of nasal consonants in syllabic codas is always the same as that of any following consonant. So we can find labiodental [ɱ], interdental [n̪], dental [n̪], palatalised [nʲ], velar [ŋ] and uvular [ɴ] nasals. For instance, *ánfora* 'amphora' ['aɱfoɾa], *encía* 'gum' [enˈθia], *antes* 'before' ['an̪tes], *ancha* 'wide' ['anʲt͡ʃa], *banco* 'bank'/'bench' ['baŋko], *enjuto* 'dry' [enˈχuto].

The place of articulation of the lateral approximant /l/ is typically alveolar but, like the alveolar nasal, it can become interdentalised, dentalised or palatalised before consonants with these places of articulation, as in *alzar* 'to raise' [a̪lˈθaɾ], *alto* 'high/tall' ['a̪lto], *colcha* 'quilt' ['kolʲt͡ʃa].

Dialectal differences

The alveolar fricative [s] presents some important dialectal differences. In most of the Iberian Peninsula it is usually apical. However, in Andalusia, the Canary Islands and Latin America it is laminal. In these areas it usually becomes a glottal fricative in syllabic coda and word-final position, as in: *los hombres* 'the men' /los+ˈombres/ [lo ʰombreʰ]. Sometimes it is lost. On the other hand, in some areas of Andalusia, in the Canary Islands and in Latin America, the interdental fricative [θ] does not exist, so when it appears in Castilian Spanish, a laminal alveolar sibilant [s] is pronounced, a phenomenon known as SESEO, for instance *zapato* 'shoe' [saˈpato]. The opposite, the non-existence of the laminal alveolar sibilant [s], is found in some other areas of Andalusia, where only [θ] occurs. This phenomenon is known as CECEO.

The velar fricative [x] usually becomes glottal [h] in some areas of Andalusia, the Canary Islands and Latin America, as in *jarrón* 'vase' [ʰaˈron].

Finally, it is necessary to point out that the lateral palatal [ʎ] is usually changed to a central palatal in all the large cities in the Iberian Peninsula: *pollo* 'chicken' ['poʝo]. In some countries of South America [ʎ], [ʄ̞] and [ʝ̞] become a postalveolar fricative: ['poʒo].

Appendix E

Transcription of the recorded passage

Semi-narrow transcription

[el ˈβjen̪to ˈnorte ʝ el ˈsol porˈfjaβan soβre ˈkwal̪ ˈdeʎoˈs era e̞l ˈmas ˈfwerte | kwan̪do̞ aθerˈto a̞ paˈsar um bjaˈxero̞ emˈbwel̪to̞ eˈn ãnʲt͡ʃa ˈkapa‖ kombiˈnjeron ẽŋ ke kje ˈn ãn̪tez loˈɣrara o̞βliˈɣar al βjaˈxero̞ a kiˈtarse la ˈkapa | seˈria konsiðeˈraðo ˈmas poðeˈroso ‖ el ˈβjen̪to ˈnorte soˈplo koŋ gram ˈfurja | ˈpero kwan̪to ˈma soˈplaβa | ˈma se̞ areβuˈxaβa e̞n su ˈkapa e̞l βjaˈxero ‖ por ˈfin | el ˈβjen̪to ˈnorte̞ aβan̪doˈno la e̞mˈpresa ‖ ẽn̪ˈton̪θez βriˈʎo e̞l ˈsol kon arˈðor | e ʝⁿmeˌðjataˈmẽn̪te se ðespoˈχo ðe su ˈkapa e̞l βjaˈxero ‖ por lo ke l ˈβjen̪to ˈnorte ˈuβo ðe rekonoˈθer la superjoriˈða ðel ˈsol].

We also offer, under 'Broad transcription' below, one of the versions published by Jones & Dahl (1944: 16) for Spanish of Buenos Aires.

Broad transcription

el bjento norte j el sol porfjaban sobre kwal de eʒos era el mah fwerte, kwando aserˈto a paˈsar um bjaxero embwelto en anca kapa. kombinjeron en ke kjen anteh lograra obliˈgar al bjaxero a kitarse la kapa seria konsiderado mah poderoso, el bjento norte soˈplo kon gram furja, pero kwanto mas soplaba, mas se arrebuxaba en su kapa el bjaxero; por fin el bjento norte abandoˈno la empresa. entonseh briˈʒo el sol kon arˈdor, e immedjatamente se dehpoˈxo de su kapa el bjaxero; por lo ke l bjento norte ubo de rrekonoˈser la superjoriˈdad del sol.

Orthographic version

El viento norte y el sol porfiaban sobre cuál de ellos era el más fuerte, cuando acertó a pasar un viajero envuelto en ancha capa. Convinieron en que quien antes lograra obligar al viajero a quitarse la capa sería considerado más poderoso. El viento norte sopló con gran furia, pero cuanto más soplaba, más se arrebujaba en su capa el viajero; por fin el viento norte abandonó la empresa. Entonces brilló el sol con ardor, e inmediatamente se despojó de su capa el viajero; por lo que el viento norte hubo de reconocer la superioridad del sol.

The Spanish text and words contained in this paper can be listened to at www.ub.es/labfon/princip.htm

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Appendix F

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THE PHONOLOGICAL SYSTEM OF SPANISH

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Abstract: *Spanish articulatory phonetics, the classification of sounds and the physiological mechanism used in the production of phonemes are discussed in this article. The process of learning a language consists of classifying sounds within the target language. Since the learner may be hearing the utterance in a different way than the native speaker some objective criteria are needed to classify sounds. If these distinctions are not mastered, he may be perceived as sounding awkward. Other phonological processes are applied in informal situations due to socio-linguistic factors such as age, social class, and education. Sound deletion in particular phonological environments are not done randomly by the speaker, but by necessity to retain semantic comprehension. Allophonic choices within phonemes make up the dialect for a particular area.*

Keywords: *Spanish phonology, phonetics, articulation, sounds, dialect.*

1. ARTICULATORY PHONETICS

The goal of phonetics is to seek a comprehensive description of classes of sounds and of the general mechanisms of speech production caused by the respiratory system as air passes in and out of the lungs through some form of obstruction (within the mouth, pharynx, and larynx). Articulatory Phonetics is one of the branches of linguistics concerned with the study of sounds as produced by the human vocal apparatus that is able to create an infinite amount of sounds. The traditional phonetic classification of speech sounds is based primarily on three variables:

1) The activity or non activity of the larynx in terms of voiced or voiceless sounds,
2) The place of maximum constriction in the mouth or pharynx referred to as the point of articulation, and
3) The type of sound-modifying mechanism in the mouth or pharynx referred to as the manner of articulation.

Other features called secondary articulation used as modifications of the basic speech sound offer a more precise classification. The vocal cords for example may be either opened or closed. When these cords are brought together while air is passing through them, the vibration resulting is the *voiced* sound. The pitch is then controlled by the tension of the cords. The passage of air through a narrowly constricted opening produces a sound known as "friction", which unlike voice has no pitch. Another type of sound is produced by the closure and opening of the vocal cords called the "glottal" stop.

The various organs that shape the passageway to allow for various sounds are known as "articulators". Often this obstruction is caused by a movable articulator (tongue, velum, lips, etc.), which approaches an immovable one (palate, alveolar ridge, top teeth, etc.).

The roof of the mouth is divisible into four portions: the alveolar, the palate or hard palate, the velum or soft palate, and the uvula. The tongue is divisible into four portions given below with the contact region for each:

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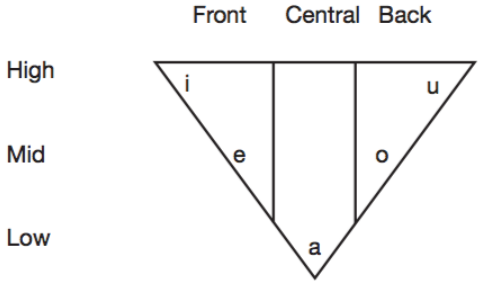
vowels in Spanish or change the meaning of the utterance. Vowels are described in terms of their most significant features; 1) tongue height and 2) tongue position.

The vowel system showing five meaningful positions can be drawn as a triangle:[5]



1. High front [i] as in *piso*.
2. Mid front [e] as in *peso*.
3. Low central [a] as in *paso*.
4. Mid back [o] as in *poso*.
5. High back [u] as in *puso*.

The phonological processes depend on the syllables as the basis for a complete description of the phonological system of Spanish. The following rules apply to the syllabic division of words:

1. Words with more than one vowel which is separated by only one consonant in the middle, the consonant goes with the second syllable,
2. For two consonant cluster groups; if the consonant group could begin a word in Spanish [pl, pr, bl, br, tr, dr, cl, cr, gl, gr, fl, fr] it can begin a syllable; ex: *a-gra-da-ble*. If the cluster could not begin a word the sequence must be divided with one consonant on each syllable; ex: *per-la*, *gran-de*.
3. For three consonant cluster groups between vowels the same rule applies; ex: *com-ple-tar*.

If the syllable has two vowels together they can form a diphthong and three vowels together can form a tripthong. A diphthong is formed when two vowels in a syllable consist of a strong vowel (a, e, o) plus a weak vowel (u or i). The shortest and weakest of the two can come before or after the other vowel. The following shows all the possible diphthongs in Spanish:

Semi-vowel before	i	e	a	o	u
i	*	bien	hacia	adiós	ciudad
u	cuido	bueno	cuando	cuota	*
Semi-vowel after					
i	*	seis	aire	boina	*
u	*	Europa	auto	*	*

Diphthongs can also be produced across words when a vowel ends one word and begins another; ex: *mi amiga*. Tripthongs are rare in Spanish. Most occur in the second person plural

[5] The 5 vowels may appear in any place in the word and differ very slightly between dialects. It is rare, however, for i or u to appear in unaccented syllable final position. It never appears in syllable nucleus but appears in verb forms or in cultisms such as *álbum*, *tribu*, and all itis names.

Appendix H

Quasi-Phonemic Contrasts.in Spanish

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1. Introduction

The striking thing about phonology is that the infinite phonetic variety in the utterances of any language can be reduced to a small inventory of contrastive units or phonemes. The bad news is that oftentimes phonemization is problematic in some corners of the language. Typically if the same language has been investigated by two linguists, we will get slightly different phonemic inventories; and these differences of opinion usually do not go away as the language is studied more extensively. Both the considerable extent to which we normally find agreement among linguists in the phonemic analysis of a given language and the existence of areas of disagreement are remarkable facts.

In this paper I consider in detail three specific aspects of the phonemic inventory of Spanish that remain controversial and argue that in all three cases it is useful to speak of quasi-phonemic contrasts (although not exactly in the same sense in every case). The paper ends with some general considerations about the nature of phonological categorization.

Let me start with an anecdote. I recently submitted a paper reporting on experimental data on Basque suprasegmentals to a journal. A reader made the sensible suggestion that the examples, which were in conventional Basque orthography, should also be given in IPA transcription. This seemed reasonable enough, and I replied that I would comply. However, it immediately became clear to me that this was easier said than done, as I would like to be objective and accurate in the transcription. Should I provide a phonetic transcription? For each sentence over a hundred tokens were examined in the study (several repetitions in different pragmatic contexts by several speakers). Doing a phonetic transcription would thus require making some decisions as to how to solve the variability present in the data. To give just one example, one of the experimental sentences started with the word mollako 'of the pier'. In this word the k was usually

* For comments, I am grateful to Lourdes Aguilar, Bob Ladd, Pilar Prieto, Daniel Recasens and the audience at WCCFL23. All errors are mine.

 WCCFL 23 Proceedings, ed. Benjamin Schmeiser, Vineeta Chand, Ann Kelleher and Angelo Rodriguez., pp. xxx -xxx. Somerville, MA: Cascadilla Press [to appear].

voiceless, but sometimes is was voiced, and some other times partially voiced. How should this

segment be transcribed? Should I choose the most frequent production perhaps?

It would seem that by choosing a phonemic transcription instead this problem would be solved. But phonemization would necessarily be subjective in some respects. For instance, something that is controversial in Basque is the phonemic status of some palatal consonants. Should I transcribe mollako as /mo ako/ or as /moilako/? In the relevant Basque dialects /l/ palatalizes after /i/ and palatal glides are absorbed by a following palatal lateral, so that both phonemic inputs would result in the same output. An alternative orthography is indeed moilako.

There are two conclusions to be drawn from this Basque example. First of all, as pointed out by Pierrehumbert, Beckman and Ladd (2002) and Ladd (2002), "systematic phonetic representations" have no scientific validity, other than as practical shorthand and allowing for some arbitrariness (see also Beckman 2003). Secondly, the phonemic/ phonological level (contrastive units) is also ill-defined in some respects. Here I will concentrate on this second issue.

We may ask now if my difficulties at the phonemic level were due to the fact that there is relatively little work on Basque phonology. I do not think this is the reason. Problems of phonemic analysis arise even in the best studied languages. This is a pervasive phenomenon. The fact is that quite often a phonemic transcription or orthography almost works.

We may note in passing that the problems of arbitrariness or indeterminacy are much greater at the level of underlying representations

(URs) in a generative analysis. For instance, is righteous really /rixt+i+ s/ (as claimed in SPE)? Do cow and beef share the same UR? (< PIE gwou-). The added problem is of course the requirement that "morphologically related" words should in principle share the same UR for shared morphemes in a generative analysis. Deciding when two words are

"related" implies a clear element of subjectivity.

Here I will leave morphophonemics aside and concentrate on the classical phonemic level (which in practice is recognized by most phonologists). The point that I want to make is that even in the case of a fairly well studied language such as Spanish the phonemic status of certain oppositions is less than clear. I will maintain that the possibility of having quasi-phonemic contrasts is inherent to the nature of linguistic categorization. Rather than trying to sweep this issue under the rug or trying to decide on unclear aspects of the phonemic inventory on the basis of the cleverness of competing analyses, I believe we should recognize the emergent character of phonological categorization (Bybee 2001).

Spanish has the phonemic inventory in (1), where phonemes in parentheses are found only in some dialects (but their status in the dialects

where they occur systematically is not disputed). Bolded phonemes, on the other hand, are of questionable status: some authors include them in the inventory and some other authors do not .

(1) Spanish phonemes: Questionable phonemes are bolded. Phonemes in parentheses are found only in some dialects

Consonants : p t t k b d g f ( ) s x m n l ( ) r

Vowels: i e a o u , Glides: j w

As we can see in (1), the controversial phonemes are the glides, the voiced palatal obstruent and the trill r. For different generative analyses see, among others, Saporta and Contreras (1962), Harris (1969, 1983), Cressey (1972), D'Introno et al. (1995) and Whitley (1995, 2002). For a

Praguean structuralist perspective see Quilis and Fernandez (1983), Alarcos (1965, 1994), Quilis (1993), Canellada and Madsen (1987), RAE (1973). Theoretical allegiance does not determine phonemic analysis. For instance, D'Introno et al. (1995) adopt a generative formalism but agree with the standard Praguean analysis in recognizing the phonemic status of and r but not that of glides, and among generative analyses we find a wide diversity of opinions. The status of glides and the palatal fricative were the topic of controversy within American structuralism as well (see Stockwell, Bowen and Silva-Fuenzalida 1956, Saporta 1956).

In the next three sections I will examine the status of glides, the voiced palatal obstruent and the trill separately, after which some general conclusions will be proposed.

2. Phonemic glides?

In Spanish there are some (near-)minimal pairs that appear to rely on a high vowel vs. glide contrast, as we see in (2):

(2) high V vs. glide contrasts in Spanish (some dialects)

du.éto 'duet'	vs.	dwélo'duel'
pi.é 'I chirped'	vs.	pjé 'foot'
midi.ána 'my target'	vs.	medjána 'medium, fem.'
re.i é 'I will laugh'	vs.	rejné 'I ruled'

In spite of the existence of these (near-)mininal pairs in at least some varieties of Spanish, many

(most?) Spanish phonologists analyze the glides not as independent phonemes but as allophones of the high vowels. This is in part because both configurations in (2) do not have the same weight in the lexicon. Hiatus sequences of the i.á type (left column) are a marked or exceptional configuration (and even more so in sequences of falling sonority such as reiré 'I will laugh'). The pattern on the right column of (2), on the other hand, represents the unmarked, regular, situation in the language. Another complication is that all words in the hiatus class also allow a pronunciation with a diphthong under conditions of weak phrasal stress. The contrast is thus one between a regular class of words with obligatory diphthong and an exceptional class of words with possible hiatus (see Aguilar 1999, Hualde and Prieto 2002).

For the most part high vowels and glides are in complementary distribution. That is, for the most part, VV syllabification is predictable in Spanish, as summarized in (3):

(3) Syllabification of vowel sequences in Spanish

a) If both vowels are [-hi]: hiatus; te.átro 'theater', bo.áto 'pomp'.

b) If there is a stressed [+hi] V: hiatus; ma í.a 'María', gan ú.a 'hook'.

c) Otherwise: diphthong; djénte 'tooth', dwélo 'duel', má jo 'Mario', italjáno 'Italian', páwsa 'pause'. Also across word-boundaries mjamígo 'my friend' (vs. miprímo 'my cousin').

From this distribution we can conclude that glides can be considered allophonic variants of high vowels when adjacent to another vowel and not bearing the stress on their own. The explanation for the surface contrast in (2) is that rule (3c) has exceptions (e.g. kli.énte 'client', du.éto 'duet'). A general sense for the distribution of exceptional hiatus sequences in Castilian Spanish can be obtained by examining Quilis and Fernández's (1985: 190-192) transcriptions of "The north

wind and the sun", which these authors offer both in broad phonetic and phonological (Praguean) transcription (a narrow and semi-narrow phonetic transcription are also provided, which do not differ from the broad phonetic transcription in relevant details). In (4) we give all examples of sequences containing a high vowel that are found in that text:

(4) VV sequences in "The north wind and the sun" (Quilis and Fernández 1985): [bjénto] /biéNto/; [porfiában] /poRfiábaN/; [kwál] /kuál/;[fwérte] /fuéRte/; [kwándo] / kuáNdo/; [bjaxéro] /biaxéro/; [embwélto] / eNbuélto/; [kombinjéron] /koNbiniéroN/; [kjen] /kieN/; [sería] /sería/; [fúrja] / fúria/; [kwanto] /kuaNto/; [eimmedjátaménte] /e iNmediátameNte/;[superjoridád] /superioridáD/

As can be seen, these authors do not include glides in phonological transcriptions. All phonetic glides correspond to phonological high vowels in the context of (3c). There is however one anomaly: the word porfi.ában which is given as containing a phonetic hiatus, even though it should have a diphthong by rule (3c).

This text is representative of the general situation in the language: What needs to be lexically marked is that some high vocoids remain syllabic in contexts where they should be realized as glides (Roca 1997, Hualde 1997, Harris and Kaisse 1999, etc). Glides are predictable/ allophonic/regular realizations of /i/, /u/ in VV if not stressed (by rule (3c) above). What is "irregular" is the exceptional presence of syllabic /i/, /u/ in the environment of the general gliding rule in some words. That it, although there is is a [i]-[j], [u]-[w] surface contrast, this contrast is not adequately captured by postulating two pairs of phonemes, high vowels and

glides, as in (5a). A more adequate characterization of the facts is that in (5b-c):

(5) Analysis of high vowel vs. glide contrast

a. Problematic phonemization: /i/, /j/, /u/, /w/

b. Possible phonemization: /i/, /i*/, /u/, /u*/ where /i*/, /u*/ differ from /i/, /u/ in not being subject to distributional rule/constraint (c):

c. Gliding rule/constraint i/u → j/w if adjacent to another V and not stress-bearing.
e.g. /duélo/ [dwélo] vs. /du*éto/ [duéto]

The phonemization in (5b-c) accounts for markedness facts better than the /i/ vs. /j/ analysis in (5a), but it is still not completely satisfactory, as it also fails to capture some facts. First of all, exceptions (with hiatus) are not randomly distributed in the lexicon. Secondly, the diphthong/hiatus contrast has quasi-categorical aspects: it is clear in some contexts, nonexistent in other contexts and marginal/unclear in yet other contexts. In addition, there is a fair amount of dialectal and idiolectal variation in this respect (cf. highmid vs. low-mid vowel contrast in French and Italian, Tranel 1987, Ladd 2002, etc).

Interestingly, the quasi-phonemic nature of the facts is recognized by the Spanish Academy in its orthographic rules. Although the diphthong vs. hiatus contrast is not directly signaled in Spanish orthography, the correct syllabification of these sequences needs to be determined for the application of the rules of orthographic accent. One such rule states that stress is indicated with an accent mark in oxytones ending in a vowel, n or s (Panamá, revolución, anís). But a systematic exception is made for monosyllabic words (fe, son, tos). Given this, should one write guión or guion? It would depend on whether the word has one or two syllables. According to the

most recent rules of the Spanish Academy in cases like these you may use an accent mark if you strongly feel that the word has a hiatus and, thus, is bisyllabic (RAE 1999: 46). The existence of interspeaker variability and differences in the strength of categorical intuitions in this respect is thus acknowledged. This is very different from other orthographic rules. For instance, Spanish speakers are not told to write an accent mark on sílaba only if they strongly feel that the stress falls on the antepenultimate. Universal agreement (or clear intuitions) among native speakers is assumed regarding such phonological matters.

2.1. Distribution of exceptional hiatus in Castilian Spanish

Subject to this variation, exceptional hiatus is far from being randomly distributed in the lexicon. We may distinguish two classes of words with morphologically justified hiatus: hiatus due to paradigm effects and hiatus due to an intervening morpheme boundary (see Navarro Tomás 1977: 158159). The hiatus in porfi.ában 'they disputed' finds its justification in other forms of the same verbal paradigm where the high vowel is stressed and therefore the sequence must necessarily be syllabified in hiatus, such as porfí.an 'they dispute' (cf. also : rí.o 'river'→ ri.áda 'high waters', dú.o
→ du.éto). In an example such as boki.ánt o 'wide-mouthed', on the other hand, the presence of a compound boundary blocks the syllabification of the sequence as a diphthong (also in prefixation. bi.énjo 'biennium'; and with some suffixes: xesu.íta 'jesuit').
In addition, there are cases of exceptional hiatus where neither of these morphological conditions holds, but these tend to occur in some specific phonological contexts. In particular, hiatus is favored with the sequences ia, io (and to some extent ui) in initial position and where the stress is

either on the second vowel of the sequence or on the next syllable .The initiality condition is demonstrated by examples like li.ána vs. italjána (*itali.ána); bi.ólogo ‘biologist’ vs. radjólogo ‘radiologist’; di.ána ‘target’ vs. medjána
‘medium, fem.’. Regarding the stress condition, cf.: di.álogo ‘dialog’, di.alógo ‘I converse’ vs. djalogó ‘s/he conversed’; dú.o, du.ál, du.alísmo ‘dualism’ vs. dwalidád ‘duality’. There is no exceptional hiatus after the stress: kópja ‘copy’, istó ja ‘history’ (*kópi.a, *istó i.a) (see Hualde 1997,
1999) .
Given this biased distribution it should be clear that the analysis in (5b-
c) does not adequately account for all the facts.

2.2. Historical origin of diphthong/hiatus contrast

There are two main possible origins for sequences of rising sonority in Spanish:

a) On the one hand, the diphthongs jé, wé arose from the breaking of stressed low-mid vowels: t rra > tjéra ‘land’, p rta > pwérta ‘door’. Sequences with this origin are unexceptionally pronounced as diphthongs. Since most of the words with ie, ue have this origin, this fact explains why hiatus is rare with these particular sequences.

b) Secondly, in Latin we find heterosyllabic vowel sequences with unstressed high vowels. These sequences were also created by the deletion of certain intervocalic consonants. The general tendency in the language has been the reduction of the hiatus to a diphthong (Quilis 1993, Lloyd 1987, Penny 2002): pretiu(m) > pré jo ‘price’, Italia > itálja ‘Italy’, rugitu(m) > ru-ido > rwído ‘noise’. But contraction has exceptionally been blocked and the hiatus has been

preserved in some of these words: diabolu > di.áblo ‘devil’, cliente > kli.énte, crudelitate > kru.eldád (hiatus possible in these words for some speakers).

From a diachronic point of view, the exceptions to the gliding rule in (5c) are words where the historical tendency i.a > ja has been blocked. Hiatus has been variably preserved: (a) when morphologically supported and (b) in “strong” positions = initial position and not too far before the stress (These hiatus words may then have acted as analogical attractors for borrowings and neologisms meeting the phonological conditions).

What needs to be explained is thus why contraction has been blocked in specific contexts. For morphologically-justified exceptions, the explanation is more or less clear (on paradigm effects, cf. Steriade 2000). But what about cases without morphological justification? To repeat, almost always these exceptional hiatus words contain sequences of rising sonority which meet the two conditions of initiality and proximity to the stress (before it). These are necessary but not sufficient conditions; rather, contrast is possible under these conditions. Why is the preservation of historical hiatus favored in these contexts?

2.3. Explaining the distribution of exceptional hiatus

Hualde and Chitoran (2003) tested the hypothesis that the diachronic tendency to reduce original rising hiatus sequences to diphthong has been exceptionally blocked in positions where vowels independently have relatively greater duration, because of the prosodic or rhythmic patterns of the language.

In a first experiment, 4 Spanish speakers from Spain (Sp4 = author JH) read a randomized list of words containing a ia sequence, within a carrier phrase (4 repetitions). For all test tokens the

duration of the sequence ia was measured (using PRAAT). To test the effect of stress on the duration of the sequence, words starting with the sequence dia- were classified into three groups, depending on the position of this sequence with respect to the stress: stressed (diáspora, diácono, diána), pretonic (diamánte, diafrágma, diatríba, diabétes, diagráma) and prepretonic (diapasón, diagonál, diametrál). Means in milliseconds for each position and speaker are shown in Table 1.

Table 1. Mean duration (in ms) of (d)ia- under three stress conditions for 4 Spanish speakers (from Hualde and Chitoran 2003).

	Sp1	Sp2	Sp3	Sp4
Stressed	192.61	161.74	136.77	165.87
Pretonic	154.19	94.574	108.19	127.85
Prepretonic	118.33	95.10	99.38	107.09

An ANOVA and post hoc comparisons revealed that stressed sequences are significantly longer than the others for all 4 speakers. In addition, for 2 of the 4 speakers, Sp1 and Sp4, pretonic sequences have significantly greater duration than those in words where the stress is further to the right. (For the other two speakers pretonic and prepretonic sequences do not significantly differ in duration.)

This experiment does not allow to tease apart lexical and purely phonetic effects, since some of the words may have contained lexical hiatus for some of the speakers. For this purpose, we need to examine monophthongs in the same positions. In a second experiment, Hualde and Chitoran (2003) examined the duration of the first vowel in five triplets differing in the position of the

stress, e.g. número/numéro/numeró, in a carrier phrase (3 speakers, 4 repetitions). The results indicated that whereas the main stress effect on duration is that stressed initial syllables (in proparoxytones) are longer than unstressed initial syllables, there is also a tendency for initial syllables immediately before the stressed syllable (in paroxytones) to be longer than initial syllables further away from the stress (in oxytones). The observed duration cline is thus the following: stressed > pretonic > prepretonic. This is also consistent with results for Catalan reported in Recasens (1991b).

We may thus conclude that the perception of hiatus is possible only in positions with enough durational substance. In these positions historical recategorization of i.a as a diphthong has been blocked in some lexical items. The same basic durational effects are found with monophthongs (número > numéro> numeró), but they remain below the level of awareness because there is no possible contrast.

Simonet (2003) speculates that intuitions about syllabification in hiatus should be more robust or consistent across speakers in stressed than in (immediately) pretonic position, given the durational difference between tonic and pretonic syllables. He conducted a paper and pencil test where participants were asked to syllabify 45 test words (including both nonce and real words) indicating how confident they were about the chosen syllabification in a 5-point scale where 1 represented clear hiatus and 5 clear diphthong . For instance, for the nonce word miabocó subjects were given the options mi.a.bo.có = na.na.na.ná and mia.bo.có = na.na.ná. All test items had initial ia type sequences and differed in the position of the stress: Type A = sequence stressed (miáboco, diálogo), Type B = sequence pretonic (miabóco, dialógo) and Type C = sequence prepretonic (miabocó, dialogó). The results (from 12 speakers of Peninsular Spanish) were consistent with the hypothesis. The number of diphthong responses increases with distance

from the stress. Averages were: Type A = 2.1 pts., Type B = 3.4 pts. and Type C = 4.3 pts. Thus, participants showed a clear preference for hiatus syllabification in words of the miáboco type, for diphthongs in the miabocó type and had less clear intuitions regarding the miabóco type. Simonet's interpretation is that the difference between diphthong and hiatus is not categorical, but gradient, and depends on general gradient patterns of prosodic lengthening. There is no precise duration point where a vowel sequence would be considered a diphthong instead of a hiatus. What we have is a gradient difference that goes from prototypical long hiatus, to prototypical short diphthongs. There are two categories, hiatus and diphthong (or, equivalently, high vowel and glide), but no precise boundary between the two.

The two recent studies reviewed in this section provide a partial explanation for why certain positions are more likely to preserve a lexical hiatus (stress condition): the longer duration of segments in those positions (due to independent rhythmic factors) favor the categorization as hiatus of sequences of vocoids. The reason for the word-initiality condition (the fact that word-internal exceptional hiatus is possible only if paradigmatically supported) remains to be investigated.

2.4. Conclusion regarding glides

Paradoxically, although all glides are contextual allophones of the high vowels in Spanish, there is a contrast between high vowel and glide in certain positions.

There are surface contrasts because in a relatively small number of cases and in very limited contexts there is exceptional syllabification as hiatus of sequences that according to the general pattern of the language should be expected to be realized as diphthongs (the historical tendency

to reduce hiatus to diphthong has been blocked). Exceptional hiatus sequences are not randomly distributed in the lexicon and, in fact, in some specific positions “exceptional” hiatus is the preferred configuration (in some varieties of the language).

3. The voiced palatal obstruent / /

The voiced palatal obstruent is another segment of disputed phonemic status. This sound corresponds to the underlined letters in examples such as yerro ‘I err’, hierro ‘iron’, llego ‘I arrive’, tramoya ‘stage machinery’, paranoia, cebolla ‘onion’ (in the majority yeísta pronunciation). In Castilian Spanish this segment is realized with a broad range of constriction degree. In an acoustic study, Aguilar (1997: 69-73) distinguishes four allophones, all of which are said to occur in free variation in word-initial position: approximant [j] ~ fricative [ ] ~ affricate [d] ~ stop [ ]. Arguably this allophonic categorization in 4 types is imposed by the IPA. Perhaps it would be more accurate to speak of a continuum of realizations regarding constriction degree. Speakers of this and many other Spanish dialects have trouble with English minimal pairs such as Yale and jail, since they do not perceive the initial segments in these words as categorically different.

The only context where is found is in syllable-initial position. Glides cannot be strengthened if preceded by a consonant in the same syllable. Thus, for instance, italjáno ‘Italian, masc.’, always with a pure glide, may constrast with itál. áno (y tal llano) ‘and such a plain’ where the element transcribed as has the range of realizations described above.

{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 {nasal^{O}} features may not co-occur with {liquid^{O}} ({lateral^{O}} or {rhotic^{O}}) *//ml, nl, mr, nr//. Onset oral {obstruent^{O}, apical^{O}} may not co-occur with {lateral^{O}} *//Stl, SDl, tl, sl, Dl//. Onset {continuent^{O}, apical^{O}} and {continuent^{O}, dorsal^{O}} may not co-occur with {liquid^{O}} ({lateral^{O}} or {rhotic^{O}}) *//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 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-interrupted^{O}, labial^{O}, high, front} {nasal^{O}, apical^{O}, low}, //##Spi-na##//, [es pi na]; 'estado' (state) {complex-interrupted^{O}, apical^{O}, low} {lax^{O}, apical^{O}, back}, //##Sta-Do##//, [es ta do]; 'escala' (scale) {complex-interrupted^{O}, dorsal^{O}, low} {lateral^{O}, low}, //##Ska-la##//, [es ka la]; and 'esfera' (sphere) {complex-continuant^{O}, front} {rhotic^{O}, 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-interrupted^{O}, labial^{O}, high, front} {rhotic^{O}, 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-interrupted^{O}, labial^{O}, high, front} {rhotic^{O}, 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 {spirantized^{O}}. 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: {tense}[ii], {lax}, {nasal}, {lateral}, {rhotic}, {palatalized}, or {labialized}[iii].

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

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Appendix J

triphthong, is analyzed as {lax^{O}, labialized^{O}, labial^{O}, 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**			
	simplex	interr	**p**	**t**	**k**	**S**	tens
		cont	**f**	**s**	**h**		
		lax	**B**	**D**	**G**	**D**	lax
		nas	**m**	**n**		**N**	nas
approximant		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

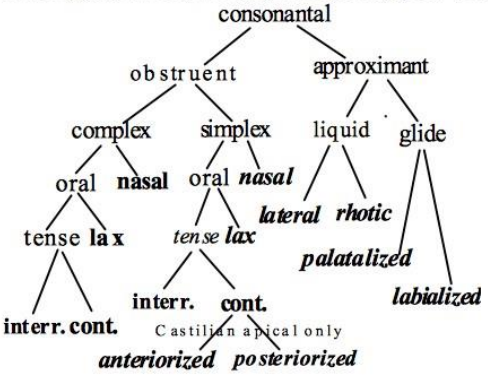
Manner features are {complex-interrupted, complex-continuant, complex-lax, complex-nasal, interrupted, continuant, lax, nasal, lateral, rhotic, palatalized, labialized}. For example, 'prueba' (test) //prwe-Ba// is represented as {interrupted^{O}, labial^{O}, rhotic^{O}, labialized^{O}, front} {lax^{O}, labial^{O}, 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-interrupted^{O}, labial^{O}, nasal^{C}, back} {continuant^{O}, dorsal^{O}, low}; //St// 'estilo' (style), //##Sti-lo##//, [es ti lo], {complex-interrupted^{O}, apical^{O}, high, front} {lateral^{O}, back}; //Sk// 'esclavo' (slave) //##Skla-Bo##//, [es kla βo], {complex-interrupted^{O}, dorsal^{O}, lateral^{O}, low} {lax^{O}, labial^{O}, back}. For {complex-continuant}, *e.g.,* //Sf// 'esfinge' (sphinx) //##SfiN-he##//, [es fiŋ he], {complex-continuant^{O}, nasal^{C}, high, front} {continuant^{O}, dorsal^{O}, front}, place is not specified because it occurs with {labial} only.

3.2.2. Interrupted

//p// 'papa' (potato) //pa-pa// {interrupted^{O}, labial^{O}, low} {interrupted^{O}, labial^{O}, low}; //t// 'tanto' (much) //taN-to// {interrupted^{O}, apical^{O}, nasal^{C}, low} {interrupted^{O}, apical^{O}, back}; //k// 'coco' (coconut), //ko-ko//, {interrupted^{O}, dorsal^{O}, back} {interrupted^{O}, dorsal^{O}, back}. The interrupted palatalized obstruent onset, as in the first syllable of 'chapa' (veneer) //tja-pa//, is specified phonologically as {interrupted^{O}, apical^{O}, palatalized^{O}, low} {interrupted^{O}, labial^{O}, low}, in parallel with 'piano' (piano) //pja-no// {interrupted^{O}, labial^{O}, palatalized^{O}, low} {nasal^{O}, apical^{O}, back}, and 'quieto' (quiet) //kje-to// {interrupted^{O}, dorsal^{O}, palatalized^{O}, front} {interrupted^{O}, apical^{O}, 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//, {continuant^{O}, labial^{O}, lateral^{C}, high, front} {continuant^{O}, labial^{O}, low}; //s// 'sosa' (soda/NaOH), //so-sa// {continuant^{O}, apical^{O}, back} {continuant^{O}, apical^{O}, low}; //h// 'jengibre' (ginger) //heN-hi-Bre//, {continuant^{O}, dorsal^{O}, nasal^{C}, front} {continuant^{O}, dorsal^{O}, high, front} {lax^{O}, rhotic^{O}, labial^{O}, 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' (lisping) //θo θa so//, {anteriorized^{O}, back} {anteriorized^{O}, low} {posteriorized^{O}, 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//, {lax^{O}, labial^{O}, rhotic^{C}, low} {lax^{O}, labial^{O}, low}; //D// 'dados' (dice) //Da-DoS//, {lax^{O}, apical^{O}, low} {lax^{O}, apical^{O}, tense^{C}, back}; //G// 'gringo' (North American) //GriN-Go//, {lax^{O}, dorsal^{O}, rhotic^{O}, nasal^{C}, high, front} {lax^{O}, dorsal^{O}, back}.

3.2.5. Nasal

//m// 'mima' (mime) //mi-ma//, {nasal^{O}, labial^{O}, high, front} {nasal^{O}, labial^{O}, low}; //n// 'nana' (grandmother) //na-na//, {nasal^{O}, apical^{O}, low} {nasal^{O}, apical^{O}, low}. The apical palatalized nasal onset, as in the second syllable of 'caña' (cane) or 'cania' (small nettle) //ka-nja//, is specified as {interrupted^{O}, dorsal^{O}, low} {nasal^{O}, palatalized^{O}, apical^{O}, low}, in parallel to 'miedo' (fear) //mje-Do// {nasal^{O}, palatalized^{O}, labial^{O}, front} {lax^{O}, apical^{O}, back}.

VCV (vowel-consonant-vowel) is always syllabified as V-CV: *a-la* 'wing', *a-mo* 'I love'. This rule has no exceptions in Spanish.[5] Remember, in this respect, that orthographic *rr* represents a single consonant /r̄/. Thus *perro* 'dog' is [pé.r̄o][6] and orthographically as well we would have *pe-rro* as the proper syllable division at the end of a line. This also applies of course to the orthographic digraphs *ch* and *ll*: *co-che* [kó.t͡ʃe] 'car', *va-lla* [bá.ja] 'fence'. A phonology/orthography mismatch is presented by the letter *x* when it stands for /ks/, as in, for instance, *taxi* 'taxi', *examen* 'exam'. Phonologically we have [ták.si], [ek.sá.men]. For orthographic purposes, the division at the end of a line would be as in *ta-xi*.

5.3.2 Consonant clusters

A sequence of two consonants is syllabified as an onset cluster only if it is one of those groups that are possible word initially. As already mentioned, these are always of the form plosive or /f/ + /ɾ/ or /l/ (*muta cum liquida* in classical terminology). Consequently, we have *o-tro* 'other', *la-bro* 'I till', *co-pla* 'song' but *ar-te* 'art', *cuen-ta* 'bead'.

The same principle applies for the syllabification of word-internal sequences of three or four consonants. Grouped with a following nucleus as onset we can have at most two consonants, a *muta-cum-liquida* cluster: *com-pro* 'I buy', *en-tra-da* 'entry', *cons-truc-ción* 'construction'. A useful way to think about this is that, when we divide a word into syllables, each syllable must have the structure

Appendix L

Table 5.8 Examples of pairs contrasting in syllabification of sequences of vocoids.

Exceptional hiatus (exceptions to Gliding rule)		Diphthong (by Gliding rule)
dueto [du.éto] 'duet'	vs	*duelo* [du̯élo] 'mourning; duel'
pié [pi.é] 'I chirped'[11]	vs	*pie* [pi̯é] 'foot'
riendo [r̄i.éndo] 'laughing'	vs	*siendo* [si̯éndo] 'being'
mi diana [miði.ána] 'my target'	vs	*mediana* [meði̯ána] 'medium, *fem.*'
reiré [r̄e.iré] 'I will laugh'	vs	*reiné* [r̄ei̯né] 'I ruled'
huimos [u.ímos] 'we flee'	vs	*fuimos* [fu̯ímos] 'we were; we went'
enviamos [embi.ámos] 'we send'	vs	*envidiamos* [embiði̯ámos] 'we envy'

stress on their own. What needs to be lexically marked as exceptional is that some high vocoids constitute nuclei of separate syllables in contexts where they should be syllabified together with another vowel and realized as glides (RAE 1973:58; Hualde 1997; J. Harris and Kaisse 1999, etc.).

To summarize:

- Sequences of two vowels are syllabified as hiatus if both are nonhigh (e.g. *poeta*) or if at least one is high but stressed (e.g. *caída*). Sequences

caz 'perspicacious' and in the last syllable of bi-ceps 'biceps'. In Spanish **coda** clusters the second consonant is always /**s**/.2 Nucleus and **coda** together are said

configuration (vowel + glide).

Rising diphthongs

/ia/	*italiano* [i.ta.ljá.no] 'Italian', *feria* [fé.rja] 'fair'
/ie/	*pienso* [pjén.so] 'I think', *pie* [pjé] 'foot'
/io/	*idioma* [i.ðjó.ma] 'language', *patio* [pá.tjo] 'yard'
/ua/	*cuando* [kwán̪.do] 'when', *recua* [r̄é.kwa] 'mule train'
/ue/	*prueba* [prwé.βa] 'test', *tenue* [té.nwe] 'tenuous'
/uo/	*cuota* [kwó.ta] 'quote', *fatuo* [fá.two] 'fatuous'

Falling diphthongs

/ai/	*vainilla* [baj.ní.ja] 'vanilla', *hay* [áj] 'there is'
/ei/	*veinte* [béj̪n̪.te] 'twenty', *rey* [r̄éj] 'king'
/oi/	*boina* [bój.na] 'beret', *hoy* [ój] 'today'
/au/	*jaula* [xáw.la] 'cage', *taurino* [taw.rí.no] 'related to bullfighting'
/eu/	*neutro* [néw.tro] 'neutral', *Europa* [ew.ró.pa] 'Europe'
/ou/	*bou* [bów] 'type of fishing boat'[10]

In its preference for rising diphthongs over hiatus in this context, Spanish clearly differs from English. Notice, for instance, that in Spanish there are diphthongs in *Vje-na*, *In-dja-na*, *San-Dje-go*, whereas in English the sequences in these words are heterosyllabic, *Vi-en-na*, *In-di-a-na*, *San-Di-e-go*.

d2) Sequences where two different high vocoids are in contact are also generally diphthongs.

additional evidence regarding the sonority of /f/, in support of the proposal in Martínez-Gil (2001); (ii) introducing refinements to the onset cluster generalization/condition (OC) (Martínez-Gil 2001; Colina 2009), most importantly with regard to point of application. The current proposal rests on input and output underspecification of voiced obstruents.

0 Introduction

Onset clusters in Spanish consist of an obstruent or /f/ plus a liquid, e.g., *blanco* 'white', *egresar* 'to graduate', *sufrir* 'to suffer', with the exception of /tl/ and /dl/ which are ill formed in some dialects (*tl) and/or in all (*dl). While this descriptive generalization is uncontroversial, the phonological account of onset clusters has been a topic of debate amongst Spanish phonologists for several decades now (Harris 1983, Harris 1989a, 1989b, Martínez-Gil 1997, Martínez-Gil 2001, Colina 2009a). Most analyses agree that the main factor driving the onset generalization and the well-formedness of the cluster is sonority. Yet, it is not entirely clear why /f/ is the only fricative grouped with the obstruents. Onset clusters cannot be fully understood without an account of the behavior of /f/ in this syllabic position. This paper contributes to our phonological understanding of onset clusters in Spanish by: (i) presenting additional independent evidence regarding the sonority of /f/ and of voiced stops in Spanish, supporting the proposal in Martínez-Gil (2001); (ii) highlighting the implications of this account for the rest of the phonology, specifically with regard to phonemic inventory and

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in (6) (Martínez-Gil 1996, 1997, 2001; Colina 2009a).

(6) Sonority scale for Spanish (Martínez-Gil 2001: 217)

Obstruents		Sonorants	
p, b, t, d, k, g, f	θ, s, h, x, tʃ, dʒ	m, n, ɲ, ʎ, r	l, ɾ
1	2	3	4

He also argues that sonority classes are driven by manner of articulation, rather than point of articulation. According to this, the relevant onset cluster generalization is that an onset cluster in Spanish consists of two consonants that differ maximally in sonority rank (7): the first member is drawn from the group of the least sonorous consonants permissible in the onset (voiced and voiceless stops) and the second member from the most sonorous ones (liquids), i.e., from groups 1 and 4 respectively in (6).

(7) Complex Onset Condition (Martínez-Gil 2001: 219)
A complex onset in Spanish is limited to two consonants that differ maximally in sonority rank.

Given the scale in (6) and the Complex Onset Condition in (7), it is clear that Spanish does not allow /s/ + stop clusters, as some languages do, because of the sonority reversal that they entail (i.e., they do not satisfy the Complex Onset Condition). Placing Spanish in a broader cross-linguistic context, one may also