Optimality Theory and language change in Spanish*

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The present chapter discusses Optimality-Theoretic approaches to language change in Spanish, reviewing a number of works that invoke not only the interaction of faithfulness and markedness constraints, but also the role of perceptual, cognitive, systemic and external influences on linguistic structure and change at the level of segment and segmental inventory, syllable- and prosodic structure, and intersecting points of morphology, and mentions formal considerations that impact these. The chapter concludes with an appendix that attempts to list all works published to date that treat language change and variation in Spanish and Hispano-Romance from an OT perspective.

Keywords: Dispersion Theory, intrusive stop formation, language change (phonological, morphological), lexicon optimization, markedness, metathesis, Optimality Theory, sonority, sporadic sound change, syllable structure, underspecification

o. Introduction

Not long after the circulation of the earliest manuscripts in Optimality Theory (OT; Prince and Smolensky 1993, McCarthy and Prince 1993a,b), its application to language change was initiated (e.g., Jacobs 1995, Gess 1996, Holt 1997). While historical OT analyses frequently rely on traditional argumentation to sustain them, they are often innovative and allow for the establishment of a relation between changes that were not seen as interrelated previously. Likewise, OT approaches have been successful at incorporating or recovering previous insights into the new theoretical machinery (e.g., functional notions), where previous generative approaches typically viewed the rule component of a language, and changes to it, as the proper object of inquiry.

^{*} The discussion presented here of OT and language change in general draws heavily from Holt (2003b), though the present work concentrates on Hispano-Romance. Thanks to two anonymous reviewers and to the editors for their comments; all inadequacies remain mine.

The question naturally arises for the historical linguist, How is language change to be characterized within a constraint-based approach that intends to be universal? An obvious answer, given the nature of OT, is via the divergent ranking of constraints; that is, that the history of a language might be viewed as being composed of a series of stages, each of which exhibits a specific constraint hierarchy. Slight reranking of the constraint hierarchies, that is, variation in the relative importance of the constraints from one language to another and from one time period to another, would elegantly capture variation in the syllable structure and phonological/phonetic forms of a given language family. Additionally, listener-oriented factors, like the effects of perception and reinterpretation by the hearer (as by the OT notion of lexicon optimization, related to the traditional concepts of reanalysis and restructuring) may play a role in the historical development of certain phenomena (e.g., Holt 1997). Likewise, several phonological processes and historical changes may be seen as interrelated, for example the impact caused by the loss of contrastive vowel length in Latin on the subsequent simplification of moraic (syllable-final and geminate) consonants from Latin to Hispano-Romance (Holt 1997, 2003b). The contributions to the recent volume on Optimality Theory and language change (Holt 2003a), while disparate in their specific implementation of OT, explore these themes, and make a strong contribution to the study of the fields of language change, Optimality Theory, and linguistic theory more broadly.

The present chapter will offer an overview of the questions that theoretical treatments (both standard generative and Optimality-Theoretic) sought to answer and discusses the results they obtained. A survey follows of a number of works in OT that emphasize the role of perception, cognition, systemic and external influences on linguistic structure and change specifically in Spanish and Hispano-Romance. Topics addressed will include the segment and segmental inventory, syllable- and prosodic structure, and morphological issues.

An appendix to the chapter attempts to list all works published to date that treat language change in Spanish and Hispano-Romance from an OT perspective.

1. Generative grammar and historical change in Hispano-Romance

One of the best-studied language families is Romance, and the earliest investigations of it (e.g., Diez 1874, Meyer-Lübke 1895 and particularly for Hispano-Romance, Menéndez Pidal 1904, Lapesa 1986, Lloyd 1987, Malkiel 1963–4 and Penny 1991) provided painstaking collections of data, along with many insightful observations that still serve as the foundations upon which current investigations frequently build. As Malkiel (1963–4:144) acknowledges, it is also important that matters of theory be addressed, though philologists and generative linguists have different ideas regarding 'theoretical refinement'. Under generative grammar (Chomsky 1957, 1965, Chomsky and Halle 1968) historical change is characterized differently. Hartman (1974:123), in discussing phonology, summarizes this shift in perspective: Kiparsky (1965) and King (1969) — with the impetus of Halle (1962) — have given us a theory of language change that differs from earlier theories in that it implies that language history is two-dimensional: that is, a historical grammar is not simply a list of sound-change laws in chronological order, but a diachronic series of synchronic grammars. Each synchronic grammar consists of a list of ordered rules, and historical changes include not only rule addition, but also rule loss, rule reordering, rule simplification, and restructuring of underlying forms. It is these additional types of change — principally rule reordering and simplification — that make phonological history different from synchronic phonology and thus interesting in its own right.

That is, "what really changes is not sounds, but grammars" (Postal 1968:270). This is because once the system of rules and the underlying forms of two languages are established, changes in the phonology between the two stages or varieties are logically limited to changes in the form, order or inventory of rules, or in the underlying representations. Language change, under this view, is not defined within a single grammar but is a description of a relationship between grammars (as noted by Reiss 2003).

Regarding the rule component, there were argued to be cases of rule *addition* (i.e., innovation), *loss, reordering* and *inversion*. Rule addition was the only type of change that could affect adult grammars (presumably occurring only at the end of the application of the system's rules, so that it would have only its effect, and allow communication with speakers who lacked the innovation); the others occurred between generations of language speakers.

Examples from the history of Spanish would include, for instance, the innovative palatalization of /l/ after /k/, the lexicalization of palatal *ll* from the initial clusters *pl*, *fl*, *cl* (*llover*, *llama*, *llave*), or the creation of *ch* from these same clusters postnasally (*ancho*, *hinchar*, *mancha*). Likewise, we may speak here of the loss of the rule of palatalization of the /l/ in the Latin clusters, and of their devoicing, as these phenomena have not persisted into Modern Spanish. (These data are treated in OT in Holt 1997, 1998, discussed below.) A case of rule reordering might be taken to obtain between dialectal treatments of /s/-aspiration and cross-morphemic syllabification. That is, in some dialects syllable-final /s/-aspiration appears to occur before syllabification across words (/mas o menos/ > [má-ho-mé-noh]; /nos+otros/ > [no-hó-troh], with aspiration, then resyllabification), and in others after resyllabification, (/mas o menos/ > [má-so-mé-noh]; /nos+otros/ > [no-só-troh], with resyllabification, then aspiration).

Rule inversion might be exemplified by certain cases of morpho-syntactic hypercorrection, as perhaps in the extension (overgeneralization) of second person singular *-s* in nonstandard Spanish to the preterit forms (e.g., *comistes* 'you ate', like present tense *comes*, versus standard *comiste*). (Similar data are treated in OT in Martínez 2000. See Bermúdez-Otero and Hogg 2003 for a treatment of rule innovation, loss and inversion in the history of English.)

Restructuring is the other locus of language change, presumed to be limited to the acquisition process of children, where discrete breaks in language learning between generations occur, as children may formulate a different set of rules than that of their

parents, and reorganize the modifications of the parents' speech into a more systematic, simpler version of the grammar (Halle 1962, discussed in Labov 1972). This may have a profound effect on the lexicon, as the effects of innovative categorical rules may be transferred to the representations of underlying forms. This accords with Postal's (1968) Naturalness Condition, which demands that underlying representations be identical to phonetic representations unless required otherwise by evidence. (A similar point could be made regarding the relationship between sound change and analogy.)

McMahon (1994:44 et passim) points out several problems with classical generative approaches, for instance, the lack of evidence to support the assertion that languages are evolving to an ever more simple state; likewise, it is clearly the case that some rules introduce complexity/irregularity into the grammar, while other changes, like a sound shift (as in Romance lenition), seem not to be simplificatory. Further, early approaches tended to model synchronic grammar as a compendium of historical rules, with restructuring and rule loss seldom invoked. As Chomsky and Halle (1968:49) put it:

...underlying representations are fairly resistant to historical change, which tends, by and large, to involve late phonetic rules. If this is true, then the same system of representation for underlying forms will be found over long stretches of space and time.

Under such a static model of grammar, the divergence of dialects and languages is limited principally to the order of late rules. For instance, the Romance languages would presumably share a common lexicon, which while true etymologically is untenable psycholinguistically. For instance, Harris (1969) posits underlying /lakte/, equal to its Latin root, for Modern Spanish leche, and formulates synchronic rules of vocalization, palatalization and vowel raising that recapitulate diachrony. Later approaches employing Lexical Phonology and Morphology (e.g., Kiparsky 1988, 1995, Kaisse 1993, Zec 1993) sought to move toward an explanation of change, including both actuation (why a change might begin) and transmission (how a change, once initiated, spreads). Proponents assume a less abstract analysis according to which underlying and surface forms are similar, and that the rules that operate in a grammar involve the integration of phonology and morphology at lexical and phrasal levels. Thus, Lexical Phonology offers a pathway whereby sound changes are incorporated into the synchronic grammar (McMahon 1994: 65) via a two-stage theory whereby phonetic variation is selectively integrated into the grammar and is passed on to successive generations via language acquisition (Kiparsky 1995: 642).

Within OT, some researchers have replicated this stratal model (e.g., Kiparsky 2000, Bermúdez-Otero and Hogg 2003, Gess 2003, Jacobs 2003, Minkova and Stockwell 2003), with separate, serially related OT constraint systems for stems, words and sentences. The aim is to yield a more restrictive and well-defined constraint inventory without need for recourse to output-output, sympathy or paradigm uniformity constraints, which these authors believe severely compromise OT. Likewise, many assume that a learner's phonetic input may lead to both reranking of constraints as well as to lexical restructuring via a principle of lexicon (and concomitantly, grammar) optimization. Interestingly, in many, if not most, OT studies on language change, candidates deemed 'nearly optimal' according to the evaluation of the constraint hierarchy subsequently become optimal ones when constraints are reranked. Naturally, one must justify the constraints employed in a given analysis and why they have been reranked to present a restrictive theory of sound change. Likewise, Bradley and Delforge (2006), surveyed below, call for a stratal model, couched in Dispersion Theory, that better allows for the incorporation of changes first at the phrasal level, then at the lexical level.

2. OT and language variation and change

If there are no rules, language change cannot be due to a change in the rule component, and if all constraints are universal, then it must be their relative ranking that determines dialectal variation and historical change. It is not always clear, however, that mere reranking is uniquely involved, since differences in underlying forms may play an important role as well, and restructuring of surface forms will impact the cues the learner has regarding the correct position of various faithfulness and markedness constraints.

Restructuring is effected according to the OT principle of lexicon optimization, which says that given the surface form of a morpheme and knowledge of the grammar, a learner will select the optimal underlying representation for that morpheme:

[O]f all the possible underlying representations that could generate the attested phonetic form of a given morpheme, that particular underlying representation is chosen whose mapping to phonetic form incurs the fewest violations of highly ranked grammatical constraints. (Inkelas 1995, based on Prince and Smolensky 1993:192)

Under lexicon optimization, underlying forms may be fully specified, with only alternating structure unspecified, as the EVALUATOR will consider optimal those candidates with fewer faithfulness violations (e.g., MAXIMALITY — "do not delete any segment/ feature"; and IDENTITY — "do not change any segment/feature"). While this places a higher burden on the lexicon, it reduces the load placed on the grammar. That is, a speaker mentally stores what is heard produced and will only entertain a more abstract underlying form when there are related groups of words whose shared segments vary only in certain features. This implies that historical forms are not inherited genetically, but are eliminated from the lexicon (see Hutton 1996 for discussion of what he terms the Synchronic Base Hypothesis); in other words, language change is not a matter of derivation, but of substitution of one input for another. On the assumption that younger members of a linguistic community are important in spreading change (i.e., the transmission problem), newer generations of listeners will lack evidence that a phonetic feature is due to a phonological process, and will posit the surface form as a lexical item (or, faced with morphological alternations, the nonalternating structure common to the related forms). Taking again the example of Modern Spanish leche

'milk', it is not the case that [leče] would surface as the optimal output synchronically for the form /lakte/ (as in Harris 1969, discussed above), despite the relation to words like *lácteo* 'milky' and *lactar* 'to lactate'; the phonological shape of the historical source is too far removed from the modern form, and so the historical form may not serve as its underlying representation. Instead, /leče/ would be posited.

A related matter is that discussed above regarding the impact of lexicon optimization on the acquisition process. With regard to the initial ranking and final placement of faithfulness and well-formedness (markedness) constraints, lexicon optimization suggests that not only does the phonetic output lead the listener to posit surface-true lexical items (like /leče/), but it also will lead the learner to reposition constraints from their original ranking (e.g., the constraint that favors palatalization of /k/ before a front vowel). That is, for a constraint with an initially high ranking, the lack of phonetic evidence that it is violated will allow the listener to leave it in its original position. Likewise, when a listener does hear phonetic forms (like [kerer] *querer*) that violate a certain constraint, she will demote the constraint to allow for the grammaticality of the output form heard. Newer speakers would not be aware of a change in the ranking of constraints, but learn the final ranking of constraints based on the phonetic evidence.

Regarding changes to the constraint hierarchy, Tesar and Smolensky (2000) argue for a learning algorithm where only constraint demotion is possible, though it is an empirical question yet to be decided definitively, and certain historical changes may require recourse to constraint promotion (see, e.g., Holt 1997:chs.2–3, and Lleó 2003, who suggests that constraint promotion may only be available in the case of external or foreign influence on a language.)

3. Survey of major historical changes in Hispano-Romance treated in OT

In this section I survey a variety of segmental (vocalic and consonantal), prosodic (syllabic, syllable contact and metrical) and morphological (metathesis of clitics) data that have been treated using OT.

The development of *Cl* clusters from Latin to Hispano-Romance (Holt 1998) is of interest because of the divergent outcomes depending on their position in the word: initial *pl*, *fl*, *cl* show palatalization-cum-simplification (*llover*, *llama*, *llave*), while postnasally they yield affricate *ch* (*ancho*, *hinchar*, *mancha*). As noted by Lloyd (1987), the Upper Aragonese forms show what is likely an intermediate stage to that of Modern Spanish: CLAVE > cllau [kʎ] 'key', PLOVERE > pllover [pʎ] 'to rain', FLAMMA > fllama [fʎ] 'flame'. Such forms would then either develop toward simplification (initially), or if retained, might undergo further modification. With the initial consonant of the medial clusters sharing phonological structure with the preceding homorganic nasal, there was an increased resistance to simplification, which then allowed the common processes of voicing and place assimilation to continue. This would have led /(n)kʎ/ to be produced as [(n)kʎ] and eventually lexicalized as /(n)č/, due to reinterpretation based on acoustic similarity, markedness considerations and lexicon optimization. That is, given that different vocal tract arrangements may yield similar acoustic speech signals,

for the listener there may be articulatory ambiguity; however, the listener aims to pronounce words as nearly as possible in the way she has heard them, and reconstructs /t//(incorrectly). When alternate grammars may adequately account for the input, other factors determine the optimal grammar, which evolves to a more unmarked system; that is, this is 'emergence of the unmarked' (McCarthy and Prince 1993a,b), in that more complex segments have been reinterpreted as simpler ones.

Other classes of historical changes are best understood as the interaction of a faithfulness constraint with a family of markedness constraints.¹ A case that may serve to illustrate this point is the collapse of distinctive vocalic quantity in Latin, which had significant repercussions on the development of the vocalic and consonantal systems of Hispano-Romance (Holt 1997, 1999b, 2003b). Reanalysis by the listener of phonetic differences leads to loss of vowel length distinctions, which in turn initiated far-reaching changes that lead to the recovery of systemic balance in the distribution of long segments. The end result of these changes is that Old Spanish and Galician/Portuguese arrive at consonant inventories composed entirely of simple segments, having no mismatch with those segments that could be distinctively long (vowels and consonants in Latin, only sonorants in Early Hispano-Romance, none in Old Spanish and Galician/Portuguese). Systemic parity, initiated by listener reinterpretation, is recovered, and in a fashion that is maximally optimized and transparent to the listener and follows naturally from the implementation of Zec's (1995) theory of the relation of moraic theory and sonority classes:

(1) Major class features of segments:

| | [consonantal] | [sonorant] |
|------------|---------------|------------|
| vowels | - | + |
| sonorants | + | + |
| obstruents | + | - |

(2) Sonority classes from Latin to Old Spanish and Galician/Portuguese Latin: μ = unrestricted

(all vowels and consonants may be moraic)

Hispano-Romance: $\mu = [+sonorant]$

- (vowels and sonorant consonants may be moraic)
- Old Spanish, Galician/Portuguese: µ = [-consonantal]

(only vowels may be moraic)

Further, speakers reformulated the Latin Stress Rule as a constraint favoring heavy stressed syllables (STRESS-TO-WEIGHT), and this constraint interacted with others militating against long elements (*LONG-VOWEL, *LONG-[-ATR], NODIPHTHONG) to shape the evolution of the seven-vowel system of Late Spoken Latin ([i e ϵ a \circ o u]), yielding [je < ' ϵ] (*bien* vs. *benéfico*) and [we < ' \circ] (*bueno* vs. *bondad*) in Old Spanish,

^{1.} Zubritskaya 1995 has argued that the loss of palatalization assimilation in consonant clusters in Modern Russian is due to the progressive demotion of the constraint requiring assimilatory spreading (MAXIMIZE LICENSING in her account) below the family of constraints that militate against secondary articulation.

where an intensified stress accent arose due to heavier Germanic influence, and increased duration allowed lengthened lax vowels to be articulated heterogeneously (à la Donegan, e.g. 1978/1985). A host of evidence indeed appears to indicate that the stress accent of pre-Galician/Portuguese was weaker than that of pre-Old Spanish (Williams 1962:11–13, 53, 56–57, 78, 87–88): less syncope in Galician/Portuguese (e.g., *-ável* vs. *-able, dívida* vs. *deuda, dúvida* vs. *duda*); slower formation of yod/wau (as indicated by the voicing of the intervocalic consonants in (e.g., SAPIAT > saiba vs. Sp. sepa 's/he know (subj.)', and SAPUIT > soube, vs. Sp. supe 'I knew, found out'); hiatus (long retention of syllabic value of e in hiatus in forms like *fêmea* 'female', from versification); and diphthongization itself (c[ɛ]u vs. *cielo*, f[ɔ]go vs. *fuego*) indicates that stress in pre-Galician/Portuguese was weaker than in pre-Old Spanish.)²

The strong accent of intensity characteristic of Germanic (Meillet 1970:38) was apparently slower to take hold in the more distant and isolated territory where Galician/Portuguese was to develop. Under this scenario, Germanic influence primarily affected pre-Old Spanish territory, and led to the adoption of their preference for long lax vowels to become tense. That is, the constraint disfavoring long lax vowels that had been lower ranked in Late Spoken Latin became more dominant:

| /bɔno/ 'good' | STW | *Long-[-atr] | No Diphthong | *Long-Vowel | |
|---------------|-----|--------------|--------------|-------------|--|
| a. bono | *! | | | | |
| b. boono | | *! | | * | |
| ☞ c. boɔno | | | * | | |

(3) Diphthongization in Old Spanish

We see here that both serious candidates have a heavy penult, satisfying STW, while candidate (a) does not, and is so eliminated from consideration.³ Candidate (b) is likewise eliminated from consideration because it shows a long lax vowel, disfavored under Germanic influence. When speakers became aware of this tendency toward fracture, lexicalization of this alternation resulted; that is, lexicon optimization leads to reanalysis of [oɔ] (< /ɔ/) as /oɔ/ (and similarly for /eɛ/ from [eɛ] < /ɛ/). Subsequent dissimilation and lexicon optimization leads to /wo/ (as in Italian; later /we/ in Old Spanish) and /je/.

The connection between the loss of vocalic quantity and the simplification of geminate and syllable-final consonants (first obstruents, later sonorants) is implemented

^{2.} Lleó 2003:275 discusses additional evidence from Duffell 1999 and Bayo Julve 1998 for stress-timing (rather than more even syllable-timing) in Old Spanish (as well as in Old French).

^{3.} The ranking of NODIPHTHONG and *LONG-VOWEL has remained constant, reflecting that all other vowels (i.e., the tense vowels and /a/) remained lengthened, but did not diphthongize. This is because for these vowels, phonetic conditions never yield a disfavored combination of length and [-ATR]. Only lengthened lax vowels lead to phonological diphthongization because of their marked status in combining features that are difficult to sustain together for articulatorily-grounded reasons (Donegan 1978/1985:118).

via the progressive reranking of MAX/IDENT vis-à-vis the sonority hierarchy:^{4,5}

 (4) Reranking of faithfulness vis-à-vis sonority/moraicity hierarchy
 MAx
 ↓ MAx
 MAx
 MAx
 MAx
 Modern Spanish, Galician, Portuguese

| • | \downarrow | Modern Spanish, Ganeian, Ford |
|--|--|-------------------------------|
| *O _µ » *N _µ » *I | $L_{\mu} $ » * G_{μ} » * V_{μ} | (Sonority hierarchy) |

That is, while in Latin all segments may bear a mora (permitting both long vowels and geminate consonants), the progressive demotion of MAX in later stages of Hispano-Romance leads to degemination both of obstruents (CUPPA > *copa*; GUTTA > *gota*; BUCCA > *boca*) and then sonorants (ANNUM > $a\ddot{n}o$, BELLA > *bella*, with palatal [Λ]), as well as to the weakening and loss of syllable-final consonants (TRUCTA > Moz. *truhta* > Sp. *trucha*; MULTU > *muito* > *mucho*):

| | · · · · · · · · · · · · · · · · · · · | | | | |
|-----------------------------------|---|---|-------------------------------|--|--|
| /-k, -g/ | *O _µ ('NMO') | Max/Ident | *N,*L,*G _µ ('NMS') | | |
| | (Syllable-fina | (Syllable-final obstruents vocalize to bear mora) | | | |
| -k _µ , -g _µ | *! | | | | |
| œ-j _µ | | * <+cons> * <-son> | * | | |
| $/k_{\mu}, g_{\mu}/$ | (Intervocalic morai | (Intervocalic moraic obstruents lose their mora, simplifying) | | | |
| $k_{\mu}^{}g_{\mu}^{}$ | *! | | | | |
| ☞ k, g | | * <µ> | | | |
| j _μ | | * <+cons> *! <-son> | * | | |
| $/n_{\mu}^{}, l_{\mu}^{}/$ | (Sonorant geminates still valid mora-bearers at this stage) | | | | |
| $rac{rac}{r_{\mu}}, l_{\mu}$ | | | * | | |
| n, l | | *! <µ> | | | |

(5) The surface moraic status of consonants in early Old Spanish.

^{4.} In Holt 2002, this approach is extended to the behavior of /-l/, whose higher sonority should have shielded it from erosion effects and ensured its mora in the early stages; instead, it vocalized (ALTERU > *outro*) along with /-k, -g/ (ACTOR > *autor*). Previously, it was assumed that /-l/ was velarized, and stipulated that all velars vocalized. By synthesizing insights on the articulator group hypothesis from Padgett 1991/1995 (and subsequent work) and on the feature geometry of liquids from Walsh-Dickey 1997, /-l/ is seen as [-cont] at its primary coronal articulation and so is targeted by Lenition, in part the step-wise reduction of valid mora-bearing, thus syllable-final, segments.

^{5.} In previous work I have employed the term NoMORAICCONSONANT (NMC) for typographical and expository convenience; really, NMC (and its subtypes, NoMORAICOBSTRUENT (NMO), No-MORAICSONORANT (NMS), etc.) is a cover term for the interaction between faithfulness, the sonority hierarchy and moraicity.

At this stage (and abstracting away from vocalic and other changes), MULTU is realized at [mujto], CUPPA as [kopa] and CASTELLUM as [kastillo]. The ranking of MAX/IDENT with respect to the sonority hierarchy encodes the fact that erosion of an offending segment is better than total loss, and relates vocalization to reduction of geminates.

The relationship between faithfulness and the sonority hierarchy continues to shift in the same direction, toward unmarkedness, and eventually even the sonorant consonants lose their license to bear a mora. Further systemic factors having to do with perceptual distinctiveness lead to the simplification-cum-palatalization of /nn, ll/.

Thus, whereas Latin /-n-, -l-/ were lost in Galician/Portuguese (pão, paço), and the reduction of /nn, ll/ to /n, l/ caused no merger, they were retained in Old Spanish (cana, pelo). The next step-wise re-ranking of MAX/IDENT will cause the loss of the moraic status of /nn, ll/, and might be expected to yield /n, l/, as in Galician/Portuguese. However, they cannot lose their moraic status without occasioning merger unless some other change takes place to distinguish them. It appears, therefore, that merger avoidance was indeed a factor in the evolution of Spanish /nn, ll/. That is, systemic factors influence the learner/listener to restructure the grammar in a particular way to ensure that former communicative distinctions are maintained, while at the same time continuing to reestablish systemic parity in the distribution of moraic segments according to sonority. That is, because geminates are intervocalic consonants that bear a mora, the added weight yields length; a certain amount of energy is required to manifest this mora, and in production, length and energy are correlates of this unit of weight (i.e., the mora). Under the assumption that 'palatal' segments are actually doubly-articulated corono-dorsal structures (Keating 1988, Lipski 1989), it turns out that despite the loss of the mora, speakers do maintain some realization of 'doubleness', no longer as duration, but in articulation, with original COR and new DOR, i.e., 'palatal':

| /nn n/ | NMS | *Merge | Max/Ident/Dep |
|---------------------|-----|--------|-----------------|
| a. n n n n COR | *! | | |
| b. n n | | *! | * <µ> |
| ☞ c. n n COR DOR | | | * <µ> * +dor |

(6) Merger avoidance in Old Spanish of /nn, n/ by palatalization of /nn/

The appeal to *MERGE builds on Dispersion Theory (DT; Flemming 1995/2002, Padgett 2003, and the discussion of Baker 2004, this volume below), and couches in OT terms the structuralist notions of maximization of perceptual distinctiveness in contrast and minimization of articulatory effort (Saussure 1916, Martinet 1964). In this tableau, what is being evaluated is a system of inputs, not an individual segment. That is, the contrast between segments is considered, and *MERGE ('No output word has multiple correspondents in the input'; 'Maintain contrast', in effect) plays a role in the evolution of the long sonorants; since the high ranking of NMS forces loss of moraic status, doing so without further change would result in loss of the contrast *nn:n* (and also of *ll:l*).

If faithfulness is ranked below *MERGE, then a change to /n, Λ / will preserve contrast. Candidate (a) represents the previously optimal state where geminate sonorants are licit, and contrast with the singletons. The double association to COR is intended to represent the fact that in production, the coronal articulation is lengthened. Candidate (b) shows that merger with *n* would happen if the previously moraic *nn* lost its mora, contrary to fact. Candidate (c) shows the result in Old Spanish: moraic status is still lost, but a change in articulation (the addition of DOR) allows the preservation of contrast between *nn:n*, now *n:n*. The double implementation of COR is now replaced by the double articulation of COR-DOR. For Galician/Portuguese, given that /-n-, -l-/ were lost, elimination of the moraic status of /n_µ, l_µ/ does not violate *MERGE, and so nothing motivates a segmental change.

Other researchers have employed more articulated DT approaches to historical data in Spanish. For instance, Baker (2004, this volume) treats dispersion and duration in stop consonant contrasts from Latin to Spanish, and Bradley and Delforge (2006) treat systemic contrast and its role in the evolution of sibilant voicing.

Baker looks at the evolution of stops as they are affected by the series of changes collectively known as lenition, whereby voiceless geminate obstruents /pp, tt, kk/ simplified, while original /p, t, k/ had voiced to /b, d, g/ (e.g., CUPPA 'cup' > copa, GUTTAM 'drop' > gota, PECCATUM 'sin' > pecado, vs. LUPUM 'wolf' > lobo, ACUTUM 'sharp' > agudo, DICO 'I say' > digo), which caused no confusion because original /b, d, g/ had become the spirants $[\beta, \delta, \gamma]$ (which further frequently deleted intervocalically, e.g., CREDO 'I believe' > creo, REGINAM 'queen' > OSp. reína). This apparent chain shift, in which meaningful distinctions are realized at all stages, is analyzed via the interaction of constraints on maintenance and maximization of perceptual contrast (MAINTAINCONTRAST and MINIMUMDISTANCE, respectively), specifically relating to the features of duration, voice and continuancy (NOAPPROXIMANTS), along with a drive to weaken all consonantal articulations (LAZY) (as posited in atheoretical terms by Lloyd 1987 and Penny 1991, e.g.). Baker argues that the drag chain (in which simple voiced stops spirantized intervocalically first, which allowed for the voicing of the voiceless ones, followed finally by the degemination of the voiceless geminates) ensues from a constraint ranking that requires a three-way stop contrast at all times in Latin and Hispano-Romance, even though the realization of each stop series changes from one period to the next, as LAZY (for some unknown reason) assumes a higher ranking vis-à-vis the other constraints, leading in Modern Spanish to the merger between the voiced stops and approximants. (That is, these are now contextually determined.) Baker sees as an advantage to his approach that the role of duration-based cues in these processes in recognized.

Bradley and Delforge look at the loss of sibilant voicing contrasts in Old Spanish and its partial reemergence in several modern dialects (e.g., *has ido* contrasts with *ha sido* in voicing of the intervocalic [s] in the highlands of Ecuador, but both are pronounced with voiced [z] in certain dialects of central Spain). They examine the well known development of intervocalic voiced sibilants in medieval Spanish, which devoiced and merged with their voiceless counterparts. This is remarkable because it involved the loss of voicing between vowels, going against the trend of intervocalic consonant lenition in Western Romance (as discussed above), and because it involved neutralization in the syllable onset, a position favoring contrast preservation. Likewise, voicing in Ecuadorian Spanish is of interest because word-final position is usually associated with devoicing and neutralization of contrast, not with voicing and emergence of contrast. Bradley and Delforge show that Dispersion Theory provides an account of these patterns that allows explicit reference to articulatory and perceptual aspects of phonetic detail, yet limits the range of possible phonological contrasts.

(7) a. The sibilants of Old Spanish

| i. | /t ^s / | det ^s ir | deçir | 'to descend' | dental |
|------|-------------------|---------------------|-------|--------------|---------------|
| | /d ^z / | ded ^z ir | dezir | 'to say' | |
| ii. | / <u>s</u> / | oso | osso | 'bear' | apicoalveolar |
| | /z/ | ozo | 050 | 'I dare' | |
| iii. | /š/ | fišo | fixo | 'fixed' | prepalatal |
| | /ž/ | fižo | | | |

b. Devoicing of the sibilants of medieval Spanish (15th, 16th centuries; also shows result of deaffrication of the dentals)

| i. | /z/ > /s/ | desir | dezir | 'to say |
|------|-------------------------------------|-------|-------|---------|
| ii. | $ \underline{z} > \underline{s} $ | oso | 050 | 'I dare |
| iii. | /ž/ > /š/ | fišo | fijo | 'son' |

Bradley and Delforge distinguish between sibilants (and obstruents more broadly) that bear a phonological specification of [voice] versus those that are neutral, or targetless with respect to voicing, in that they assume the laryngeal attitude of a neighboring sound.⁶ That is, the articulatory gestures required to reach the perceptual target of phonological voicing or voicelessness presumably involve some degree of effort cost, and violate the markedness constraint *[avoice]. In contrast, no effort is made to realize a neutral obstruent as voiced or voiceless, and the gradient phonetic realization of syllable-final sibilants (e.g., $de[s]de \sim de[z]de$) falls out naturally as the least marked laryngeal setting of the phonetic context. Other constraints that play an important role are *MERGE, SPACE-SV ("minimal pairs differ in sibilant voicing at least as much as [s] and [z] between vowels") and σ [s ("a syllable-initial sibilant is [-voice]"). They further assume a distinction between lexical and postlexical phonological levels in OT that allows them to account for the phrasal behaviors exhibited in Ecuador and Spain that emerge precisely in those environments where [s] and [z] were contrastive in medieval Spanish. Finally, the paradox of losing contrast in syllable-initial position is resolved by the fact that voiced sibilants are marked both articulatorily and perceptually, a fact integrated into the DT apparatus.

^{6.} This would seem to be similar in spirit to the (non-OT) approach taken in Roca and Johnson 1999, where the voicing or not of /s/ in English in words like *raisin* vs. *basic* is attributed in part to underspecification and in part to cyclicity.

Likewise, Holt 1999a, 2000 treats vowel harmony in Asturian, and appeals to Archiphonemic Underspecification (Inkelas 1995) under a constriction-based vowel geometry (Clements and Hume 1995); in effect, Asturiano creates archisegments that lack only the alternating features for those cases of alternating a, e, o (only); high harmony may then be viewed as feature-filling; this has the effect of optimizing both grammar and lexicon.

OT approaches to prosody have been employed in treatments of syncope (Hartkemeyer 1997, 2000a,b, Lleó 2003) and syllable contact phenomena (e.g., metathesis, Holt 2004a,b, and consonantal epenthesis, Martínez-Gil 2003).

Hartkemeyer offers an analysis of syncope that calls on an anchoring constraint (LEFT-ANCHOR-V) that favors retention of initial vowels and a constraint that disfavors all vowels in the output (*V). Thus, all vowels should delete unless a more dominant constraint prevents it (e.g., LEFT-ANCHOR-V, HEADMAX).

Lleó (2003) analyzes the loss of unstressed vowels in Old Spanish and provides an account of why certain of them were deleted while others were preserved (e.g., sĒCŪRU > *seguro* vs. oC(U)LU > *ojo* vs. SECUNDU > *segund* or *segunt* 'second', later recovered). The conditions on vowel loss are made explicit, and include prosodic concerns (FOOT-TROCHEE, STRESS-TO-WEIGHT, PARSE- σ , HEADMAX) regarding the position of the unstressed vowel in relation to the primary and secondary stress, as well as phonotactic constraints on complex codas (NoCODA, NoCODACOMPLEX, CODA_{SON}>ONSET_{SON}) and morphological conditioning that bans deletion of lexical material (MAX-MOR-PHEME, MAX-SEGMENT, MAX-/a/). Increased syncope in Old Spanish is interpreted as the result of Germanic influence, whose stress-timed characteristics impacted the prominence of stressed and unstressed syllables, and the later increase of apocope is interpreted as taking place under French influence. Thus, syllable structure constraints are shown to have had a rather variable position in the hierarchy of constraints in different periods of Spanish (going from a rather dominant to a low-ranked position, and back again to a very dominant one) (Lleó, 280):

- (8) Stages in the position of NoCoda and Stress-to-Weight
 - Stage 1 Late Hispanic Latin: NoCodA dominates STW
 - Stage 2 Early Old Spanish: STW is promoted and outranks NoCodA
 - Stage 3 Old Spanish (11th-13th centuries): NoCODA is further demoted
 - Stage 4 Modern Spanish: NoCoDA is promoted, STW is demoted

Finally, Lleó suggests that constraint demotion is the normal means of internal sound change, whereas constraint promotion might have to be appealed to in the case of external conditionings for change.

With regard to the analysis of Hartkemeyer, Lleó recognizes that it technically works, but rejects it for two main reasons: (i) that in treating all unstressed vowels alike, it fails to account for the differential loss of vowels due to metrical reasons (to comply with FTTROCH and STW); and (ii), that given that vowels are basic to human language, and on the assumption that constraints are universal, a constraint banning vowels in such an blanket manner is suspect (Lleó, 276–277).

Metathesis has been treated as a case of optimization of syllable contact (Holt 2004a,b); that is, marked syllable contact brought about by syncope in Late Spoken Latin (CAT(E)NATU > candado) or by the concatenation of morphemes ($dezid#lo \sim dezildo$) is "repaired" such that the transition between syllables was improved. This is effected by the interaction of various constraints, including Syllable Contact Law, MINIMAL DISTANCE IN SONORITY, SONORITY SEQUENCING PRINCIPLE, ALIGN, and faithfulness constraints, primarily LINEARITY. The variation that existed is modeled

according to a partially-ordered OT grammar (Anttila 2002), and further factors that determine the ultimate outcomes are morphological structure and the external influence exerted by the prescriptivist cultural institution the Real Academia Española.

The listener is argued to play a role as well. Namely, there would have been ambiguous evidence for the construction of the grammar and lexicon in that two processes of grammaticalization were underway: (i) the erosion of Latin demonstratives into the clitic pronouns and articles of Old Spanish, which showed ambivalent grammatical status and wavering prosodic independence; and (ii) the future and conditional "endings" of Old and Modern Spanish were developing from the present tense of the auxiliary verb HABERE 'to have' and the imperfect tense of either HABERE or IRE 'to go'. At the earlier stages, the process is still unsettled, and there are abundant citations of future and conditional forms with these atonic pronouns where the clitic appears between the infinitive and the emerging "endings": e.g., amar lo é ~ lo amaré (Lloyd 1987:311), ferlo ia (Penny 1991:205-6), and excusarse ía (Gracián, Criticón, from the Golden Age, cited in Lapesa 1986:392). Likewise, there is a strong tendency towards enclisis, with attestations such as dixol (~ dixo le), diot (~ dio te), un colpel dio (~ un golpe le dio) and quem (~ que me) (data principally from Martínez-Gil 2003). These factors suggest that there was confusion in speakers' minds regarding the morphological analysis of the clitic pronouns, which would arguably hinder the definitive ranking of ALIGN with regard to the other constraints and lead to its partial ranking, in the sense of Anttila (2002). Beginning in the 17th century, the grammar must have Align » SyllCon, since metathesis no longer obtains. The founding of the Real Academia Española de la Lengua (1713/1714), whose focus was (and is) to maintain the purity of the language,⁷ surely played a decisive role. It is argued that this impulse toward purity would have disfavored the selection of metathesized forms, as each component morpheme would be compromised, and this appears to have led to the definitive ranking of ALIGN » SYLLCON. Within words, the metathesized forms were lexicalized, with no way to reconstruct their Latin form; on the other hand, morphological concatenation (as with the clitics and verbal forms) is productive, and would result in marked syllable contact upon each utterance. This conscious awareness would be susceptible to the prescriptivism of not overlapping or interleaving of segments of component morphemes.

Intrusive stop formation in Old Spanish also improves syllable contact, and Martínez-Gil (2003, who also treats Old French) compares rule-based approaches (e.g., Clements 1987) with his own constraint-based one. Data treated are of the sort Lt. HUM(E)RU > OSp. *ombro*, TREM(U)LAR > *tremblar*, INGEN(E)RAR > *engendrar*, *sal(i)r-á* > *saldrá*, etc., where a heterosyllabic cluster of rising sonority resulted from vowel loss, and obstruent epenthesis obtains, improving the phonotactics. Martínez-Gil argues that while Clements' analysis captures the facts, it lacks explanatory power, as it faces a number of limitations regarding why epenthesis is the repair employed, rather than

^{7. &}quot;Su propósito fue el de 'fijar las voces y vocablos de la lengua castellana en su mayor propiedad, elegancia y pureza'. Se representó tal finalidad con un emblema formado por un crisol al fuego con la leyenda *Limpia, fija y da esplendor*, obediente al propósito enunciado de combatir cuanto alterara la elegancia y pureza del idioma, y de fijarlo en el estado de plenitud alcanzado en el siglo XVI." (RAE)

other strategies, and stipulates the directionality of voicing and place assimilation and the appearance of an oral stop that define this phenomenon. Instead, he argues that the interaction of universal constraints on syllable contact, sonority slopes, identical clusters, licensing and faithfulness (both segmental and positional) determine the proper and attested outcomes, and yield a formally more elegant analysis.

Gutiérrez-Rexach (this volume) pursues a formal approach to sonority scales and syllable structure and their change over time from Latin and Spanish, and discusses metatheoretical issues such as the kinds of hierarchies that should be acceptable, continuous vs. discrete models, constraint aggregation/conjunction, and learning and computation. In his approach, he presents constraints on sonority distance, peak-margin distinctions and distance and other phenomena in logical terms, and offers various theorems, proofs and corollaries for each stage of development, showing that languages can instantiate a finer- or coarser grained sonority scale. He concludes that the formal properties of his analysis are more desirable and elegant than other approaches from a theory-internal standpoint.

4. Concluding remarks

In this chapter, I have discussed Optimality-Theoretic approaches to language change in Spanish and Hispano-Romance, and shown that it is often useful, indeed necessary, to appeal to factors broader than traditionally attributed to a strict classical sense of grammatical competence. That is, in addition to the interaction of faithfulness and markedness constraints, the role of perceptual, cognitive, systemic and external influences on linguistic structure and change is evident at all levels: that of segment and segmental inventory (ll vs. ch; the evolution of the vocalic system of Latin, with its consequences for the vocalization of syllable-final segments and the gradual simplification of the geminates, leading also to the creation of the palatals ll and \tilde{n} ; the emergence of diphthongs *ie* and *ue*; the effects of duration reduction on lenition; the role of systemic contrast on sibilant voicing), syllable- and prosodic structure (syncope and metathesis, as well as the heavier Germanic influence on prosody that favored diphthongization), and intersecting points of morphology (morphemic conditioning of syncope in Vulgar Latin, clitic boundaries as an impediment to metathesis in Old Spanish after the establishment of the Real Academia). Likewise, it is also important to bear in mind issues regarding the formal instantiation of various concepts and constraints employed.

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Appendix: Bibliography on Optimality Theory and language variation and change in Spanish

o. Introduction. What follows is an attempt to list all works published to date that treat aspects of language variation and change in Spanish and Hispano-Romance from an Optimality-Theoretic perspective (Section 1). These are most frequently phonological in nature, but there is also research on morphophonology (e.g., Morris 2005, on analogical leveling based on phonological naturalness or unmarkedness couched in the Optimal Paradigms model of McCarthy 2005) and morphosyntax (e.g., Martínez 2000, on analogy based on imperfect learning; and Koontz-Garboden 2004, on indirect transfer of verbal aspect due to language contact). Given the continued expansion of this line of research, omissions may be inevitable, regrettably. In addition to the author's own research, contributions have been gathered from individual subscribers to the Optimality Theory (optimal@ucsd. edu) and Historical Linguistics (histling@listserv.sc.edu) electronic discussion lists, whom I gratefully acknowledge, and from the Rutgers Optimality Archive (http://roa.rutgers.edu).

In Section 2, the reader will find works that list, review and discuss the areas of language variation and change in OT in general.

1. Bibliography of Spanish- and Hispano-Romance related works

Historical change

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