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Comparing approaches to the underlying specification of Spanish vowels

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0. Introduction. It is a fact of Spanish that /e/ is the unmarked vowel, given that in all cases of productive epenthesis (i.e., initial, medial, final, plural, other; see (1) below), including loan adaptation of words with initial /sC/ and other unsyllabifiable consonant clusters, [e] surfaces, 'rescuing' syllable structure (à la Harris 1983), since certain consonant clusters are unsyllabifiable without further vocalic support:

(1) Initial	Medial	Final	Plural	Other
***e**slavo / Yugoslavo* *espirar / inspirar* *esfera / hemisferio* *etc.*	*frat**e**rnal / fratricidio* (cf. *esculpir / escul(p)tor*) *etc.*	*padr**e** / padrino* *lech**e** / lechoso* *etc.*	*tamal / tamal**e**s* *tren / tren**e**s* *etc.*	*el / al, del, los* *etc.* (?)
esnob, espray, espía, España, etc.				

- Interpretation of these data and their theoretical import and implementation contested.
  - Many/most phonologists advocate some measure of underspecification, but differ in their theoretical assumptions, the importance they attribute to considerations of markedness, and the relation they assume between **predictability**, **redundancy** and **(under-)specification**.

- **Goals of this paper:**

a. Compare several theories that treat or touch on this matter and data;

b. Explore the relevance of these for the predictions that may be formulated based on the unmarked behavior of [e];

c. Discuss the status of this "epenthetic" vowel; and,

d. Briefly consider implications of present analysis for vowel harmony in Asturiano.

- **Preview of the final conclusions I reach:**

i. Upon reevaluating the traditional evidence adduced to support the status of epenthetic [e], I conclude that in **most cases [e] is lexically specified**, as to do otherwise requires arbitrary decisions based on suspect assumptions.

ii. Further, I adduce rarely mentioned evidence of /sC/ clusters with other vowels and of /lC/ clusters to support my claim. Based on this closer look, I conclude that **considerations of economy of derivation and simplicity/transparency of representation**, implemented through lexicon optimization under OT, **favor AU**.

iii. However, for **Asturiano**, whose **harmony** system gives clear evidence that a single underlying form may not account for alternating surface forms, I show that AU is most consistent with current thought on constraint interaction in generative phonology.

iv. Further, by assuming a **constriction-based model of vowel geometry** (e.g., Clements and Hume 1995), I demonstrate that AU offers a completely uniform and maximally consistent analysis of the vocalic alternations seen in Asturiano

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I. Underspecification Theory

- Take a typical 5-vowel system:

	i	e	a	o	u
high	+	-	-	-	+
low	-	-	+	-	-
back	-	-	+	+	+

  - Basic tenets of underspecification: (Steriade 1995:114)

(2) Lexical Minimality:

Underlying representations must reduce to some minimum the phonological information used to distinguish lexical items.

- Basically, this says that lexical items are stored in their simplest form possible.

along with **Default / Redundancy Rules** lead to

(3) Full Specification:

The output of the phonological component must contain fully (or at least maximally) specified feature matrices.

- The predictable information surfaces eventually.

I.1 Approaches to underspecification:

a. **derivational**

(i) Radical Underspecification, **'RU'**; and,
(ii) Contrastive Underspecification, **'CU'**

b. **constraint-based**

(i) Combinatorial Specification, **'CS'**; and,

(ii) Archiphonemic Underspecification, **'AU'**, under Optimality Theory ('OT')

I.1.a Derivational approaches

I.1.a.i Radical Underspecification ('RU') (Archangeli 1984, Archangeli & Pulleyblank 1989):

(4a) Only universally marked features specified in UR:

	i	e	a	o	u
high	+				+
low			+		
back				+	+

(4b) Redundancy Rules:

[ ] → [-high]
[ ] → [-low]
[ ] → [-back]
[ ] → [+back] / [___ , +low]
[+back] → [+round] / [___ , -low]

(This contrasts with Yoruba (Pulleyblank 1988), e.g., where /i/ *is* asymmetric in that it fails to trigger cross-word regressive assimilation in possessive constructions, cross-word deletion of the preceding adjacent vowel, instead disappearing itself; it fails to trigger lateralization of a preceding /m/, and to trigger assimilation of the /o/ of certain nouns to the first vowel of the noun to which it is affixed; it alone changes to /u/ following /h/ prefixation and stem reduplication; it alone can (variably) delete after a nasal consonant, which then becomes syllabic; and it alone can (variably) delete in initial position if it carries a mid tone and the word is minimally trisyllabic. (All examples cited in Roca 1994:63-4). We see that the UR is doing some heavy work for us, a nice result -- none of this, however, applies to Spanish.)

I.1.a.ii Contrastive Underspecification ('CU') (Steriade 1987, etc.)

- The system comes first, not the identification of the asymmetric vowel.

(5a) Features that serve to differentiate pairs of segments are specified lexically:

	i	e	a	o	u
high	+	-		-	+
low			+	-	
back	-	-		+	+

- *i, e* are [-back] because this feature distinguishes them from *o, u*, which are correspondingly marked [+back]. Likewise, *e, o* are specified for [-high] because it distinguishes them from [+high] *i, u*.

(5b) Redundancy Rules:

[ ] → [-high] (possibly should be reformulated as '[+low] → [-high]')
[ ] → [-low]
[ ] → [+back] / [___ , +low]

- Given these URs and RRs, we lose the obvious connection between the UR of [e] and its status as the unmarked and epenthetic vowel of Spanish.
- It is up to the individual grammar to select an unmarked vowel for insertion in the appropriate contexts.
- Thus, since the surface inventory is constant, the URs are as well.

(6) Further criticisms of RU:

a. Supposed markedness is encoded directly in the lexicon.

- All else being equal, it is **truly mysterious that the set of asymmetric vowels (and consonants, for that matter) comes from a very reduced set of segments**
  - /i, u, e, a/ for vowels, usually /t/ for consonants
- We would equally expect /æ/, back unrounded vowels, etc., or /m, p, h, etc./.
- Why is this never the case if we may identify any segment and build our lexicon based on its features?

b. Related criticism of RU (and of CS in this regard, discussed below) is that maximally underspecified vowels and consonants are predicted to be **stray-erased**, *but are not*.

- How, then, can we distinguish a *permanently* placeless unmarked segment (such as [h] and [ʔ]) from one that it *temporarily* placeless (such as [e] and [t])?

I.1.b Constraint-based approaches

I.1.b.i Combinatorial Specification ('CS') (Archangeli & Pulleyblank 1992)

- Similar in many ways to RU.
- Main premise: the segment, per se, does not exist, but is derivative of the free combination of F-features. (HIGH, LO, BACK for Spanish):

(7)

	1	2	3	4	5	6	7	8
HI	HI	HI	HI				HI	
LOW		LOW	LOW	LOW	LOW			
BACK			BACK		BACK	BACK	BACK	
	i	*	*	a	a	o	u	e

- These vowels obtain with the additional interaction of **'grounding constraints**,' that effectively rule out certain combinations of features, some of which are logically impossible, like HI/LOW, LOW/HI, and **act as or regulate RRs**, such as LO/BACK, since all [low] vowels in Spanish are [back].

(8) Morales-Front (1994): (applying OT to Spanish)

*[+high], *[+low], *[+back] >> *[-high], *[-low], *[-back]

- Thus, for both CS and OT, the unmarked status of the vowel [e] is built into the mechanism that produces vowels (in the case of CS), or that evaluates them (in the case of OT and Morales 1994).

I.1.b.ii Archiphonemic Underspecification ('AU') (Inkelas 1994)

- The concepts of lexicon and grammar optimization developed in Prince and Smolensky (1993) and Inkelas (1994) allows for profitable reconsideration of the data.

(9) Lexicon Optimization:

[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.

(10) Grammar Optimization:

The optimal grammar is the most transparent, i.e. the one in which alternations are maximally structure-filling. In terms of Optimality Theory, this means that PARSE [FAITHFULNESS] *is ranked as high as possible.*

- Under an approach that assumes these principles, in order to eliminate gratuitous constraint violation, only those segments that undergo alternations are underspecified, and only for the alternating features, **full specification being the norm when the system is stable**. (This is nearly identical to Girelli's 1988:116 Neutral Ground Hypothesis.)

- **Implications for Spanish**:
  - All vowels are **fully specified** in the lexicon; (that is, there is no alternation that would warrant eliminating any feature or feature value from the underlying form)
  - The epenthetic vowel is 'blank', and receives its features via the language-particular constraint ranking. (This is usually [e], but see below for important qualification.)

II. Another look at the epenthesis data

- Not entirely true to say that ø → [e] / # __ s [+cons] (contra Harris 1969:141):

(11) Additional evidence to consider:

(a) Other /sC/ clusters:

- /asC/ *(h)asta, asbesto, ascendencia, ascesis, áspero, asperjar, aspiración, asma, asno, aspa,* etc.
- /isC/ *historia, istmo*
- /osC/ *hospital, Óscar, oscilar, oscultar, oscuro, ostento, ostensible*, etc.
- /usC/ *usted*
- Also, cf. *ascender ~ descender; aspiración ~ respiración (~ inspiracion)*

(b) [a] predictable in /#alC/:

- *álgebra, Alcázar, alcorán, alba, Álvaro, albacore, albañil*, and several thousand others listed in the Dictionary of the Real Academia Española.
- Now have ***two*** initial vowels that are largely predictable from the cluster that follows, but for this we would need *two* epenthetic vowels, which may not be generated by a single set of RRs.
- *Too many to redundantly specify?*

(c) Additionally, there are in fact words with a supposed initial epenthetic [e] that carry main stress:

- *esto, esta, este, estos, estas, este, esta, estos, estas* ('this/these'); *este* ('East'); *el, él*

(d) Lastly, while there are many forms that alternate between /esC/ and /sC/ *(**e**sfera ~ hemisferio),* there are many more that begin with /sC/ that do not (*esnob, esprey, España, espía,* etc.).

- Thus, the connection between predictability and underspecification is not so clear after all.

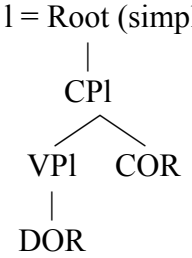
(12) Tentative proposal:

- There is a single process of epenthesis that inserts a blank vowel during the derivation (one-step in OT), but the features that are surface result from constraint interaction.
- So, both [e] and [a] may be underspecified in the lexicon before unsyllabifiable consonant clusters (/sC/ and /lC/, respectively), with the correct surface form resulting from the interaction of a constraint on vowel agreement with :

(13) VOWEL-AGREEMENT (V-AGR) (Morales-Front and Holt 1997: 424)

Members of a complex nucleus share Place of Articulation features.

(14) Lateral feature geometry (Holt 2000, synthesizing Padgett 1995 and Walsh Dickey 1997)



- Given the above, when the epenthetic vowel appears before /l/, the high ranking of V-AGR will result in a vowel that is [DOR], but when the epenthetic vowel occurs before /s/, which has no VPl node, the unmarked vowel [e] will result. (This is a simplified account; several details are left begging for the moment.)

III. Asturiano scalar vowel harmony

(15) Lena dialect (Neira 1955, treated in Hualde 1989a,b)

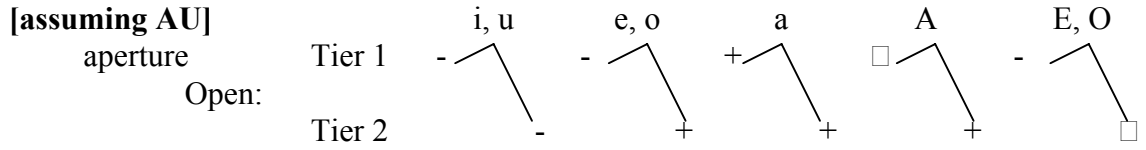
	masc. sg.	***vs***.	masc. pl.	fem. sg.	gloss
e ←a	*bent**é**nu*		*bent**á**nos*	*bent**á**na*	*'window'*
	*g**é**tu*		*g**á**tos*	*g**á**ta*	*'cat'*
i ←e	*kab**í**θu*		*kab**é**θos*	*kab**é**θa*	*'head'*
	*kald**í**ru*		*kald**é**ros*	*kald**é**ra*	*'pot'*
u ←o	*k**ú**ku*		*k**ó**kos*		*'worm'*
	*k**ú**ʃu*		*k**ó**ʃos*	*k**ó**ʃa*	*'cripple'*

- **Major stipulation and problematic assumption of previous accounts:**
  - When the vowel [a] is the stressed vowel, it must add the feature [+high] to its [+low] feature. This is a logical contradiction, an impossible combination.
    - Hualde proposes that the illicit combination [+high, +low] is changed to [-high, -low]. (Necessary assumption for **RU**, **CS** and **CU**.)
  - Additional problem for **CU**: change from [e] → [i] and [o] → [u] is also problematic because it requires us to change the underlying representation, in effect destroying information, not just adjusting it by making it more complete.

- Under **AU**, to optimize both the grammar and the lexicon, Asturiano creates **archisegments** that lack only the alternating features for those cases of alternating *a, e, o* (only); high harmony may be viewed as **feature-filling**.

(16) Constriction-based vowel geometry: (Clements & Hume 1995)

- [±high] is supplanted by two tiers of [±open]

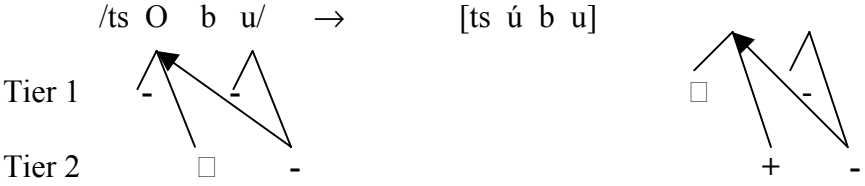


- **Scalar raising revisited:** (a → e; e → i, o → u) due to spreading of [-open]
  - This is purely feature filling; no underlying information is destroyed, because the lexicon knows, in effect, that it's going to change, so it doesn't bother to store those feature values. (*Faithfulness* is maintained; *Invariance* (Steriade 1995:123).)
  - Nonalternating vowels are fully specified, including most cases of *a, e, o*.
  - Only alternating *a, e, o* are underspecified, as /A E O/.
  - No more need for problematic assumption regarding [+high, +low].

(17) Sample derivations:

/p E l u/ → [p í l u] /g A t u/ → [g é t u]

/ts O b u/ → [ts ú b u]



IV. Summary

Given the quite limited evidence for alternations in Spanish, and assuming lexicon optimization, there is no need to posit generalized underspecification of any sort for Spanish, since for AU the system comes first. (The cases of epenthesis confirmed above are exceptional in this regard.) Languages do vary, but only in their alternations and their RRs or constraint rankings, not their URs, unless alternations warrant such (partial or complete) underspecification, but only of those segments that alternate. Finally, AU offers a completely uniform and maximally consistent analysis of the vocalic alternations seen in Asturiano, assuming these arguments for the constraint-based approach.

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