

A structural approach to vowel reduction

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Problem. Eastern Catalan (EC; Wheeler 2005) and Brazilian Portuguese (BP; da Silva 1992) have seemingly identical 7-vowel systems, which, however, reduce differently in unstressed position, cf. (1) overleaf. Within Government Phonology (GP; Kaye, Lowenstamm & Vergnaud 1985, 1990), vowel reduction is understood as the loss of elements in unstressed position (Harris 1997, 2005, Harris & Lindsey 1995, 2000). This allows for the easy expression of the BP merger of [e] and [i] as [i]: In [e] the element **I** is head and **A** non-head, i.e. (**{A}I**), while in [i] the sole element **I** is head, i.e. (**{I}**). The merger is effected by loss of **A**. Despite the attractiveness of such an account, it remains unclear how a merger of BP [e] and [ɛ] as [e] is effected: Two interpretations are conceivable for [ɛ], (**{I}A**) or (**{I,A}**), the latter having no head. In order to go from one of the those two possibilities to [e], i.e. (**{A}I**), a rearrangement of elements is necessary, but no element is lost. **Problem 1 (P1):** Why do *loss* of an element and *rearrangement* of elements both “count” as the same, i.e. as reduction? (Nevins 2012 simply assumes that the unheaded version is weaker.) Furthermore (**P2**), it is not clear why BP [e]/[ɛ] would merge as [e] and not as [ɛ] (a different rearrangement), also a problem in Italian or Slovenian vowel reduction. Lastly (**P3**), why do BP [i]/[e]/[ɛ] merge as [i] in parallel to [u]/[o]/[ɔ] as [u], cf. (1), while EC has an asymmetry with [e]/[ɛ] going to [ə] but [o]/[ɔ] going to [u]? This presentation tries to address all three problems in one fell swoop.

Proposal. Building on GP 2.0 (Pöchtrager 2006, Živanovič & Pöchtrager 2010, Pöchtrager & Kaye 2013), in particular the idea that old **A** is reinterpreted as more (empty) structure (Pöchtrager 2010, 2013), I argue for the following internal structure of vowels: [i], GP’s empty nucleus, is a simple nuclear head xN. [i/u/ə] involve an adjunction to the head with **I** [i], **U** [u] or nothing [ə]. [e/o/a] involve an additional projection up to N’, [ɛ/ɔ] yet a further projection to N’’. (The lack of a third vowel is yet unclear.) (2) illustrates this for [u/o/ɔ]. Roughly, the more open a vowel, the more empty structure there is. Reduction can now be uniformly expressed as the loss of structure: BP [ɔ] to [o] involves the loss of N’’, [o] to [u] that of N’. EC simply combines both steps in one. **P1** and **P2** are solved in one go. **P3** can be tackled in the following way: Assume that the element **I** sits high up in EC (3), while **I** sits in a lower position in BP (4). **U** is low in both languages. If tree pruning starts from the top, then EC **I** will be lost immediately, as the branch it sits on is cut off first. BP **I**, being low, is safe, as is **U** in both EC and BP. We derive the asymmetry in reduction patterns. Further evidence for the low position of **I** in BP comes from alveolar palatalisation (absent from EC, alas): BP [t/d] go to [tʃ/dʒ] before [i], but not before [e/ɛ]. All three vowels contain **I**, but in [e/ɛ] it is buried deep in the structure and thus has no effect on what precedes. **I** in [i] is not shielded off by structure in the same way. In a similar vein, the following prediction can be made for Russian: In Russian, [i] consistently palatalises preceding consonants, while this does not hold exceptionlessly for [e]. This can be explained by assuming that in Russian [e] **I** is shielded off by empty structure, just like in BP. If that is the case, [e] should reduce to [i] in unstressed position, since the **I** is buried deep and will not be affected by tree-pruning. This prediction is correct.

Further issues. The microvariation between EC and BP is only a start, but the proposal leads further: **1.** Lowenstamm (1996) claims that in the templatic language Chaha [ə] acts as the smaller version of [a]. This follows as a corollary from my proposal. **2.** (Old) **A** has been claimed to underlie alveolars, too (Broadbent 1991). If **A** is replaced by more empty structure, then alveolars must be bigger than consonants of other places of articulation and should be more susceptible to lenition. This serves to explain why *d/t* are lenited (tapping) in English rather than velars/labials. **3.** The last point also raises the more general question whether *all*

lenitions are about structure. In GP 2.0, **A** is replaced by structure, but so are the old elements **?** (stop) and **H** (voicelessness), albeit by somewhat different types of structure. Certainly stopness is a lenition target (Spanish: Harris 1969, Catalan: Wheeler 2005, Danish: Basbøll 2005) and so is voicelessness (Danish: Basbøll 2005).

(1)	(2)	(3)	(4)																																																
<table border="1"> <tr><td>tonic</td><td>i</td><td>e</td><td>ɛ</td><td>a</td><td>ɔ</td><td>o</td><td>u</td></tr> <tr><td colspan="8">Brazilian Portuguese</td></tr> <tr><td>pre-tonic</td><td>i</td><td>e</td><td>a</td><td>o</td><td>u</td><td></td><td></td></tr> <tr><td>post-tonic/ final</td><td colspan="2">i</td><td>ə</td><td>u</td><td></td><td></td><td></td></tr> <tr><td colspan="8">Eastern Catalan</td></tr> <tr><td>atonic</td><td>i</td><td>ə</td><td>u</td><td></td><td></td><td></td><td></td></tr> </table>	tonic	i	e	ɛ	a	ɔ	o	u	Brazilian Portuguese								pre-tonic	i	e	a	o	u			post-tonic/ final	i		ə	u				Eastern Catalan								atonic	i	ə	u					<p>[u] [o] [ɔ]</p> <p style="text-align: center;">N''</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">N' N' x</p> <p style="text-align: center;">/ \ / \</p> <p style="text-align: center;">xN xN x xN x</p> <p style="text-align: center;">/ \ / \ / \</p> <p style="text-align: center;">xN x xN x xN x</p> <p style="text-align: center;">U U U</p>	<p>EC [ɛ]</p> <p style="text-align: center;">N''</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">N' x</p> <p style="text-align: center;">/ \ I</p> <p style="text-align: center;">xN x</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">xN x</p> <p style="text-align: center;">U</p>	<p>BP [ɛ]</p> <p style="text-align: center;">N''</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">N' x</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">xN x</p> <p style="text-align: center;">/ \</p> <p style="text-align: center;">xN x</p> <p style="text-align: center;">I</p>
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