Problem. Transparent vowels, i.e. vowels that seem invisible to vowel harmony (VH), pose a challenge for feature-based and phonetically grounded accounts alike (Gafos & Dye 2011): Finnish /e/ (1) are classified as [−back]/articulatorily front, yet do not pattern as such, which in turn leads to long-distance interaction between flanking vowels for VH. This abstract argues that the transparency of vowels follows from their internal structure, more precisely their size: Transparent vowels are structurally small, thus invisible to VH.

Proposal. Pöchtrager (2015b, in print), dealing with the reduction of unstressed vowels (Catalan, Brazilian Portuguese etc.), argued that openness be expressed structurally: open-mid vowels (5) are bigger (contain more empty structure) than close-mid vowels (4), which are in turn bigger than high vowels (3). Vowel reduction ([ɛ]→[e], [e]→[i]) can then be uniformly expressed as the loss of structure (extend to other patterns, e.g. [ɛ/e]→[ɛ]). If correct, then that structural difference should show up elsewhere, too. I argue that it plays a role in VH.

Finnish VH (Karlsson 1974) defines three sets of vowel: (non-transparent) front (F), transparent (T), back (B). T combines freely with any other vowel (1b–d), unlike F (1a,f) or B (1e,f). (3–5) show Finnish /e/ä. All three contain the element I. Openness is encoded structurally by the amount of empty positions. Universally, a vowel consists of up to two nuclear heads (xN1/xN2, the projection of one embedded in that of the other), each of which can project maximally twice. (The projections of a head will simply be referred to as "projections"). T /e/ only involve two layers and thus the projection of one head (the lower one, xN1) suffices; ā will require a third layer and thus a second projection (xN2), which is crucial: All F vowels have their I in the higher projection (of xN2), where I can escape and harmonise the other vowels of the domain. B does not cooccur with F, as it would be harmonised by F. T vowels have their I in the lower projection, making them inert to VH.

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<td>a.</td>
<td>F</td>
<td>kylä ‘village’</td>
<td>a.</td>
<td>kylä-ā</td>
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<td>b.</td>
<td>F,T</td>
<td>tätti ‘aunt’, isää ‘father’</td>
<td>b.</td>
<td>tätti-ā, isää-ā</td>
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<tr>
<td>c.</td>
<td>T</td>
<td>keli ‘weather’</td>
<td>c.</td>
<td>keli-ā (*keli-a)</td>
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<tr>
<td>d.</td>
<td>B,T</td>
<td>nalle ‘bear’, melu ‘noise’</td>
<td>d.</td>
<td>nalle-a, melu-a</td>
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<tr>
<td>e.</td>
<td>B</td>
<td>talo ‘house’</td>
<td>e.</td>
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Consider now y [y] (6). The distribution of I and U is universally restricted such that U must not c-command I, as argued on the basis of their roles in diphthongs and glides in English, Putonghua and Japanese in Pöchtrager (2009, 2015), Živanović & Pöchtrager (2010). Thus, I and U must be separated into two different projections, with I higher than U (also true for ā). This unites all F vowels (y/ö/å), with I always in the higher projection. Openness is still uniformly expressed by the amount of empty structure: i (3), y (6), and u (7) have one empty
position each and thus all count as high. B vowels, like (high) u in (7), simply lack I. On the other hand, both F and T do have it, but differ in where it sits. The three sets are adequately characterised (no I; I high; I low) and “transparency” follows from structure.

(2c) shows that if a stem contains only T vowels, they behave as F. Assume that T vowels try to form a chain from left to right, and, if they succeed (i.e. if no F/B intervenes) they “gang up” (similar in spirit to Kiparsky & Pajusalu’s 2003 “Combinatorial markedness constraint”) and I can get out, even from the lower projection. It is as if having several vowels with only a lower projection is as good as having one with a lower and a higher projection.

Further confirmation for the analysis comes from Hungarian, where only i [i], i [iː], é [eː] are truly T; but not e [ɛ], the short counterpart of é. This follows: T vowels will have structures like (3–4), but e [ɛ], being more open, will be like (5). High(er) vowels are generally more likely to be transparent (Anderson 1980, Beňuš 2005) which falls out from the proposal.

**Variation.** T vowels are not a necessity, cf. Turkish (Charette & Göksel 1996): Here, i/e are always F. Following (3–6), an element in the higher projection (that of xN2) is always involved in harmony, suggesting that Turkish i/e consist of a projection of xN2 only, where I can get out and harmonise. Finnish i (3) and Turkish i (8) are alike in structure (one empty position each, i.e. high), but differ in what they are a projection of. Cross-linguistic differences follow. (A similar argument is made for vowel reduction in Pöchtrager in print).

**Opacity.** The opacity (opposite of transparency) of a (e.g. in Pulaar) might follow from it being low, hence big (with a lot of empty structure) and possibly too big for VH to get across.

**Conclusion.** Insights from vowel reduction and a structural approach to vowels as well as restrictions on I and U can be successfully brought to bear on transparency in VH.

**References.**


PÖCHTRAGER, Markus A. 2015b. Vowel reduction: Sawing off the branch you’re sitting on. Paper at the 23rd Manchester Phonology Meeting, 28–30 May 2015, University of Manchester, UK.

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