Cross-morphemic laryngeal coloring in PIE: a short survey

Chengzhi Zhang
Program in Indo-European Studies
University of California, Los Angeles
czhang@humnet.ucla.edu

i. Introduction

1. Behaviors of laryngeal coloring across morpheme boundaries are inconsistent, e.g. them. vowel *-*e/o*- (never †-*a/o*- or †-*o*-) vs. nasal infix *-*ne-h₂*- > *-*na-h₂*- (Gk. -νᾱ/να-).

2. Opinions range from considering it a regular phonological process (Francis 1970 *passim*, Peters 1980: 192fn149, Beekes 1996: 6fn9, Kloekhorst 2008: 275) to denying that it applies (Byrd 2015: 12fn15).

3. Appr. 15% of all reconstructable roots in LIV² have a root-final *h_2 or *h_3:
→ Where are all the laryngeal conditioned allomorphs (of affixes, endings, in compounds, etc.)?

4. Aims of this paper:
   - offer a (partial) survey of the primary data surrounding cross-morphemic laryngeal coloring (CMLC): the environments where it applies (and is preserved) vs. where it is regularly blocked (or reversed)
   - provide some tentative generalizations on its distribution.

ii. Cases showing underapplication of CMLC

5. Most inflectional endings with an initial *-*e* including perf.3sg. *-*e*, gen.sg. *-*es*, dat.sg. *-*ei̯*, nom.pl. *-*es*, etc.

5.1 Evidence:
- Perf.3sg. *-*e*:
  - E.g. no *-α or *-o variants in the perfects of *seṛ* roots in Greek (e.g. 3sg. †τέτολα < *te-tolh₂-e*, cf. τέτληκε '(s)he has endured')
    [but two caveats here: (1) perf. of *CeRH*- roots mostly remade into κ-perf., hence little evidence for *-*CoRH-e* and (2) possible interference of Saussure's Effect.]
  - no traces of 3sg. act. *-*a* in Hittite *hi*-conjugation, e.g. †*malla* < *mólh₂-e*, cf. *malli* '(s)he grinds' (and "thematized" *mallai*), cf. 3sg. *-s, -sta*
- Gen.sg. *-*es*, dat.sg. *-*ei̯*, instr.sg. *-*eh₁*, nom.pl. *-*es*
  - no *a-/o*-vocalism allomorphs when following a *h_2/h_3-final root (i.e. in a root noun paradigm)

5.2 Possible exceptions:
- Athem. 3pl. *-*ent* (and *-*enti*, possibly *-*ento*):
  - Greek variation between -εν, -αν, -ον is often thought to be laryngeal-conditioned, e.g. τίθεν (Pi., Dor.) 'they placed' < *di-dh₁-ént-, ἔβαν (Hom.+) 'they went' < *$g^{w}h_2$-ént, ἔδιδον 'they gave' < *di-dh₃-ént*. (Rix 1992: 244f., Weiss 2020: 410).
  - But: Greek 3pl. involve complicated analogical development (see Risch 1982: 329, Kortlandt 1988)
    → The *a*- and *o*- variants could be *-*C$\underset{\circ}{h}_{2/3}$-nt* after *-*nt*- (next to inherited *-*n̥t*-, cf. Av. -*aṯ*) is generalized (cf. ἔφῡν < *b^{h}uH-nt*) on the model of them. *-o-nt*
    → or analogically imported from the root vocalism, e.g. *di-dh₃-ent > *ἔδιδεν >> ἔδιδον, or *dh₃-n̥t > *ἔδα(τ) >> *ἔδαν >> ἔδον (Hom., Dor.) and ἔδοαν (Arc.-Cypr., Aeol.)
  - A more secure case (?): Gk. πρίατο (Hom.+, possibly in Myc. *qi-ri-ja-to*) << ἐπρίαντο 'they bought' < *$k^{w}rih_2$-ento* (Peters 1980: 192fn149, Rix 1992: 215), replacing *πρῖτο < *$k^{w}ih_2$-to* ; but contrast Francis's idea (1970: 87-92) that *CRih₂C- > Gk. CRιᾰ̆C-.

- Endings after *-*eh₂*- stems:
    - Gen.sg., dat.sg., nom.pl. of *-*eh₂*- stems are effectively *-*ah₂-as* (or *-*ah₂-s*), *-*ah₂-a̯i̯*, *-*ah₂-as*.
    - But only marginal evidence: perhaps Dor. dat.sg. -ᾱ̃, which cannot be from *-*a-ei* (> †ᾳ).
    - Elsewhere, little known about the different outcomes of inherited contracted vowels (*-*a-a*- vs. *-*a-e*-), e.g. Goth. gen.sg./nom.pl. *ōs* (cf. Stiles 1988: 119f.), Lith. dat.sg. -*ai*, gen./nom. pl. -*os* (cf. Vaillant 1958: 80-3); in Latin both *-*a-a*- and *-*a-e*- could become -*ā*- (Weiss 2020: 142f); Tocharian evidence on final *-*eh₂-es* also obscure (cf. Fellner 2013: 21fn15); IIr. and Anatolian not probative on this matter.

      [contraction of the type *-*VHV*- should be post-PNIE given the trimoraic treatment in Germanic and the disyllabic scansion in Vedic; thus no inherited *-*ās*, -*āi*, etc. in *-*eh₂*-stems]

6. The thematic vowel *-*e* in virtually all environments

   6.1 Evidence (abundant):
- *-*e/o* in them. conj.:
    - E.g. ἔθανε 'died' (< *-*h₁e-dʰn̥h₂-e-t*; not †ἔθανα), πορεῖν (< *-*porh₃-é-s-en*; not †ποροῦν), Lat. *bibit* 'drink' (< *-*pí-ph₃-e-ti*; not †*bibut*[?]), OIr. *melid* 'grinds' < *-*melh₂-e/o*-, etc.

      [Willi (2018: 300): OLat. 2sg. subj. *fuās* < *-*bʰuh₂-e-s(i)* with *a*-vocalism from coloring and lengthened after them. subj. *-*ē*-; highly speculative.]

- *-*e* in them. stem nouns:
    - No discernible allomorphs for voc.sg. *-*e* (as *-*a* [< *-*h₂-e*] or *-*o* < [*-*h₃-e*])

   6.2 Possible exceptions:
- Gk. πέταμαι (Sapph.) 'fly' < *-*peth₂-e/o*- with coloring per Rix 1999: 517, cf. πέτομαι, but could also be athem. *-*peth₂-m, s, t* (cf. Schrijver 1991: 395); *-*h₂* in root aor. ἔπτατο < *-*pth₂-to*.
- Thematic n.pl. *-*e-h₂* > *-*a-h₂*, but whether this environment is cross-morphemic is debatable.
- Before factitive suffix *-*h₂*- in "*newaḫḫi*-type" formations in, e.g., the eponymous Hitt. *newaḫḫ*- 'renew', Gk. νεάω 'plough', Lat. *novāre* 'make new' < *-*neu̯e-h₂-(i̯e/o-)*, etc.

7. Primary *s*-stem suffix *-*es*- (in obl. cases, adjectives)

   7.1 Evidence:
- General absence of supplement ablaut patterns of *(-*h₂)-os* ~ *(-*h₂*)-*as*- or *(-*h₃*)-*os* ~ *(-*h₃*)-*os*-
    - E.g. gen.sg. πλάτους 'breadth' (Hdt.+) <= *πλέτεος < *-*pleth₂-es-os* (not †πλάταος), n.sg.adj. ὑγιές 'healthy' < *-*h₁su-/h₁iu-gʷih₃-es* (not †ὑγιος), etc.
    - uniform -*o*- ~ -*es*- ablaut in Slavic (OCS *nebo* ~ *nebese*, etc.), although *seṭ*-root examples rare.

      [Latin not probative due to short vowel merger before -*r*-; A possible *s*-stem following *-*h₂*- in HLuw. *piḫas*- 'light' (KARATEPE 1, §52; cf. CLuw. *piḫaššašša/i*-, Skt. *bhās*-), but this is contested (see Starke 1990: 103-6, Kloekhorst 2008: 675, to be held against Stüber 2002: 69-71, Sasseville 2018: 304f) and is not useful either due to merger of *-*ĕ/ă/ŏ* > Luw. -*a*-]

   7.2 Possible exceptions:
- Greek *s*-stems of *-*h₂*-final roots in -ας, -αος (κρέας 'meat', κέρας 'horn', etc.)
    - Following the proterokinetic paradigm set up by Schindler (1975: 205), the obl. cases in Greek is thought to show coloring: *-*CéCḫ₂-s* ~ *-*C(e)Ch₂-ás* (cf. Nikolaev 2010b: 124-50)
    - Some debate remains: both the equation between Gk. κρέας ~ *kravíṣ* 'flesh' and the PIE antiquity of Greek neuter stems in -ας has been contested (Stüber 2002: 176-8, Litscher 2007; cf. Meissner 2005: 124); also possible the Greek paradigm reflects a generalized strong stem *-*CéCḫ₂-s* (cf. IIr. -*iṣ*- neuters, e.g. besides *kravíṣ* (*-*kreu̯h₂-s*-), YAv. *stairiš*- 'bed' (*-*sterh₃-s*-),

etc) or a secondary *s*-stem built to *-h_2-* collectives with non-ablauting suffix (**CéC-h_2-s*).

8. Primary *i*-stem suffix **-$e\underset{\wedge}{i}$-* and *u*-stem suffix **-$e\underset{\wedge}{u}$-*

8.1 Evidence:
- No traces of allomorphic †*-$a\underset{\wedge}{i}/o\underset{\wedge}{i}$-* or †*-$a\underset{\wedge}{u}/o\underset{\wedge}{u}$-* when built directly to **h_2/h_3*-final roots
    - Mainly affects the weak stem of proterokinetic *i*-stems (cf. Grestenberger 2014) and adj. *u*-stems, e.g. nom.pl. βαρεῖς 'heavy' < **$g^{w}\underset{\circ}{r}h_2$-éu-es* (†βαράες), gen.sg. πλατέος 'wide' < **$p\underset{\circ}{l}th_2$-$é\underset{\wedge}{u}$-os-* (†πλατάος).
    - Diagnostic *i*-stem examples lacking.

8.2 Possible exception
- n.pl., e.g, τανα(ϝ)α 'thin'
    - From a primary *u*-stem with coloring **$t\underset{\circ}{n}h_2$-$e\underset{\wedge}{u}$-$\underset{\circ}{h}_2$* per Meissner (2005: 62), cf. Myc. *ta-na-wa* PY Sa 793; (on **h_2*, cf. OIr. *tanae* 'thin', Skt. *taniman* 'thinness')
    - But several other explanations more plausible: **t(e)nh_2-$\underset{\wedge}{u}$-e/o-*, **t(e)nh_2-$e\underset{\wedge}{u}$-e/o-*, cf. Zair 2012: 210-3.

9. Stative suffix **-eh_1-*

9.1 Evidence:
- No traces of allomorphic †*-ah_1-* or †*-oh_1-* when built to **h_2/h_3*-final roots
    - E.g. Gk. ἐδάμη 'was conquered' <= **$demh_2$-eh_1*, etc.

      [McCullagh (2002: 75f.), e.g., argues for an expected †ἐδάμᾱ and ἐδάμη a post-laryngeal formation, following Francis's earlier idea (1970: 74f.) of a putative †δαμᾶναι preserved in the name Ἀδαμαντ-, but cf. Chantraine 1933: 269, Lubotsky: 1998 for alternative explanations of the proper name; for **$demh_2$-* in particular, an originally *aniṭ-* root **dem-* is also possible, see Nikolaev 2010a]

    - Several B.-Sl. statives based on **h_2-* roots are set up in LIV^2 (*s.vv.*) with "restored" *e*-grade, e.g. OCS *zъrěti* 'ripen' < **$\acute{g}\underset{\circ}{r}h_2$-$eh_1$-* (Gk. ἐγήρᾱ 'aged'), Lith. *kedéti* 'burn' < **(s)kedh_2-eh_1-* (Gk. ἐσκέδασα 'scatter').

      [see also the recent comment in Jasanoff (2021: 172fn17) that the stative suffix *-ē* "seems to have been immune to coloration".]

9.2 Possible exceptions:
- Gk. ἑάλων 'was taken' < **-$\underset{\wedge}{u}\underset{\circ}{l}h_3$-$oh_1$-*
    - So Francis (1970: 65-76), Harðarson (1993: 208), Hackstein (1995: 302), among others; if so, the sole example of both **$C\underset{\circ}{R}h_3V$ > *CaRV* and a colored stative suffix **-eh_1-*.
    - Better alternative: root aorist **$\underset{\wedge}{u}\underset{\circ}{l}eh_3$-* (with the Lindeman-variant of the initial cluster), cf Hettrich (1978), Peters (1980: 31fn19), Balles (2007: 19fn16).

      [as will be shown below, *a*-coloured variants appear to be more resilient than *o*-coloured ones, possibly due to the fact that *seṭ* roots with final **h_2* are more abundant in number than those with **h_3*. This makes the survival of **-oh_1-* in the absence of **-ah_1-* even more dubious; on the possibility of a stage II full-grade **$\underset{\wedge}{u}leh_3$-*, cf. Lyc. *lati* 'dies' < PA. **$\underset{\wedge}{u}laH$-*; a rare case for a *h_2*-colored **-ah_1-* is made by McCullagh (2002: 72fn50) for Cyrenean μιᾶι 'be defiled' < **mih_2-eh_1-*.]

- Gk. -άω, Lat. *-āre* < **-h_2-ah_1-$\underset{\wedge}{i}e/o$-* (?)
    - Theoretically some of the **-ā-$\underset{\wedge}{i}e/o$-* verbs could be from **-h_2-ah_1-$\underset{\wedge}{i}e/o$-* with coloring of **-eh_1-*, e.g. Lat. *stāre* < **sth_2-eh_1-$\underset{\wedge}{i}e/o$-* (Cowgill 1973, Willi 2018: 154), *sonāre* < **s$\underset{\wedge}{u}enh_2$-$ah_1$-$\underset{\wedge}{i}e/o$-* 'to be sounding, noisy'(?); further investigation needed.

10. *-eh_2- suffix

    - No traces of allomorphic *-oh_2- (< *-h_3-eh_2-, if *h_3 wins in such environments, cf. Eichner 1988: 131) in, e.g., βορά 'food' (Pi.+) < *$g^{w}orh_3$-$éh_2$ (not †βορώ).

iii. Cases showing application/preservation of CMLC

11. Nasal infix *-*ne*- (~ *-*na*-h_2-, *-*no*-h_3-)

    - Gk. -νᾱ(νη)/να-, -νῡ/νυ- (remodeled from *-νω/νο- after Cowgill's Law, Sihler 1995: 526f, Milizia 2004, Sturm 2021: 90ff)
        - E.g. δάμνᾱμι 'subdue' < *dam-$né$-h_2-, πέρνᾱμι 'hang' < *per-$né$-h_2-, etc.
          στόρνῡμι 'scatter' << *$st_{\text{ə}}r$-ne-h_3-, ὄμνῡμι 'swears' << *$h_{1/3}emh_3$-, etc.

12. Iterative-causative suffix -$é\underset{\wedge}{i}e/o$-
    12.1 *-h_2-$é\underset{\wedge}{i}e/o$- > *-h_2-$á\underset{\wedge}{i}e/o$-
    - Of the Latin -$ā$-*(re)* type (< *-*ae*- < *-$a\underset{\wedge}{i}e$- < *-h_2-$a\underset{\wedge}{i}e$-)
        - E.g. Lat. *domā-(re)* 'tame' < *$domh_2$-$é\underset{\wedge}{i}e/o$-, OLat. *votā-(re)* 'forbid' < *$\underset{\wedge}{u}oth_2$-$é\underset{\wedge}{i}e/o$-, cf. Schrijver 1991: 111, Rix 1999: 518-20 with more examples.

          [not all have secure *h_2 and there remains the difficulty of distinguishing *-h_2-$é\underset{\wedge}{i}e/o$- from inherited *-$\underset{\wedge}{i}e/o$- presents built directly to the root, i.e. *(C)-$\underset{\text{ə}}{h}_{2/3}$-$\underset{\wedge}{i}e/o$-, and the denominative *-eh_2-$\underset{\wedge}{i}e/o$-, all ending up in the 1st conj. in Lat.]

    - Of the Greek -άω type
        - E.g. Gk. ποτάομαι 'fly' < *$poth_2$-$é\underset{\wedge}{i}e/o$-, (rare) πτο(ι)άω 'frighten' (next to the common πτοέω) < *$pioh_2$-$é\underset{\wedge}{i}e/o$ (Hackstein 1992: 151ff.)

          [Willi (2018: 273) hints at deriving σχάω 'slit open' and ἀρόω 'plough' respectively from *$sḱh_2$-$é\underset{\wedge}{i}e/o$- and *$\underset{\text{ə}}{h}_2rh_3$-$é\underset{\wedge}{i}e/o$-. But zero-grade -$é\underset{\wedge}{i}e/o$- formations are in general untypical. Rather, the traditional reconstruction as *$sḱ\underset{\text{ə}}{h}_2$-$\underset{\wedge}{i}é/ó$- and *$\underset{\text{ə}}{h}_2r\underset{\text{ə}}{h}_3$-$\underset{\wedge}{i}é/ó$- is preferable.]

    12.2 But no good examples for *-h_3-$é\underset{\wedge}{i}e/o$- > *-h_3-$ó\underset{\wedge}{i}e/o$-
        - E.g. λοέω 'wash' <= *$lo\underset{\wedge}{u}h_3$-$é\underset{\wedge}{i}e/o$ (not †λοόω), Slov. *molíti* 'extends' <= *$molh_3$-$é\underset{\wedge}{i}e/o$- (LIV^2 *s.v.* *$melh_3$-), Hitt. *aniya*- 'work' *if* from *h_1onh_3-$é\underset{\wedge}{i}e/o$- (Janda 1999, Stüber 2002: 88-90, cf. Gk. Ἐνοσίχθων 'earth-shaker').

13. Deverbative suffix *-*etó*-
    - Greek -ατο (< *-h_2-*ató*-), -οτο (< *-h_3-*otó*-)
        - E.g. θάνατος 'death' < *$d^{h}\underset{\text{ə}}{n}h_2$-*etó*-, κάματος 'toil' < *$ḱ\underset{\text{ə}}{m}h_2$-*etó*-, etc.; possibly *-h_3-*otó*- in βίοτος 'life' < *$g^{w}ih_3$-*etó*-. See Waanders 1974, Vine 1998: 12, 66-70.
        - Lat. *cognitus* 'known' < *-$ǵ\underset{\text{ə}}{n}h_3$-*eto* not probative due to vowel weakening (cf. Schrijver 1991: 202)
        - But for θάνατος and κάματος at least a "*palma*-rule" explanation (*$C\underset{\text{ə}}{Ḱ}H_iC$ > Gk. *CV_iRV_iC) with retracted accent is also possible.

14. *(-$h_{2/3}$)-*es*- > *(-$h_{2/3}$)-*a/os*- in some secondary derivations
        - E.g. παλαστή 'palm' (Alc.+) ~ Hitt. *palḫasti*- 'breadth' < *$pl\underset{\text{ə}}{h}_2$-*es-to/i*- (Höfler 2018: 125); γαληνός 'calm' (Ibic.+) < *$g\underset{\text{ə}}{l}h_2$-*es-nó*-, cf. Dor. γαλᾱνᾱ 'stillness' (EDG *s.v.*, Höfler 2017: 75).

          [the direct comparison between παλαστή and *palḫasti* is weakened by OCS. -ostъ (cf Sturtevant 1933: 155f.) seems to point to *-*os-ti* and the other -*ašti* nouns in Hittite (*dalugašti* - 'length', *pargašti* - 'height', etc.) do

not involve a root final *h_2]

- Less secure:
  - Lat. *onustus* 'loaded' (as *h_1enh_3-es-to-) if one adopts a root *h_1enh_3-, see Stüber 2002: 88, cf. de Vaan 2008 *s.v. onus* (base with *-os-* also possible, so Weiss 2020: 256).
  - κάρηνα (n.pl.) 'heads' (Hom.+) / Dor. κάρᾱνος 'chief' if < *$k\acute{r}h_2$-es-no-, but given the accent this may reflect the *palma*-rule outcome.
  - A series of words meaning "ash (tree)" incl. Lat. *ornus* (< *os-eno-), OIr. *uinnius* (< *os-no-), Lith. *úosis*, Latv. *uôsis*, OHG *asc* (< *os-k-) is reconstructed to a root *Heh_3-, with the prevalent base *os- resulting from an *s*-stem *Hh_3-es-, see Anderson 1996: 142f., Derksen 2008: 29, Schrijver 1991: 77f.; but an original *o*-grade suffix (*-os-) possible.

15. *(-h_2)-$e\underset{\cdot}{u}/\underset{\cdot}{i}$- > *(-$h_2$)-$a\underset{\cdot}{u}/\underset{\cdot}{i}$- in some secondary derivations
    - E.g. Πλαταῖα (TN) < *$pl̥th_2$-$e\underset{\cdot}{u}$-ieh$_2$- (cf. fem. Adj. πλατεῖα), κεραυνός 'thunderbolt' < *$\acute{k}erh_2$-$e\underset{\cdot}{u}$-nó- (Steer 2020: 261-4), ταναός < *$tn̥h_2$-$e\underset{\cdot}{u}$-é/ó- (cf. above); possibly also Ἀχαιϝοί 'Achaean' < *$m̥\acute{g}h_2$-$e\underset{\cdot}{i}$-$\underset{\cdot}{u}$o- (Bader 1999: 44f.)
    - A few more examples in Celtic but less secure incl. OIr. *Letha* < *$pl̥th_2$-$e\underset{\cdot}{u}$-$\underset{\cdot}{i}$eh$_2$-, Breton *divalav* 'ugly, odious' < *$m̥lh_2$-$e\underset{\cdot}{u}$-$\underset{\cdot}{i}$eh$_2$-, etc., see Zair 2012: 205, 210.

16. *(-h_2)-ero- > *(-h_2)-aro- (?)
    - Gk. -αρο- in, e.g., βριαρός (Hom.) 'strong' < *g^wrih_2-ero-, to be connected with βρῑ́θω 'be weighed down' (EDG [*s.v.* βρί]), μιαρός (*Il.*, cf. Call. μιερός]) 'defiled' < *mih_2-ero-, cf. μιαίνω 'defile'.
    - But -(ι)αρο- could also be borrowed from such forms as γεραρός 'honorable, old' < *$\acute{g}erh_2$-ro-, σοβαρός 'rushing, violent' < *$t\underset{\cdot}{i}og^w$-h_2-ro- (Nikolaev 2010b: 130), with *a*-vocalism directly from *h_2.

17. *(-h_2)-ed- > *(-h_2)-ad-
    - Gk. -αδ- stems, e.g. φυγάς 'fugitive', with coloring (by the reduced *-eh_2-) either directly in the strong cases *b^hug-h_2-éd-or indirectly via an intermediary thematized stem b^hug-h_2-e-d- (Rau 2004[2010]: 169), assuming the hysterokinetic ablaut of the suffix(*-ed-/-d-) proposed by Nussbaum 2004.

      [a non-ablauting *-h_2-d (so Leukart 1994: 305fn424) also possible; cf. the less attractive connection with *n*-stem (*-$n̥$-d-) by Peters (1980: 167) following Solmsen (1909: 55-8)]

18. Some archaic lexical items
    - E.g. *san- in Lat. *sanguis* 'blood' <*h_1sh_2-en- (if not *h_1sh_2-n-?), Hitt. *išḫan-* (obl.) 'id.' < *h_1sh_2-(e)n-, etc., cf. Kloekhorst 2008: 256, Yates 2021.
    - The word for 'salt' (Lat. *sāl*, Gk. ἅλς, TA *sāle*, etc.) could contain an ablauting *l*-stem *seh_2-l-/sh_2-el- if one follows the Leiden reconstruction, see recently de Vaan 2022.

iv. Patterns of distribution

19. That the uncolored variants of *-h_2-e- and *-h_3-e- in (5)-(10) are shared across all branches indicates that at least some of the blocking or reversion of coloring happened already in the parent language.

    19.1 → coloring effect of laryngeals ceased to be a strict synchronic rule by the end of the reconstructable stage of PIE.

20. On the surface, a few tendencies may be observed.

    20.1 The colored variants are more likely to survive when:
    - the affected vowel is away from the right edge of the stem (12, 13, 16)

- in non-primary formations (14, 15)
- involving constructions of less productivity (17, 18).

20.2 CMLC is avoided as a rule when the coloring alters:
- the ending itself (5)
- a monosyllabic suffix at the end of the stem (6-10); although Gk. -αϛ-, -αδ- may be exceptions to this.

20.3 *a*-colored variants better represented than *o*-colored ones.

21. These tendencies are best understood in terms of the speakers' efforts to find alternative models in the grammar to parse the colored variant
- as a category in the same functional domain (nouns, verbs, etc.)
- while maintaining a minimal identity of the underlying stem.

21.1 Morphemes in (5-10) after coloring find no alternative parsing possibilities and become unparsable.
- (5): perf.3sg. †*a*, gen.sg †*as*, etc.
- (6): an ablauting them. vowel †*-a/o-*; a constant **-o-* may be acceptable (?)
- (7): an ablauting *s*-stem †*-os/as*, †*-s/as*
- (8): *i*- and *u*-stem suffix †*-ai̯/au̯-*; an *o*-grade **-oi̯-* may be acceptable (cf. amphikinetic *i*-stem, e.g. Ved. *sákhāy-*, Gk. πειθώ, etc.)
- (9), (10): †*-oh₂-*, †*-ah₁-*, †*-oh₁-* all synchronically obscure.

21.2 Morphemes in (12, 13, and 16) readily reanalyzable with colored vowel understood as presuffixal element:
- (12): * …]*-ái̯e/o-* => …]*-i̯e/o*
- (13): * …]*-ató-* => …]*-tó*
- (16): * …]*-aro-* => …]*-ro*

21.3 Similarly, since the affected morphemes in (14) and (15) are in secondary formations with the head suffix intact, the colored stems are likely to be acceptable and preserved.

21.4 Nasal infix still problematic: if the suffix had originally been **-ne-/n-*, the colored variants **-na-/n-*, **-no-/n-* should be disfavored. The preservation may be facilitated by:

- The fact that **-ne/n-* is the only infix in PIE and thus protected from the restoration affecting the right-edge suffixes.

- The relatively high percentage of **h₂/₃*-final roots among nasal presents.

22. The general idea in (21) is briefly hinted by Peters in his analysis of the Greek materials (1980: 192fn149):

> …sie dadurch gestützt wurden, daß in den betreffenden Formkategorien bereits andere Formen mit gleichem oder vergleichbarem Ausgang existierten.

22.1 I differ from Peters crucially in that a significant part of the restoration in my view must have taken place in PIE not in the daughter languages.

- Thus, e.g. a comparison of ἐάλων (cf. 9.2) with synchronic forms such as ἔγνων, ἔβρων, etc. as a proof of the acceptability of **-ō-*(*m, s, t*, etc.) is anachronistic, because a colored **u̯l̥h₃-oh₁-* will not survive beyond PIE given the analysis here.

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