

Evidence of laryngeal coloring in Proto-Indo-Iranian*

Abstract: Past scholarship has made almost no mention of the effects in the Indo-Iranian languages of ‘laryngeal coloring’, the putatively Indo-European development according to which */e/ is ‘colored’ into */a/ or */o/ by an adjacent */h₂/ or */h₃/, respectively. And for good reason: the merger of nonhigh vowels in Proto-Indo-Iranian would have effaced these distinctions in any case. In this paper I survey the etyma in which laryngeal coloring could have interacted with Proto-Indo-Iranian palatalization, which (in part) preceded the merger of nonhigh vowels, and find that palatalization in almost every case has not occurred to inputs involving */Keh₂/ or */Keh₃/, where coloring may be assumed to have taken place. This strongly suggests that laryngeal coloring – not as a discrete ‘sound change’, but as a phonological rule which requires additional sound changes (such as palatalization) before it can ‘show itself’ by affecting the distribution of phonemes in the lexicon – was present in the early stages of Proto-Indo-Iranian, giving further support to the hypothesis that laryngeal coloring was a feature of Proto-Indo-European itself.

Introduction: Laryngeal coloring

In his ‘Ennealogie’ of laryngeal theory, Eichner (1988) summarizes one of the most well-known effects of the PIE. laryngeals:¹

- (1) Unmittelbar neben (d.h. unmittelbar vor oder unmittelbar hinter) Laryngalen wird *ē* zu *ě*, *ā*, *ō* nach folgender Regel aufgespalten:
- (a) *ē* bleibt neben *h₁* als *ē* bestehen (“Kehlkopf”);
 - (b) *ē* wird neben *h₂* zu *ě* umgefärbt (“Kahlkopf”);
 - (c) *ē* wird neben *h₃* zu *ō* umgefärbt (“Kohlkopf”).

These ‘coloring’ effects allow us to explain the various kinds of vocalic ablaut in the daughter languages as resulting from the interaction of laryngeal phonemes and a relatively simple system of vocalic ablaut.²

* I am grateful to Elizabeth Tucker and Alexander Lubotsky for comments on an earlier version of this paper.

¹ Abbreviations: PIE. = Proto-Indo-European, PIr. = Proto-Indo-Iranian, PIA. = Proto-Indo-Aryan, PIr. = Proto-Iranian PGr. = Proto-Greek; Skt. = Sanskrit (inclusive of Vedic), Ved. = Vedic, Pkt. = Prakrit, Av. = Avestan, YAv. = Young Avestan, OAv. = Old Avestan, Sogd. = Sogdian, Khot. = Khotanese, Parth. = Parthian, MP. = Middle Persian, Chor. = Choresmian, OLith. = Old Lithuanian, Lith. = Lithuanian, ORuss. = Old Russian, Slov. = Slovenian, ṚV. = Ṛgveda, AV. = Atharvaveda, ŚB. = Śatapatha Brāhmaṇa.

² See Lindeman (1987) for a general survey of the laryngeal theory and Fortson (2004, 63) for a short overview.

Each of the following forms have a Proto-Indo-European full grade, but the identity of the laryngeal in the protoform explains the different quality of the vowel in the Greek reflexes:

- (2) $-d^h e h_1-$ > $-d^h e h_1-$ (> PGr. $-t^h e-$, in τί-θη-μι)
 (3) $-s t e h_2-$ > $-s t a h_2-$ (> PGr. $-s t a-$, in Doric ἴ-σ τ ᾱ-μι)
 (4) $-d e h_3-$ > $-d o h_3-$ (> PGr. $-d o-$, in δί-δ ω-μι)

The effects that Eichner summarized are observed in many Indo-European languages, and they are widely supposed to date back to Proto-Indo-European.³

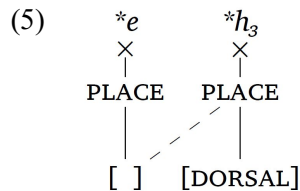
Further ‘coloring’ effects can be mentioned: in Greek, the vocalic reflexes of laryngeals in interconsonantal position mirror the reflexes of sequences of vowels and laryngeals (compare the above examples with the zero-grade forms τί-θε-μεν, ἴ-σ τ α-μεν, and δί-δ ω-μεν from $-d^h h_1-$, $-s t h_2-$, and $-d h_3-$ respectively), and similarly for the reflexes of laryngeals adjacent to resonants (cf. $-γ ν η τ ος$, $-τ λ ᾱ τ ος$ and $χ λ ω ρ ός$ for $-n h_1-$, $-l h_2-$ and $-l h_3-$ respectively).⁴ The coloring effects are difficult to trace in the Indo-Iranian languages, because the very contrast that laryngeal coloring produces – namely, between *e*, *o*, and *a* – was effaced by the merger, in Indo-Iranian, of all inherited nonhigh vowels. As a result, the Sanskrit cognates of the examples in exx. 2, 3, and 4 are *dádāti*, *tīṣṭhati*, and *dádāti*. In fact, according to Kobayashi (2004, 130), Indo-Aryan and Iranian are the only language families which do not furnish evidence of coloring. It might therefore seem that Indo-Iranian evidence cannot be brought to bear on the phenomenon of laryngeal coloring.

The nature of the coloring effects themselves pose a more general problem for evaluating the evidence of particular language families, including Indo-Iranian: while these changes must have constituted an ‘event’ in linguistic evolution, in a broad sense, they did not in themselves constitute a reorganization of the phonological system, and therefore they are not the kinds of changes that historical phonology can localize. We can imagine coloring as a process in which features associated with laryngeals came to be associated with an adjacent vowel. Assuming – now using phonological notation – that PIE. $*/h_3/$ had the feature dorsal,

³ E.g., Rasmussen (1999, 73).

⁴ According to Mayrhofer (1986–2001, 128), Armenian and Tocharian also have different reflexes for resonant-laryngeal sequences depending on the identity of the laryngeal: Armenian has $-R h_1-$ > *aR*, but $-R h_2-$ and $-R h_3-$ > *Ra*; Tocharian A has $-R h_1-$ > *äR*, but $-R h_2-$ and $-R h_3-$ > *Ra*, and the B forms are similar.

the coloring of */e/ by */h₃/ can be represented as the spreading of this feature to an adjacent node:⁵



Coloring is often described in the Indo-European literature as a change from one vowel quality to another (see Eichner's account in ex. 1), but in what sense has */e/ in the above representation 'become' */o/? True, it has the features of */o/ ([DORSAL]), but those features are not uniquely associated with it: it is borrowing them, so to speak, from the adjacent */h₃/. Put otherwise, we are still dealing with an allophonic change: the phoneme */e/, in this environment, has a phonetic realization close to */[o]. In the phonological representation that is stored in a speaker's mental lexicon, [DORSAL] is not a feature of the vowel segment */e/ but of the consonant segment */h₃/. When */h₃/ disappears, however, [DORSAL] will be stored as a feature of the vowel segment, and at that point we may justifiably speak of */o/.

The problem for historical phonology is twofold. First, coloring itself is a reversible allophonic change: it might occur anytime that */e/ abuts a laryngeal phoneme, but never needs to result in a phonemic change. Thus it is impossible to say whether it happened once and for all in PIE, or separately in all or some of the daughter languages. Second, for coloring to become phonemic, the laryngeals that serve as its conditioning environment must disappear, and the fate of the laryngeals in the daughter languages is one of the more intractable problems in Indo-European historical phonology. Thus even if we could localize coloring, as an allophonic process in the evolution of the Indo-European languages, it would be difficult to state when it became phonemic.

Lubotsky (1990) attempted to place laryngeal coloring in a relative chronology of sound changes in PIE. He argued that the change from */h₃e/ to */h₃o/ must have followed the Indo-Iranian change, known as Brugmann's Law, which lengthened */o/ in open syllables. Lubotsky noted that Skt. *ápas-* 'work' and *ánas-* 'cart' depend on preforms with */e/

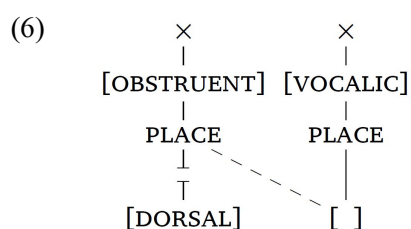
⁵ I leave aside the precise structural description of laryngeal coloring. If, however, we make the likely assumption that PIE. */e/ was underspecified for place features, then this underspecification might make it a prime target for processes that spread place features.

(from PIE. *h₃épos-* and *h₃énos-*) at the time of Brugmann's Law, because if the preforms had been (e.g.) **Hópos-* and **Hónos-*, Brugmann's Law should have turned these into ***Hó:pos-* and ***Hó:nos-* (resulting in ***ápas-* and ***ánas-*). On this argument, the change **h₃e > *h₃o* (or **Ho*) must have occurred subsequently to Brugmann's Law, if it occurred at all, and therefore could not have been a feature of PIE. This argument, however, depends on an understanding of Brugmann's Law as a neogrammarian sound change (for which there are alternatives: see Kiparsky 2010) and the assumption – rendered problematic by the feature-geometrical representation above – that a 'colored' **Ho* would have counted as an input to Brugmann's Law (which, in any case, preceded the loss of the laryngeals).

Besides Brugmann's Law, there is another change in the history of PIIr. that depends on vowel quality: the *Palatalgesetz*, the palatalization of the inherited labiovelars before front vowels. In this paper I will collect evidence from the interaction of putative coloring effects and the *Palatalgesetz* in PIIr. which speaks in favor of these coloring effects.

Indo-Iranian Palatalization

According to the traditional statement of the *Palatalgesetz*, the velar stops **/k/*, **/g/*, and **/g^h/* (deriving, in most cases, from the PIE. labiovelars **/k^w/*, **/g^w/* and **/g^w^h/*) became palatal obstruents, conventionally represented **č*, **ǰ*, and **ǰ^h*, before the front vowels **/e(:)/* and **/i(:)/*, and the front glide **/j/*.⁶ This change must have occurred before it could be bled by the change **/e(:)/ > */a(:)/*, i.e., the merger of inherited non-high vowels mentioned above. We can represent the *Palatalgesetz* with feature geometry in the following way:



In this scenario, dorsal obstruents (pre-PIIr. **/k/*, **/g/*, and **/g^h/*) lose their place features when preceded by a [vocalic] segment without place features (i.e., coronals: the trigger thus includes pre-PIIr. **/e(:)/*, **/i(:)/*,

⁶ I leave aside the question of whether **/i(:)/* and **/j/* are distinct phonemes (see Kiparsky 1972).

and */j̥/). The erstwhile dorsal obstruents, with the features [HIGH] and [DORSAL], lose the feature [DORSAL] and become palatal obstruents.⁷ This accounts for the following reflexes (in Skt. unless otherwise noted):

- (7) */k/: *ca* ‘and’ < */k^he/; *cit* ‘even’ < */k^hit/; *cyávate* ‘moves’ < */kieu-/
 (8) */g/: Av. *jimaṭ* ‘will come’ < */g^hemet/; *jīvati* ‘lives’ < */g^hih₃u-/
jyā- ‘bowstring’ < */g^hieh₂-/
 (9) */g^h/: Av. *jaiṇtī* ‘slays’ < */g^hen-/

The results of this change are complicated by further sound changes and analogy. The palatalized outcome of PIE. */g^h/, PIIr. */j̥^h/, becomes a continuant (Skt. *h* and Av. *z*). Indo-Aryan in particular has a tendency to analogically restore dorsal obstruents: Av. *jimaṭ* (ex. 8) corresponds to Skt. *gamat*, and *jān* ‘he came’ to Skt. *gan* (< */g^hem-t/); similarly Av. *ranjiiah-* ‘swifter’ and *drājišta-* ‘longest’ can be compared to Skt. *rāghišṭha-* ‘swiftest’ and *drāghišṭha-* ‘longest’. We can glimpse the opposite tendency in Av.: in *jasaitī* ‘comes’ (< */g^hm-sketi/), the palatalized *j-* has even been extended where we expect *g-* (compare Skt. *gáčchatī*).⁸

In purely phonological terms, we expect an */e/ to trigger palatalization if */h₂/ or */h₃/ follows, unless these laryngeals had ‘colored’ the vowel to *[a] or *[o] respectively, and unless this kind of ‘coloring’ was capable of bleeding palatalization. (This latter condition fundamentally depends on what level of representation – lexical or postlexical – the *Palatalgesetz* had access to.) To test this hypothesis, we must find Indo-Iranian etyma which continue an inherited shape */Keh₂/ or */Keh₃/ (where */K/ = */k/, */g/, or */g^h/). The evidence must be evaluated with attention to possible analogical developments. Thus if palatalization is absent, we must consider the possibility of analogy from unpalatalized forms (e.g., from different ablaut grades, such as */KoH/ or */KH/) – a process better attested in early Indo-Aryan than in early Iranian. If palatalization is present, we must likewise consider analogical models,

⁷ I understand PIIr. dorsal obstruents to have the feature [HIGH], since such segments trigger RUKI, which appears to have been sensitive to tongue height features. Lipp (2009a) also considers the immediate output of the *Palatalgesetz* to be palatal obstruents, specifically */c/, */j̥/ and */j̥^h/.

⁸ Cf. Lubotsky (2001a): ‘It is well known that Indo-Iranian languages dislike paradigmatic alternation of palatalized and nonpalatalized consonants in anlaut and often generalize one of the variants. In general, Sanskrit does so more rigorously than Iranian.’

although in this situation analogy is less likely, especially for Indo-Aryan forms.

I gathered the possible Indo-Iranian etyma for */Keh₂/ and */Keh₃/ from Bartholomae (1904), *EWAia* = Mayrhofer (1986–2001), Scarlata (1999), Kümmel (2000), *LIV*² = Rix (2001), Mayrhofer (2005), and Cheung (2007).

Evidence

To begin, we may exclude several etyma which appear to continue */KeH/ but which, to a greater or lesser degree of likelihood, do not.

Skt. $\sqrt{k\acute{a}ś$ ‘appear’: The PIIr. root, \sqrt{kac} , did not contain a laryngeal. The long vowel appears in the causative (AV.+), where palatalization is not expected because of the original *o*-grade of the root, and in the simple present first in ŚB. *ávakāśate* ‘appears’. This present may be based on the causative or a nominal derivative (e.g. *prakāśá-*, *ākāśá-*). Alternatively, *LIV*² posit an acrostatic present for this root, with a strong stem */ke:k-/ and a weak stem */ke:k-/ (Gotō, cited in *EWAia* s.v., connects Gr. τέκνωρ, τέκνωρ to reconstruct */k^uék/). The Skt. present *kāśa-* might thus be a thematic replacement for the strong stem, and the YAv. present *kasa-* (in *V* 22.2 *ākasat* ‘he noticed’) might be a similar replacement for the weak stem. Lipp (2009b, 277) invokes ‘palatal dissimilation’ (e.g., pre-PIIr. */čac-/ > PIIr. */kac-/) to account for the lack of palatalization in both Skt. and YAv. The other inherited forms of PIIr. \sqrt{kac} are the thematic aorist, where PIIr. */ká-/ is reflected in OAv. *ā.xsō* ‘you look’ and Ved. *ákhyat* ‘looked’ (written more faithfully as *akśat* in the *Maitrāyaṇī Saṃhitā*: see Lubotsky 1983), and the present stem */čacś-/ (YAv. *cašte*, Ved. *caṣṭe* and *caṣṭate*). The latter is either a reduplicated present with ‘dissimilation’ of */čakć-/ (which should have given YAv. **caxś-*) to */čacś-/ (Narten 1968, fn. 28), or an *s*-present (*/čacś-s-/; *EWAia* s.v.). Most likely this root formed a thematic aorist and two presents in PIIr.: a semantically neutral acrostatic present, and a semantically specialized (perhaps ‘ingressive’) *s*-present.

Skt. $\sqrt{ghā}$ ‘be active’: *EWAia* refers us to \sqrt{hay} , since this root had the palatovelar */ǵʰ/ as indicated by *hinóti* and OAv. *zaēman-* ‘wakefulness’; the perf. form *jighāya* (instead of expected **jihāya*) is probably analogical upon *jaghāna* vel sim. (Kümmel s.v.).

Skt. *cāyú-* and *cāyamāna-* ‘respectful’ (RV.), *acāyat* ‘observe’, *upacāyanti* ‘respect’ (ŚB.): The root $\sqrt{cāy}$ which these forms appear to

represent is a long-vowel form of the root \sqrt{ci} or $\sqrt{cay} < * \sqrt{k^u ei}$ ‘watch out’ (as shown by the forms *ni-citá-* ‘observed’, *ápa-citi-* ‘respect’, OAv. *caiiah-* ‘attention’). The long vowel probably comes from a lengthened grade (so Gotō 1987, 137: ‘Die dehnstufige Präs.-Bildung ist urindogermanischer Herkunft, da sie auch in aksl. *čajō* ,erwarte, hoffe‘ vorliegt: $*k^w \acute{e}i-e-$ ’).

Skt. *cáru-* ‘pleasing’: Bartholomae associates this word with the root $\sqrt{kā}$ ‘love’ (see the discussion of Skt. and Av. $\sqrt{kā}$ below), but Mayrhofer in *EWAla* strongly insists that *cáru-* derives from the root $\sqrt{kan^i}$ ‘take pleasure’. One argument for Mayrhofer’s position is that the word *cániṣṭha-* ‘most pleasing’, related to $\sqrt{kan^i}$, functions as the superlative to *cáru-*. The palatal stop of *cáru-*, which is phonologically unexpected if the protoform is $* /knH-ru-$, would in this case be analogical upon related forms (*cániṣṭha-*, *cánas-* ‘pleasure’, *cániṣṭám* ‘you two take pleasure’, etc.). But such an analogy might operate even if *cáru-* derived from the root $* \sqrt{keh_2}$, if the roots $\sqrt{kan^i}$ and $\sqrt{kā}$ were felt to be related (note that Whitney 2003 [1885] does not separate them, and Cheung s.v. \sqrt{kanH} suggests that $* \sqrt{kenH}$ is ‘perhaps a (infixd) nasal pres. stem of IE $*keH_2-$ ’).

The etyma which possibly continue $* /Keh_2/$ and $* /Keh_3/$ are:

Skt. $\sqrt{kā}$, Av. $\sqrt{kā}$ ‘desire’: All of the forms of this root which could conceivably continue a full grade $* /keh_2-$ lack palatalization. Skt. *kāma-*, Av. *kāma-* ‘desire, love’ may go back to either $* /keh_2-mo-$ (so Cheung; cf. PIE. $* /keh_2-ro-$, reflected in Lat. *cārus* ‘dear’, Latv. *kārs* ‘lustful’, and Goth. *hors* ‘adulterer’) or $* /koh_2-mo-$ (cf. possibly Grk. *κῶμος* ‘reveling group’); the latter seems more likely because ‘[a]lte -mo-Bildungen zeigen die Wurzel entweder schwundstufig oder in der o-Stufe’ (Janda 2000, 278). Skt. also has compounds in *-kāti-* (*ṛṇá-kāti-*, *kāma-kāti*) which could continue $* /-keh_2-ti-$, and an adjective *ākāyyā-* ‘desirable’. The latter is formed from a present stem in *-ya-*, attested in the participle *kāyamāna-* ‘desiring’ (*RV* 3.9.2); this stem possibly occurs in OAv. *kaiiā* (*Y* 33.6) (but Kellens and Pirart 1990 derive this form from the root $\sqrt{kan^i}$ ‘take pleasure’). LIV² reconstructs a present stem $* /kéh_2-i-e-$ for PIE. on the basis of these Indo-Iranian forms. For the form *cāru-*, which has been derived from $\sqrt{kā}$ in the past, see above. Conclusion: conspicuous absence of palatalization in *kāti-* and *kāyamāna-/kaiiā*.

Skt. $\sqrt{kānks}$ ‘desire’: perhaps related to $\sqrt{kā}$ ‘desire’, but in any case not an inherited root shape.

Skt. *kā́ru-* and *kā́ra-* ‘singer’: probably related to $\sqrt{k\bar{r}}$ *carkarti* ‘praises’, which derives from $*/kerH/$; *LIV*² mentions the possibility of dissimilation ($*/kreh_2\text{-}ru\text{-}/ > */keh_2\text{-}ru\text{-}/$). These forms might lack palatalization either because of laryngeal coloring or because the *Palatalgesetz* applied to the non-dissimilated form $*/kreh_2\text{-}ru\text{-}/$.

Skt. $\sqrt{k\bar{a}s}$ ‘cough’: OHG *huos-to* ‘cough’, OLith. *kos-mi* ‘I cough’, Toch.B *kos-i* speak for the PIE. reconstruction $*/k^h\text{eh}_2s$ (for more cognates see Adams 1999, 207). The verbal forms *kāsate* etc. (*Suśruta*+) do not show palatalization, though Mayrhofer suggests we are dealing with formations based on the root noun *kās-* ($< */k^h\text{oh}_2s\text{-}/$). Conclusion: no evidence.

Skt. *khā́-*, Av. *xā́* ‘well’ is probably a loanword.⁹ A relationship with the root \sqrt{khan} (Skt.) and \sqrt{kan} (Av. OP), both ‘dig’, is uncertain. Kümmel suggests that the root \sqrt{kanH} was formed within PIr. on the basis of a nasal present of a root \sqrt{kaH} ($< */keh_2/$, distinct from \sqrt{kaH} ‘love’), and that \sqrt{kanH} took on the anlaut of *khā́* within Skt.

Skt. $\sqrt{kh\bar{a}d}$: More precisely, this is two roots (so Kümmel): $^1\sqrt{kh\bar{a}d}$ (*khā́dati*) means ‘chew’; $^2\sqrt{kh\bar{a}d}$ (*khidāti*) means ‘oppress’. The former appears to have cognates in Iranian – if one finds the semantic correspondences compelling – viz. Khot. *khās-* ‘drink’ and Parth. *x’y-* ‘devour’, which however have a different final sound. Cheung considers the possibility of a PIr. root $*/k^h\text{a:d}$ with an ‘extended’ variant $*/k^h\text{a:d-s-}$, parallel to PIr. $*/\text{ur}\bar{a}d$ and $*/\text{ur}\bar{a}z$. Skt. $^2\sqrt{kh\bar{a}d}$ has a peculiar ablaut: zero grade *khid-* (*khidāti*), full grade *khād-* (*cakhā́da*, *-khāt*, *akhā́tsur*) and full grade *khed-* (RV. *khédā-*, classical *cakheda* and *khetsyati*). The history of forms in Sanskrit gives the clear impression that *khed-* is a ‘false’ full grade formed on the basis of the zero grade *khid-*; the ablaut of *khid-* and *khād-* gives an equally clear impression that the Skt. root goes back to $*/k^h\text{a}Hd$. But the Iranian root $*/\text{xad}$ ‘injure’ bears some formal and semantic similarity to $^2\sqrt{kh\bar{a}d}$ (e.g., YAv. *vīxada*, which Cheung translates ‘beat apart’ and which *LIV*² translates ‘auseinander quetschen’, Khot. *khad-* ‘wound’, Sogd. *γd-* ‘a wound’: but Gershevitch 1964 gives the latter as ‘thief’). The solution of *LIV*² is to group Skt. $^1\sqrt{kh\bar{a}d}$ ‘chew’ with Iranian $*/\text{xad}$ ‘injure’ under $*/k^{(u)}\text{h}_2\text{ed}$ ‘verquetschen’ (for which the editors give an acrostic root present), to enter Iranian $*/\text{xaz}$ ‘devour’ (*vel sim.*) under $*/k^{(u)}\text{h}_2\text{e}g$ ‘verzehren’

⁹Lubotsky (2001b).

(with another acrostic root present), and to enter Skt. $^2\sqrt{khād}$ ‘oppress’ under $^*\sqrt{k^{(u)}eh_2d}$ ‘reissen, drücken’.

Cheung objects to *LIV*²’s treatment of these forms, and gives $^*\sqrt{xad}$ ‘injure’ and $^*\sqrt{xād}$ ‘devour’ separately, connecting only the latter with Skt. $^1\sqrt{khād}$. I would suggest, instead, two homophonous PIIr. roots: $^*\sqrt{k^h aHd}$ ‘devour’ and $^*\sqrt{k^h aHd}$ ‘oppress’. Homophony avoidance may have been the motivation for creating from the first the extended root $^*\sqrt{k^h aHd-s}$ ‘devour’. The PIIr. root $^*\sqrt{xad}$ ‘injure’ would be cognate with Skt. *khidāti* (from $^2\sqrt{khād}$ ‘oppress’): they share a protoform $^*/k^h Hd-/$, but with the loss of laryngeals in PIIr. the phonotactically intractable $^*/k^h d-/$ was remade to $^*/k^h ad-/$ with a ‘false’ or facultative full grade. On this view, the ‘true’ full- and lengthened-grade forms (of ‘devour’, Skt. *khādāti*, Khot. *khās-*, and Parth. *x̄y-*; of ‘oppress’, Skt. *-khāt* and *akhātsur*) continue an inherited shape $^*/k^h e(:)H-/$. The origin of $^*/k^h/$ in both roots is a related problem; standardly (e.g., in *LIV*²) $^*/k^h/$ is taken back to $^*/kh_2/$, but possibly we must consider longer-range assimilation of laryngeal features (e.g., $^*/keh_2d/ > ^*[k^h eh_2d]$). If we reconstruct forms with $^*/kh_2/$, the lack of palatalization in Indo-Iranian may be due to the laryngeal intervening between $^*/k/$ and $^*/e/$ (although see the discussion of $\sqrt{chā}$ ‘cut up’ below); if we reconstruct $^*/keH/$ and allow the aspirate $^*/k^h/$ to have arisen secondarily, the lack of palatalization may be due to the coloring of $^*/e/$ by the laryngeal.

Skt. $\sqrt{gā}$ and Av. $\sqrt{gā}$ ‘step, go’: This root, going back to PIE. $^*\sqrt{g^u eh_2}$, had an *e*-grade in the root aorist (cf. Gr $\epsilon\beta\eta\nu$). In Ved. the form is *ágāt*, but intraparadigmatic analogy often leads to the restoration of dorsal obstruents in Ved. (cf. the discussion of *gāmat/jimat̄* and *gan/jān* above). But in OAv. we also encounter *gāt* (*Y* 46.6), and Mayrhofer cites Khovar *goī* ‘comes’ from a putative root present $^*/ga:ti/$. Cheung claims the palatal anlaut of the Khot. forms (*jsāte* etc.) is from *jsem* ($^*\sqrt{g^u em}$ ‘step’), a root with which $^*\sqrt{g^u eh_2}$ was suppletive. All of the nominal derivatives of this root also lack palatalization: Skt. and YAv. *gātu-* ‘movement, way’ (cf. OP *gāθu-* ‘place’) $< ^*/g^u eh_2-tu-/$; Skt. and YAv. *gāman-* ‘step’; YAv. *gāiia-* ‘step’, and Skt. *-gā-* at the end of root compounds (e.g., *tamogām* ‘going in the darkness’, *svastigām* ‘going to heaven’, *samanagā* ‘going to an assembly’). Cheung also lists for Iranian a root $\sqrt{gā}$ ‘have sexual intercourse’, probably historically identical with $\sqrt{gā}$ ‘go’; here too we encounter (e.g.) MP $/ga:i-/$ and $/ga:dan/$, without palatalization. Conclusion: conspicuous absence of palatalization, except for Khot. *jsāte*, which is probably analogical.

Skt. *gātra-* ‘limb’: Mayrhofer posits an ablauting root ($*\sqrt{g^u eh_2}$ ‘move’) on the basis of $*x\acute{a}dra-$ < $*/g^u h_2\text{-tró-}/$ in YAv. *bix\acute{a}dra-* ‘Name eines zu Ritualzwecken dienenden Gefäßes’. No palatalization.

Skt. *gādhá-* ‘ford’: The Lat. word *uadum* ‘ford’ leads Narten (in *EWAia s.v.*) to suggest contamination for the Skt. form (i.e., between $*/g^u m\text{-d}^h om/$ and $*/g^u eh_2\text{-d}^h om/$, from the suppletive roots $\sqrt{g^u em}$ and $\sqrt{g^u eh_2}$); contamination at a later stage by $*\sqrt{g^u e\acute{g}^h}$ > Skt. $\sqrt{g\acute{a}h}$ (see below) also seems possible. *LIV*² gives a root $*\sqrt{g^u eh_2 d^h}$ ‘eintauchen’ (OIr. *-bádi* ‘taucht etw. unter, ertränkt’ and Gr. βῆσσα ‘glen’). In either case, palatalization is absent.

Skt. $\sqrt{g\acute{a}h}$ ‘plunge’: Mayrhofer posits $*g^u \acute{a}\acute{g}^h$ on the basis of Slov. *gáziti* ‘waten’ and Serbo-Croat *gáziti* ‘treten, waten’. Cheung reconstructs $*\sqrt{gaHz}$ for Iranian forms with the meaning ‘begin’ (e.g., Sogd. $\gamma\acute{z}\text{-} \acute{a}\gamma\acute{z}\text{-}$ ‘begin’), which would imply a preform $*\sqrt{g^u eh_2 \acute{g}^h}$. *LIV*² and Lipp (2009b, 269ff.), however, give this root as $*\sqrt{g^{(u)} e\acute{g}^h}$ with an acrostic root present. *LIV*² supports this etymology by citing the Skt. form *durgáha-* ‘impassable’ and suggesting a connection with the Skt. root $\sqrt{k\acute{s}ar}$ ‘flow, pour’ < $*\sqrt{g^u g^h er}$ (Av. $\sqrt{\gamma\acute{z}ar}$, Prakrit \sqrt{jhar}), which appears to be formed secondarily from $*\sqrt{g^{(u)} e\acute{g}^h}$. But because *durgáha-* conforms to a synchronic pattern of adjective-formation in Vedic, in which an indeclinable first member combines with a verbal second member of the shape \sim ,¹⁰ *-gaha-* need not reflect an inherited short vowel. The connection with $*\sqrt{g^u g^h er}$ is plausible but not compelling. In either case, forms from this verb lack palatalization entirely: if the etymon is $*\sqrt{g^u eh_2 \acute{g}^h}$, we might account for the lack of palatalization by supposing that laryngeal coloring blocked palatalization (i.e., $*[g^u ah_2 \acute{g}^h]$ was not an input to palatalization); alternatively, even if the etymon is $*\sqrt{g^{(u)} e\acute{g}^h}$, we can account for it, with Lipp (2009b, 277), by ‘palatal dissimilation’ ($*/g^u e\acute{g}^h\text{-}/ > */\acute{g}^h\text{-}/ > */g\acute{a}\text{-}/$).

Skt. \sqrt{gai} ‘sing’: Lith. *giedóti* ‘sing’, ORuss. *gajati* ‘crow’ allows us to reconstruct PIE. $*\sqrt{g^{(u)} eh_2 i}$ or $*\sqrt{g^{(u)} eh_3 i}$. None of the Skt. or Av. forms of this root show palatalization; though we might expect an *e*-grade in the present stem (3sg. *gāyat* etc., as if from $*/g^{(u)} eh_2 ie\text{-}/$), in the *s*-aorist (1sg. *gāsi*, as if from $*/g^{(u)} e\text{:}h_2\text{-s-}/$), and the verbal noun *-gā-* (in *sāma-gā-* ‘one who chants the *sāmans*’, as if from $*-/g^{(u)} eh_2\text{-}/$). *LIV*² cites Parth. *ny-g’y-* (*ni-gāy-*) ‘sing’, but Cheung *s.v. jad* gives the meaning of

¹⁰ See Debrunner (1954, 63): several roots with *-ā-* form compounds with *-a-*, e.g., besides *-gāha-*, *-dhāra-*, *-śaka-*, *dūnāsa-* (Padapāṭha; Samhitāpāṭha *-nāsa-*), *suśāha-* (Padapāṭha; Samhitāpāṭha *-śāha-*). See also Kiparsky (2010).

this word as ‘pray, supplicate’ and derives it from PIE. $\sqrt{g^{uh}ed^h}$ ‘wish’ (based on Gershevitch 1964, 27). For Manichean Sogd. $\dot{y}y-$, Christian Sogd. $\dot{z}y-$ ($\dot{z}\dot{a}y-$) ‘to speak’, Cheung accepts the explanation of Schwartz (1970, 387 fn. 10), whereby the Sogd. forms derive from a *e*-grade present stem $*/geHi-/$ with palatalization, and the unpalatalized Skt. forms derive from an *o*-grade stem. (Schwartz rejects the derivation of Gershevitch 1964, 45 from $*/dra:i-/$ in 1964, 45 because of Yaghnobi $\dot{z}oy-$ and Wakhi $\dot{y}\dot{o}y-$ ‘read’ and Munji $\dot{z}\dot{a}y-$ ‘say’, since PIr. $*/dr-/$ is preserved in those languages.) The problem with Schwartz’ explanation, however, is that we expect an *e*-grade, not an *o*-grade, to underlie many of the Skt. forms. I have no alternative etymology for Sogd. $\dot{z}\dot{a}y-$, unless it is borrowed from a MP form $*/\dot{z}a:i-/$ which derives (with intervocalic loss of $*/d/$) from $*/\dot{y}a:d-/ < */g^{uh}e:d^{h1}-/$, from the root $\sqrt{g^{uh}ed^h}$ ‘wish’.¹¹ Conclusion: no palatalization where expected in Skt., but problematic palatalization in Sogd. and modern Iranian languages.

Av. \sqrt{gau} ‘commit a sin’: Cheung (‘possibly’) interprets OAv. $g\dot{a}u\dot{s}$ as the 3sg. *s*-aor.inj. of a root \sqrt{gau} , which he further connects with Lat. *haud*, Gr. $\chi\acute{\alpha}\omicron\varsigma$ (presumably through PIE. $\sqrt{g^heh_2u}$, although the connection is quite doubtful). If the interpretation of $g\dot{a}u\dot{s}$ is correct, its protoform would be $*/g^{(h)}e:u-s-t/$ or, in light of the Greek and Latin cognates, $*/g^he:h_2u-s-t/$. Cheung gives the PIr. form and meaning as \sqrt{gaHu} ‘be lacking’.¹² No palatalization is found in the other Iranian forms of this root (e.g., Bact. $\gamma a\omicron\omicron-$ ‘to be necessary’, Sogd. and Chor. $\gamma w-$ ‘to be wanting’, Parth. prg^w ‘to lack’). Conclusion: conspicuous absence of palatalization in $g\dot{a}u\dot{s}$ and related Iranian forms.

Skt. $\sqrt{ch\bar{a}}$ ‘skin’: As Lubotsky (2001a) has shown, palatalized $*/sk/$ merged with $*/s\hat{k}/$ as (pre-)PIr. $*/s\acute{c}/$ in most circumstances; the result then regularly developed to $/c^h/$ in Sanskrit and $/s/$ in Avestan. Lubotsky himself is skeptical of the connection between this root and OAv. $s\dot{a}zd\dot{u}m$ (in *Y* 34.18: ‘tear up!’ or ‘teach!’ from $\sqrt{s\bar{a}h}$) and $sii\dot{o}d\dot{u}m$ (in *Y* 48.7 ‘chop up!’ or, reading $sii\dot{o}zd\dot{u}m$, ‘banish!’ from $\sqrt{sii\dot{a}z}$). Never-

¹¹ Compare Parth. $niy\dot{a}yi\dot{s}n$ ‘prayer’, which Gershevitch (1964, 27) considers to be borrowed from a MP reflex of $*/ni-ga:d-/$ such as Manichean MP $nyz\dot{y}-$ ‘implore’.

¹² This is in accordance with the proposal of Humbach (1974) on *Y* 32.8: ‘Viel besser paßt jedoch die im Sogdischen, Baktrischen und Chwaresmischen belegte Wurzel gul/gau ‚sündigen, fehlen (peccare, deesse)‘, für deren juristisch-religiösen Gebrauch insbesondere sogd. $\gamma w'n$ ‚Verfehlung, Sünde‘ zeugt. ... ‚der im Bestreben, die Menschen zufriedenzustellen (= ihnen gefällig zu sein), die Unseren, sich versündigte, indem er mit Gott rechtete‘. But in Humbach (1991) he has translated the word as if it is related to $*/g^hou/$ ‘cow’.

theless Lubotsky argues that the protoform of $\sqrt{ch\bar{a}}$ (and its Iranian cognates, including Khot. *sāta*- ‘smooth’) is $\sqrt{skeh_2}$ rather than $\sqrt{\hat{s}keh_2}$ because of Grk. $\sigma\chi\acute{\alpha}\sigma\alpha\iota$ ‘split open’ (< $\sqrt{skeh_2-s-}$) and because the element $\sqrt{sk-}$ is common to other PIE. roots with the meaning ‘split, cut’ vel sim. (\sqrt{sek} in Lat. *secō* ‘I cut’, and $\sqrt{skeu(H)}$, \sqrt{sker} , \sqrt{skeid} , $\sqrt{skel(H)}$). Skt. *chyāti* ‘he skins’ should therefore continue an inherited $\sqrt{skeh_2-i\acute{e}-ti}$. Lubotsky notes that this case $\sqrt{h_2}$ appears not to have blocked the palatalization of \sqrt{k} . Perhaps, however, we could say that the change $\sqrt{kh_2} > \sqrt{k^h}$ in this position – which was of PIIr. date – preceded the operation of the *Palatalgesetz*, so the chronology was PIE. $\sqrt{skeh_2i\acute{e}ti} > \sqrt{sk^hi\acute{e}ti} > \sqrt{sci\acute{e}ti} > \text{PIIr. } \sqrt{sci\acute{a}ti}$. More tentatively Lubotsky suggests that the participle *chitá*- < $\sqrt{skeh_2t\acute{o}-}$ shows palatalization by and vocalization of $\sqrt{h_2}$ in a way similar to *duhitár*- < $\sqrt{d^hugh_2tr-}$.

Let us assume that the the anlaut *ch-* was present in the present stem and the past participle. The history of attestations of this root in Skt. supports the idea that palatalization was carried over from these inherited zero-grade forms into newer full-grade forms, where we might have expected $\sqrt{sk\bar{a}}$. The earliest forms are the present stem *chyá*- (AV.+), followed by the absolutive *-chā-ya* (ŚB.+, though this is not an inherited morphological category) and the past participle *-chitá*- (ŚB.), then *-chā-na-* and *chāta-* (*Śrauta Sūtras*). Other full-grade forms, such as aor. *acchāt* or *acchāsīt*, are Pāṇinian and classical. The form *vichāyāti* ‘drive by blows’ (AV.+), which Hoffmann (1966) convincingly explained as a denominative from $\sqrt{vich\bar{a}}$ - ‘Wundschlager’, presents a problem for this chronology, since it shows both an early full grade and a palatalized anlaut. But if this hypothetical $\sqrt{vi-ch\bar{a}}$ - was an ablauting root noun like *go-pā-*, in historical-phonological terms Skt. might have inherited a paradigm with both palatalized and unpalatalized variants: nom.sg. $\sqrt{sk\bar{a}-s} < \sqrt{-skeh_2-s}$, gen.sg. $\sqrt{-ch-as} < \sqrt{-c^h-as} < \sqrt{sk^h-es} < \sqrt{skeh_2-es}$. The paradigm may then have been levelled in favor of the palatalized variant, perhaps with *chyāti* serving as an analogical model. This is indeed special pleading, but it shows that we do not need to assume in this case that $\sqrt{-skeh_2-}$ underwent palatalization by the *Palatalgesetz*.

In any case, if Lubotsky was wrong, the palatalized forms would derive unproblematically from $\sqrt{\hat{s}keh_2}$. For Iranian cognates, *EWAia* adduces Baluchi *sāyag* ‘scheren, rasieren’ (similarly Bailey 1979 connects Khot. *sāta*- ‘smooth’ with *chyāti*), but it is not clear that this and related

forms belong with Skt. $\sqrt{ch\bar{a}} < * \sqrt{skeh_2}$ ‘skin’ as opposed to Skt. $\sqrt{s\bar{a}} < * \sqrt{keh_3}$ ‘whet, cut’, where Cheung in fact places them.

The palatalization of the initial cluster in *chāyā́* ‘shadow’ is a similar case: since Gr. σκιά ‘shadow’ is clearly a cognate, Mayrhofer posits proterokinetic ablaut (strong cases $*/skéh_1-ih_2-/$, weak cases $*/skh_1-iéh_2-/$). But we would not expect $*/h_1/$ (posited on the basis of OCS сѣнь ‘shade’) to color $*/e/$, or block the palatalization triggered by it, in any case.

Conclusions

The examples in which PIIr. likely inherited $*/eh_2/$ and in which a dorsal obstruent is preserved are: *-kāti-*, *kā́yamāna-*, OAv. *kaiiā* ($< */keh_2/$); *khādati*, Khot. *khās-*, Parth. *x’y-*; *prakhāt*, *akhātsur* ($< */k^{(h)}eh_2/$); *agāt*, OAv. *gāt*, Khowar *goī*, *gātu-*, *gāman-*, YAv. *gāiia-*, *gātra-* ($< */g^{uh}eh_2-/$); *gādha-* ($< */g^{uh}eh_2-/$); *gāyat*, *gāsi*, etc., *gāman-*, *-gā-* ($< */g^{(u)}eh_2-/$ or $*/g^{(u)}eh_3-/$); OAv. *gāuš* ($< */g^{uh}eh_2u-/$). Examples of palatalization are limited to Sogd. *j’y-/z’y-*, if this verb in fact derives from the PIE. root for ‘sing’ ($* \sqrt{g^{(u)}eh_2i}$ or $* \sqrt{g^{(u)}eh_3i}$), and the reconstructed Ved. agent noun **vichā*. There is clearly an asymmetry in the PIIr. outcome of PIE. $*/Keh_2/$ sequences: rarely, if at all, do we encounter reflexes which point to an early palatalization. This is not likely to be an accident of analogy. The most likely explanation is that the *Palatalgesetz* did not apply to such sequences. Since the *Palatalgesetz* did apply regularly to other sequences involving $*/Ke/$ ($* \sqrt{k^ue} > ca$; $* \sqrt{g^uei} > jāyati$; $* \sqrt{g^uhen} > hānti$, YAv *jaiṅti*), we can infer that $*/Ke/$ sequences crucially differed, at the level of phonological representation at which the *Palatalgesetz* worked, depending on whether $*/h_2/$ followed: that is to say, $*/[Ke]$ met the rule’s structural description, but $*/[Ka]$ (from $*/Ke/$ with ‘coloring’ by $*/h_2/$) did not.

As stated above, these are postlexical rather than lexical representations: here, $*/[a]$ is not a phoneme that minimally contrasts with $*/[e]$, since its [LOW] feature – or whatever distinguishes $*/[a]$ from $*/[e]$ – is associated, in the lexical representation, with the adjacent phoneme $*/h_2/$. But this accords with the way that the *Palatalgesetz* is assumed to work: neogrammarian ‘exceptionless sound changes’ are in fact post-lexical rules, since they (1) apply ‘across the board’, without restrictions to particular morphological domains; (2) are not necessarily ‘structure preserving’, as they may introduce distinctions which are not present in lexical representations (or erase distinctions which are). The traditional formulation of the *Palatalgesetz* thus involves two components: first,

the addition of a postlexical rule to the grammar of PIIr. which straightforwardly palatalizes dorsal obstruents before high vowels (formally, this may be a constraint on the feature [DORSAL] before place-unspecified vocalic segments); second, the neutralization of contrasts among nonhigh vowels, which renders output of the previous postlexical rule opaque. The result is a new contrast between dorsal and palatal stops.

The data assembled in this paper allow us to add some welcome nuance to this account. It appears that the postlexical phonology of PIIr. included both the palatalization rule and a coloring rule. The coloring rule spread the [LOW] feature of $*/h_2/$ (and probably the [DORSAL] feature of $*/h_3/$, though the etyma are few) to an adjacent vocalic segment with unspecified place and height features (i.e., to the unmarked vowel $*/e/$). As a result, $*/Keh_2/$ sequences took on a representation that excluded them from the structural description of the palatalization rule, and they emerged from the neutralization of contrasts among nonhigh vowels with their dorsal obstruents intact. Of the chronology we can only say that both the coloring rule and the palatalization rule were in effect at the time of the vowel merger. The view that PIIr. shows effects of laryngeal coloring is, however, consonant with the mainstream view (though not often articulated explicitly) that laryngeal coloring was a feature of PIE.

This finding appears to contradict the claim of Lubotsky (1990) that the change $*h_3e > *Ho$, if it occurred in PIIr. at all, occurred after Brugmann's Law. His account and the present one, however, do not necessarily conflict: while Lubotsky understands Brugmann's Law as a neogrammarian sound change, there are good reasons for supposing that it had a morphological component,¹³ and application to derived environments is standardly a feature of lexical rather than postlexical rules. To put the matter simply: Brugmann's Law might have applied to an underlying $*/o/$, which – because of further sound changes – laryngeal coloring never actually produced in PIIr.

Bibliography

- Adams, D. Q. (1999): *A Dictionary of Tocharian B*. Amsterdam and Atlanta: Rodopi.
 Bailey, H. W. (1979): *Dictionary of Khotan Saka*. Cambridge and New York: Cambridge University Press.

¹³ Kiparsky (2010) claims that Brugmann's Law was a 'morphophonological process' that only applied to 'fleeting' (i.e., ablauting) *o*, and this only when unaccented morphemes follow.

- Bartholomae, C. (1904): *Altiranisches Wörterbuch*. Strassburg: Trübner.
- Cheung, J. (2007): *An Etymological Dictionary of the Iranian Verb*. Leiden: Brill.
- Debrunner, A. (1954): *Altindische Grammatik: Band II, 2: Die Nominalsuffixe*. Göttingen: Vandenhoeck and Ruprecht.
- Eichner, H. (1988): 'Anatolisch und Trilaryngalismus.' In A. Bammesberger (ed.), *Die Laryngalthorie und die Rekonstruktion des indogermanischen Laut- und Formensystems*, pages 123–151. Heidelberg: Carl Winter.
- Fortson, B. W. (2004): *Indo-European Language and Culture: An Introduction*. Malden, Mass.: Blackwell.
- Gershevitch, I. (1964): 'Dialect variation in early Persian.' *Transactions of the Philological Society* 63: 1–29.
- Gotō, T. (1987): *Die „I. Präsensklasse“ im Vedischen: Untersuchung der vollstufigen thematischen Wurzelpräsentia*. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- Hoffmann, K. (1966): 'Vedisch *vichāyāti* und *govyachá-*.' *Münchener Studien zur Sprachwissenschaft* 19: 61–72.
- Humbach, H. (1974): 'Methodologische Variationen zur arischen Religionsgeschichte.' In M. Mayrhofer, W. Meid, B. Schlerath, and R. Schmitt (eds.), *Antiquitates Indogermanicae: Studien zur Indogermanischen Altertumskunde und Sprach- und Kulturgeschichte der indogermanischen Völker: Gedenkschrift für Hermann Güntert*, pages 193–200. Innsbruck: Innsbrucker Beiträge zur Sprachwissenschaft.
- (1991): *The Gāthās of Zarathushtra and the Other Old Avestan Texts, Volume I: Introduction – Texts and Translation*. Heidelberg: Carl Winter.
- Janda, M. (2000): *Eleusis: Das indogermanische Erbe der Mysterien*. Innsbruck: Innsbrucker Beiträge zur Sprachwissenschaft.
- Kellens, J. and E. Pirart (1990): *Les textes vieil-avestiques, volume 2: Répertoires grammaticaux et lexique*. Wiesbaden: Reichert.
- Kiparsky, P. (1972): 'Metrics and morphophonemics in the Rigveda.' In M. K. Brame (ed.), *Contributions to Generative Phonology*, pages 171–200. Austin and London: University of Texas Press.
- (2010): 'Compositional vs. Paradigmatic Approaches to Accent and Ablaut.' In S. W. Jamison, H. C. Melchert, and B. Vine (eds.), *Proceedings of the 21st Annual UCLA Indo-European Conference*, Bremen: Hempen.
- Kobayashi, M. (2004): *Historical Phonology of Old Indo-Aryan Consonants*. Tokyo: Research Institute for Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies.
- Kümmel, M. J. (2000): *Das Perfekt im Indoiranischen*. Wiesbaden: Ludwig Reichert.
- Lindeman, F. O. (1987): *Introduction to the 'Laryngeal Theory'*. Oslo: Norwegian University Press and the Institute for Comparative Research in Human Culture.
- Lipp, R. (2009a): *Die indogermanischen und einzelsprachlichen Palatale im Indoiranischen: Band I: Neurekonstruktion, Nuristan-Sprachen, Genese der indoarischen Retroflexe, Indoarisch von Mitanni*. Heidelberg: Winter.
- (2009b): *Die indogermanischen und einzelsprachlichen Palatale im Indoiranischen: Band II: Thorn-Problem, indoiranische Laryngalvokalisation*. Heidelberg: Winter.
- Lubotsky, A. (1983): 'On the external sandhis of the *Maitrāyaṇī Samhitā*.' *Indo-Iranian Journal* 25: 167–179.
- (1990): 'La loi de Brugmann et *H₃e-. La reconstruction des laryngales.' *Bibliothèque de la Faculté de Philosophie et Lettres de l'Université de Liège* 253: 129–136.
- (2001a): 'Reflexes of Proto-Indo-European *sk in Indo-Iranian.' *Incontri linguistici* 24: 25–57.
- (2001b): 'The Indo-Iranian substratum.' In C. Carpelan, A. Parpola, and P. Koskikallio (eds.), *Early Contacts between Uralic and Indo-European: Linguistic and*

- Archaeological Considerations. Papers presented at an international symposium held at the Tvärminne Research Station of the University of Helsinki 8–10 January 1999*, Number 242 in Mémoires de la Société Finno-ougrienne, pages 301–317. Helsinki: Finno-Ugrian Society.
- Mayrhofer, M. (1986–2001): *Etymologisches Wörterbuch des Altindoarischen*. Heidelberg: Carl Winter.
- (2005): *Die Fortsetzung der indogermanische Laryngale im Indo-Iranischen*. Vienna: Österreichische Akademie der Wissenschaften.
- Narten, J. (1968): ‘Zum “proterodynamischen” Wurzelpräsenz.’ In *Pratidānam: Indian, Iranian and Indo-European Studies Presented to Franciscus Bernardus Jacobus Kuiper on his Sixtieth Birthday*, pages 9–19. The Hague/Paris: Mouton.
- Rasmussen, J. E. (1999): ‘Determining Proto-Phonetics by Circumstantial Evidence: The case of the Indo-European laryngeals.’ In *Selected Papers on Indo-European Linguistics, with a Section on Comparative Eskimo Linguistics*, pages 67–81. Copenhagen: Museum Tusulanum Press.
- Rix, H. (ed.) (2001): *Lexikon der indogermanischen Verben*. Wiesbaden: Reichert, 2nd edition.
- Scarlata, S. (1999): *Die Wurzelkomposita im Rg-veda*. Wiesbaden: Reichert.
- Schwartz, M. (1970): ‘Miscellanea Iranica.’ In M. Boyce and I. Gershevitch (eds.), *W.B. Henning Memorial Volume*, pages 385–394. London: Lund Humphries.
- Whitney, W. D. (2003 [1885]): *The Roots, Verb-forms, and Primary Derivatives of the Sanskrit Language*. Delhi: Motilal Banarsidass.

Columbia University
 Department of Middle Eastern, South Asian, and
 African Studies
 401 Knox Hall, MC9628
 606 W. 122nd St.
 New York, NY 10027
aso2101@columbia.edu

Andrew Ollett