The Lengthening of **i, *u* > *ī, ū* / __*rC* in Sanskrit

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1 The problem

1.1 PIE **L̥HC* > Ved. *īrC*/*ūrC* & PIE **uLC* > Ved. *ūrC*

1.1.1 Indo-Aryan and Iranian agree in their treatment of PIE **L̥H* sequences (**l̥H*, **r̥H*): both branches produce anaptyctic vowels before the liquid, as shown in (1).

(1) Development of PIE **L̥H* in Indo-Iranian:

a. **L̥HC*: PIE **dl̥h₁gʰó-* 'long' > PIIr. **dr̥Hgʰá-* > { Ved. *dīrghá-*; OAv. *darᵊga-*, YAv. *darᵊγa-*; OP *darga-*[1]; Khot. *dāra-*; Oss. *darğ-* }

b. **L̥HV*: PIE **ǵʰl̥h₃-en-yo-* 'gold' > PIIr. **jʰr̥Hanya-* > { Ved. *híraṇya-*; YAv. *zarańiia-*; OP *daraniya-*[2]; Khot. *zrny* /zirnī/; Oss. *zarin* }

(2) PIE **L̥* > PIIr. **ər* / __{*H*, *V*}

1.1.2 The uniform anaptyctic vowels before inherited liquids has led some authors (e.g. Kümmel 2017, p. 9; Cantera 2017, p. 489; Clayton, under review) to assume an Indo-Iranian anaptyxis before laryngeals and vowels like that in (2).

1.1.3 Indo-Aryan, however, also shows an increase in length from bimoraic **L̥ᵘH*ᵘ*.C* to trimoraic *ī*ᵘᵘ*r*ᵘ*.C* / *ū*ᵘᵘ*r*ᵘ*.C* in closed syllables, as in (1a).

1.1.4 As Seebold (1972, p. 201) and Lubotsky (2000, p. 321) note, trimoraic outcomes like in (3) mostly do not create Sievers' Law variants, perhaps showing the extra length is recent:

(3) Non-application of Sievers' Law after *ūr*:

a. *ūrdhvá-* 'upright', not ˣ*ūrdhᵘvá-*
b. *ūrvá-* 'container', not ˣ*ūrᵘvá-*
c. *pū́rva-* 'before, earlier', not ˣ*pū́rᵘva-*
d. *pūrvī́-* 'many' F, not ˣ*pūrᵘvī́-*

1.1.5 Clayton (under review) argues for the development PIE **L̥H.C* > PIIr. **ər(H).C* > pre-PIA **i/ur.C* > PIA **ī/ūr.C* > Ved. *ī/ūr.C*.

1.1.6 In this paper, I argue that the lengthening of pre-PIA **i/ur.C* > Ved. *ī/ūr.C* occurred in all inherited **i/ur.C* sequences, not just those generated by liquid-laryngeal sequences. This insight will simplify several formerly fraught etymologies.

1. ⟨d-r-g-⟩
2. ⟨d-r-n-y-k-r-⟩ *daraniya-kara-* 'goldsmith'

2 The evidence

2.1 PIE *ur]$_\sigma$ > Ved. ūr]$_\sigma$

2.1.1 No clear examples of PIE *CilC/ *CirC > Ved. CīrC, but this is perhaps unsurprising as *IEW* and *LIV*^{2} contain no instances of roots with the shape √*(C)yel(C)- or √*(C)yer(C)-.

(4) Roots of the shape √*(C)WeL(C)- out of 1181 roots harvested from *LIV*^{2} by Sandell (2015):

√*(C)wer(C)-	30	~ 2.5%	√*(C)yer(C)-	0	0%
√*(C)wel(C)-	23	~ 1.9%	√*(C)yel(C)-	0	0%
√*(C)weL(C)-	2	~ 0.2%	√*(C)yeL(C)-	0	0%
Total	55	~ 4.7%	Total	0	0%

(5) Underlying PIE */CwlC/ and */CwrC/ have three outcomes under various conditions:

a. **Syllabic liquid type**: PIIr. *CwṛC > CvṛC
b. **Metathesized type**: PIIr. *CruC > CruC
c. **Syllabic glide type**: PIIr. *CurC > CūrC

2.1.2 It is the "syllabic glide type" that underwent the proposed lengthening, though the other two types are useful for demonstrating that no laryngeal followed.

2.2 *aniṭ* roots in √(C)var-

(6) *ǵ^{h}wer- > √hvar- ~ hvṛ- ~ hru- ~ hur- ~ hūr- 'to be/make crooked/astray'[3]

a. Full grade:
   *ǵ^{h}wér-e-toy > hvárate (3SG.PRS.MID.IND, *RV*)
b. Preconsonantal *aniṭ* zero-grade:
   *ǵ^{h}wṛ́-(t-) > °hvṛ́t- (VBN, *RV*)
   *ǵ^{h}wṛ-tó- > -hvṛta- (PPP, *RV*)
   *ǵ^{h}wṛ-tó- > -hruta- (PPP, *RV*)
c. Prevocalic zero-grade:
   *ǵ^{h}e-ǵ^{h}ur-m̥h$_1$nó- > juhurāṇá- (PF.MID.PTCP, *RV*)
d. Lengthened zero-grade:
   *-ǵ^{h}úr-ye- > -hū́r^{i}ya- (GER, *RV*)
   *ǵ^{h}ur-sḱé-ti > hūrchati 'to go crooked' (3SG.ITER-PRS.ACT.IND, *ŚatBr*)
   ?*ǵ^{h}e-ǵ^{h}ur-th$_2$e- » juhūrthās (2SG.AOR.MID.INJ, *RV*)

(*pace* Insler 1968; *KEWA*, *s.v. hvárate*; Hoffmann 1980; Gotō 1987, pp. 352–353 & n872–873; *EWA*, *s.v. HVAR*; *LIV*^{2}, *s.v.* *ĝ^{h}u̯er-)

3. For evidence that *hvarita-* (P VII.2.33, *MŚS* II.5.4.24) is an innovation, see Hoffmann (1980).

(7) *d^hwer- > $\sqrt{dhvar\text{-} \sim dhv\underset{\circ}{r}\text{-} \sim dhur\text{-} \sim dh\bar{u}r\text{-}}$ 'to harm'

a. Full grade:
*$d^hwér\text{-}e\text{-}ti$ > *dhvárati* (3SG.PRS.ACT.IND, *MS*, *TS*)

b. Preconsonantal *aniṭ* zero-grade:
*$d^hw\acute{\underset{\circ}{r}}\text{-}(t\text{-})$ > °*dhv$\acute{\underset{\circ}{r}}$t-* (VBN, *RV*)

c. Prevocalic zero-grade:
*$d^hur\text{-}éh_1$ > *dhurā́* 'violently?' (VBN.INS.SG, *ŚatBr*)

d. Lengthened zero-grade:
*$d^húr\text{-}w\text{-}onti$ > *dhū́rvanti* (3PL.PRS.ACT.IND, *RV*)
*$(h_1)é\text{-}d^hur\text{-}s\text{-}\underset{\circ}{n}to$ > *ádhūrṣata* (3PL.AOR.MID.IND, *RV*)
*$d^hur\text{-}tí\text{-}$ > *dhūrtí-* 'harm' (*RV*)

(Eichner 1973, pp. 75–76; *KEWA*, *s.vv. dhvárati, dhurā́*; Oettinger 1979, p. 151; Gotō 1987, pp. 190–191 & n355; *LIV*^{2}, *s.v.* ?*$d^h\underset{\frown}{u}er$-)

(8) *twer- > $\sqrt{tvar\text{-} \sim tur\text{-} \sim t\bar{u}r\text{-}}$ 'to hasten, rush'

a. Full grade:
twér-e-toy > *tvarate* (3SG.PRS.MID.IND, *KS*)

b. Prevocalic zero-grade:
tur-ó- > *turá-* 'quick' (*RV*)

c. Lengthened zero-grade:
túr-ni- > *tū́rṇi-* 'quick' (*RV*)
tur-tó- > *tūrtá-* 'quick' (PPP, *ŚatBr*)

(*KEWA*, *s.v. tvárate*; Gotō 1987, p. 169–170n279; *EWA*, *s.v. TVAR*; *LIV*^{2}, *s.v.* *$t\underset{\frown}{u}er$-)

2.2.1 Forms in *tūrC- are frequently assigned to $\sqrt{tar^i\text{-} \sim t\underset{\circ}{\bar{r}}\text{-}}$ 'to cross, overcome' < *$terh_2$- ~ *$t\underset{\circ}{r}h_2$-, though the semantics are not always compelling.

2.2.2 *ŚatBr* VI.3.2.2:
yád vaí kṣiprám tát tūrtám átha yát kṣiprā́t kṣépīyas tát prátūrtam.
'What is quick, that is *tūrtá-*, but what is quicker than quick, that is *prátūrta-*.'

(9) *h_xwer-, *wel-, & *wer- > $\sqrt{var\text{-} \sim v\underset{\circ}{r}\text{-} \sim \bar{u}r\text{-}}$ 'to cover'

a. Full grade:
*$(h_x)wér\text{-}etoy$ > *várate* (3SG.PRS.MID.IND, *RV*)

b. Preconsonantal *aniṭ* zero-grade:
*$w\underset{\circ}{r}\text{-}tó\text{-}$ > *v$\underset{\circ}{r}$tá-* (PPP, *RV*)
*$pró\ w\underset{\circ}{r}\text{-}new\text{-}ti$ > *$prá\ v\underset{\circ}{r}nawti$ > *prá v$\underset{\circ}{r}$ṇoti* (3SG.PRS.ACT.IND, *RV*)

c. Lengthened zero-grade:
*$h_x\underset{\circ}{m}b^hí\ h_2w\underset{\circ}{r}\text{-}new\text{-}ti$ > *$ab^hí\ Hurnawti$ > *abhí ūrṇoti* (3SG.PRS.ACT.IND, *RV*)
*$h_xw\underset{\circ}{r}\text{-}wó\text{-}$ > *$Hurwá\text{-}$ > *ūrvá-* 'container' (*RV*)

(*KEWA*, *s.vv. v$\underset{\circ}{r}$ṇóti, ūrváḥ*; *EWA*, *s.vv. VAR*^{2}, *ūrvá-*; *pace* Lubotsky 2000; *LIV*^{2}, *s.vv.* *$H\underset{\frown}{u}er$-, 1. *$\underset{\frown}{u}el$-, 1. *$\underset{\frown}{u}er$-)

2.3 Roots in √(C)varC-

(10) **werǵ-* 'to swell up; to become angry' > Ved. *ūrj-* 'food, refreshment, strength':

a. Grk. ὀργή 'passion, anger, fierceness' < **worǵ-éh$_2$-*

b. OIr. *ferc* 'anger' < **werǵ-*

c. Av. *var^{ə}zaiiaṇt-* 'strengthening' < **worǵ-éy-ont-*

d. H *warkant-* 'fat' < **worǵ-ont-*
H *warkui-* 'anger' (via Luwian) < **wr̥ǵ-u-it-*

(*KEWA*, *s.v. úrk*; *EWA*, *s.v. úrj-*; *EDH*, *s.vv. u̯arkant-*, *u̯arkui-*; *EDG*, *s.v.* ὀργή; Goedegebuure 2020)

2.3.1 Normally reconstructed **werh$_x$ǵ-* with laryngeal solely on the basis of Ved. *ūrj-* with laryngeal deletion in the **o*-grade **worǵ-* < **worh$_x$ǵ-* by the "Saussure-Hirt effect".

2.3.2 By assuming a root noun **werǵ-* ~ **urǵ-* with lengthening, we obviate the need for the laryngeal and appeal to Saussure-Hirt.

(11) **swerg^h-* 'to be sick; to worry' makes **surg^h-se-te* 2PL.DES.ACT.IMP > *mā sūrkṣata* 'do not worry' (*KS*):

a. OIr. *serg* 'wasting sickness' < **swerg^h-o-*

b. Lt. *sergù* 'to be sick' < **swérg^h-e-*

c. NHG *sorgen* 'to worry' < OHG *sorgēn* < **swr̥g^h-h$_1$yé-*

d. ?Alb. *dergjet* 'anger' < **werǵ-*

e. ?TB/TA *särk-* 'to take care of' < **swérg^h-e-*

(*LtEW*, *s.v. sir̃gti*; Werba 1997, p. 440; Demiraj 1997, *s.v. dérgj/em*; *LIV*^{2}, *s.v.* ?*su̯erg^h*; *EDPC*, *s.v. *swergo-*; *DTB*^{2}, *s.v. särk-*; *EDBIL*, *s.v. sirgti*)

2.4 Isolated nominals

(12) The word *muhūrtá-* 'moment' has variously been taken from:

a. **mr̥ǵ^h-ur-tó-* 'shortness (of time)' (cf. Ved. *múhur* 'suddenly' < **mr̥ǵ^h-wr̥*)

b. **mr̥ǵ^h-u-h$_2$r-tó-* 'a brief time' (cf. Ved. *r̥tú-* 'period, time' < *h$_2$r-tú-*).

(Jacobi 1920, p. 249; Bloch 1985, p. 167; Benveniste 1935, p. 38; Lamberterie 1990, p. 157n4; *KEWA*, *s.v. múhuḥ*; *EWA*, *s.v. múhur*)

2.4.1 Both forms however, would result in PIA **mr̥j^{h}urtá-* (with intervocalic laryngeal loss in PIIr. **mr̥j^{h}uHr̥tá-* < **mr̥ǵ^h-u-h$_2$r-tó-*), which again requires lengthening.

2.4.2 *dvā́r- ~ dúr-* 'door' and *dhúr- ~ dhūr-* 'yoke pole; axle pivot' have been taken as doublets of one noun **d^{h}wór- ~ *d^{h}úr-* 'post, pivot, pivot hinge' (Kluge 1890, p. 562; Pedersen 1950).

(13) **d^{h}wór- ~ *d^{h}ur-* » *dvā́r- ~ dur-* '(pair of) doors':

a. **d^{h}wór-eh$_{1}$(u)* » *dvā́rā* (7×), *dvā́rau* (2×) (F.NOM/ACC.DU, *RV*)
b. **d^{h}wór-es* » *dvā́ras* (5×), *dúras* (1×) (F.NOM.PL, *RV*)
c. **d^{h}ur-n̥s* » *dúras* (24×), *durás* (1×) (F.ACC.PL, *RV*)
d. **d^{h}ur-b^{h}yós* » *dvārbhyás* (F.DAT/ABL.PL, *VS*, *TBr*)

Deaspiration via Grassmann's Law (**d^{h}ur-b^{h}í- > *dur-b^{h}í-*) or by analogy to *dvaú* 'two'.

(14) **d^{h}wór- ~ *d^{h}ur-* » *dhúrV- ~ dhūrC-* 'yoke pole, axle':

a. **d^{h}ur-í > dhurí* (13×) (F.LOC.SG, *RV*)
b. **d^{h}ur-sú > dhūrṣú* (11×) (F.LOC.PL, *RV*)
c. **d^{h}wór-m̥* » *dhúram* (4×) (F.ACC.SG, *RV*)
d. **d^{h}wór-s* » *dhū́r* (3×) (F.NOM.SG, *RV*)

2.4.3 This technological term seems to have split into two separate lexical times. Skt. *dhū̆rya-* 'fit to be harness; beast of burden' would thus match H *tūriye/a-^{zi}* 'to harness' (for phonology, see Melchert 2020, pp. 266–267), Grk. θαιρός 'door pivot; chariot axle' < **d^{h}wr̥-yó-*.

(15) The word *ūrdhvá-* 'upright' has long been compared to other words of similar meaning throughout Indo-European:

a. OAv. *ərᵊduua-*, YAv. *ərᵊδβa-* 'high'
b. Grk. ὀρθός, Myc. *o-two-wo-* */ort^{h}wowo-/ 'straight'
c. L *arduus* 'high, tall'
d. OIr. *ard* 'high'
e. ON *ǫrðugr* 'steep'

2.4.4 Because of the mismatch between *ūrdhvá-* and the rest, this word has received a variety of reconstructions:

- **h$_{3}$wr̥d^{h}-wo-* (Lubotsky 1988, p. 95n22)
- **h$_{x}$r̥(H)d^{h}-wo-* (Schrijver 1991, pp. 312–313)
- **worh$_{x}$d^{h}-u- ~ *wr̥h$_{x}$d^{h}-ew-* (Meiser 2002, p. 109)
- **h$_{3}$rd^{h}-wo-* (*EDL*, pp. 52–3)
- **h$_{2}$o/erHd^{h}-wo-* (*EDPC*, pp. 40–1)
- **h$_{3}$wr̥h$_{x}$d^{h}-wo-* (Byrd 2015, p. 208)
- **wŕ̥Hd^{h}-ew-o-* (Hackstein 2018)

2.4.5 While the details still remain complex, a form such as **h$_{3}$wr̥d^{h}-wó-* could give PIA **Hurd^{h}wá-* > *ūrdhvá-*.

2.4.6 The other branches would require dissimilation of the first **w* to provide **h$_{3}$rd^{h}wó-*, but the non-application of the *RUbL*-rule in L *arduus* remains difficult.

2.5 The categories of exception

2.5.1 In the *RV* there are some surface examples of *urC* and *irC* instead of expected *ūrC* and *īrC*, but they fall into three main categories:

(16) Inherited **-ur-* occurring before a compound boundary:
  a. *catur-dhá* 'four-fold' < PIE **k^{w}etur-d^{h}eh$_1$*

(17) *-ir-* and *-ur-* from **-is-* and **-us-*:
  a. *dur-gá-* 'difficult to approach' < PIE **dus-g^{w}h$_2$-ó-*
  b. *havírbhis* 'burnt oblation' N.INS.PL < PIE **ǵ^{h}ew-ís-b^{h}i-*

(18) Exceptions of the type **CL̥HWÝ* > Ved. *Ci/urv/yÝ* identified by Lubotsky (1997):
  a. *turváṇe* 'to overcome' < PIE **tr̥h$_2$-wén-ey*
  b. *jujurvā́n* 'having grown old' PF.ACT.PTCP.M.NOM.SG « PIE **ǵe-ǵr̥h$_2$-wós*

3 The conclusions

3.0.1 There seems to be good support for a Sanskrit sound change **ur]$_\sigma$ > *ūr]$_\sigma$*.

3.0.2 The assumption that Ved. *ūrC* comes only from PIE **L̥HC* has led to many bad etymologies. Not all vowel length requires a laryngeal.

Linguistic abbreviations

°	a compound boundary
~	alternates morphophonologically with
μ	mora
σ	syllable
ABL	ablative
ACC	accusative
ACT	active
AOR	aorist
DAT	dative
DES	desiderative
DU	dual
F	feminine
GER	gerund
IMP	imperative
IND	indicative
INJ	injunctive
INS	instrumental
ITER	iterative
LOC	locative
MID	middle
M	masculine
NOM	nominative
PF	perfect
PL	plural
PPP	past passive participle
PRS	present
PTCP	participle
SG	singular
VBN	verbal noun
2	second person
3	third person

Language abbreviations

Alb.	Albanian
Av.	Avestan
Grk.	Ancient Greek
H	Hittite
Khot.	Khotanese
L	Latin
Lt.	Lithuanian
Myc.	Mycenaean Greek
NHG	New High German
OAv.	Old Avestan
OHG	Old High German
OIr.	Old Irish
ON	Old Norse
OP	Old Persian
Oss.	Ossetic
PIA	Proto-Indo-Aryan
PIE	Proto-Indo-European
PIIr.	Proto-Indo-Iranian
Skt.	Sanskrit
TA	Tocharian A
TB	Tocharian B
Ved.	Vedic Sanskrit
YAv.	Young Avestan

Text abbreviations and editions

KS	*Kāṭhaka Saṃhitā*	***TP***	*Taittirīya Prātiśākhya*	***ŚatBr***	*Śatapatha Brāhmaṇa*
MS	*Maitrāyaṇī Saṃhitā*	***TS***	*Taittirīya Saṃhitā*	***RP***	*Ṛgveda Prātiśākhya*
MŚS	*Mānava Śrauta Sūtra*	***VP***	*Vājasaneyī Prātiśākhya*	***RV***	*Ṛgveda*
TBr	*Taittirīya Brāhmaṇa*	***VS***	*Vājasaneyī Saṃhitā*	**P**	Pāṇini, *Aṣṭādhyāyī*

Abbreviations

DTB[2] *See* Adams, Douglas Q. 2013.

EDBIL *See* Derksen, Rick. 2015.

EDG *See* Beekes, Robert S.P. 2010.

EDH *See* Kloekhorst, Alwin. 2008.

EDL *See* de Vaan, Michiel. 2008.

EDPC *See* Matasović, Ranko. 2009.

EWA *See* Mayrhofer, Manfred. 1986–2001.

IEW *See* Pokorny, Julius. 1959.

KEWA *See* Mayrhofer, Manfred. 1956–1980.

LIV[2] *See* Rix, Helmut, and Martin Joachim Kümmel, eds. 2001.

LtEW *See* Fraenkel, Ernst. 1962-1965.

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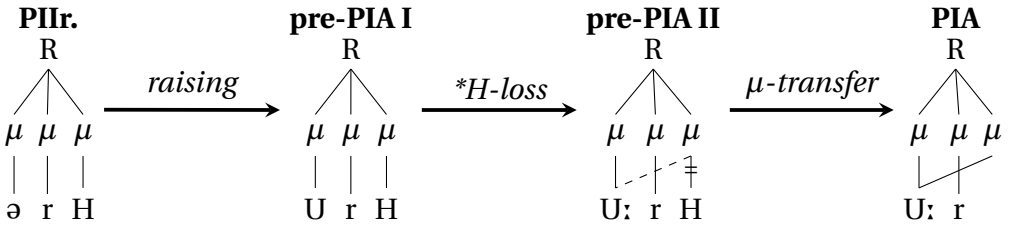
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Appendix I: the theory

A1.1 PIE *L̥HC > Ved. īrC/ūrC

A1.1.1 One might be tempted to explain the lengthening of bimoraic $*\underset{\circ}{L}_{\mu}H_{\mu}.C$ to trimoraic $\bar{\imath}_{\mu\mu}r_{\mu}.C$ / $\bar{u}_{\mu\mu}r_{\mu}.C$ in closed syllables as in (19).

(19)



A1.1.2 Such an analysis, however, runs afoul of the WELL-FORMEDNESS CONDITION given in (20), which prevents crossed association lines.

(20) WELL-FORMEDNESS CONDITION
(Goldsmith 1979, p. 48; rev. Sandell and Byrd 2014, pp. 34–35, 2015, p. 3)

a. All segments are associated with at least one prosodic unit;
all prosodic units are associated with at least one segment.

b. Association lines do not cross.

A1.1.3 Clayton (under review) suggests that the lengthening of high vowels before PIA *r stemmed from the special properties of Indo-Iranian *r, namely that it was a "molar" or "bunched" [ɻ̈] like that of General American English.

A1.1.4 Bunched [ɻ̈] is produced with a constriction of the tongue body at the pharynx and a constriction of the tongue tip at the palate.

A1.1.5 Catford (2001, pp. 181–183) makes exactly the same claim that Indo-Iranian had a bunched [ɻ̈], several reasons for which are given in (21).

(21) The phonetic properties of PIIr. *r̥:

a. The Prātiśākhyas describe Vedic r̥ not as retroflex but as *jihvā-mūlīya* 'produced at the root of the tongue' (e.g. *ṚP* 1.41; *VP* 1.65) and as using the jaws and with the tongue tip near the upper back gums (*TP* 2.18; Deshpande 1979, p. 282, Hock 1991, pp. 124–128)

b. Indo-Iranian *r̥ was particularly susceptible to lip rounding as a possible secondary articulation, a property common among dorsal segments (Clayton, under review)

c. Indo-Iranian *r acted as a transition between the Indo-European coronal /r/ (Kümmel 2017, §3) to the Sanskrit retroflex /ɻ/ (Ryan 2017). General American English bunched [ɻ̈] similarly alternates freely with [ɻ].

A1.1.6 These special properties of Indo-Iranian bunched [ɻ̈] caused it to lengthen preceding tautosyllabic high vowels in Indo-Aryan (e.g. PIIr. $*ur]_{\sigma}$ > Ved. $*\bar{u}r]_{\sigma}$).

A1.2 English and Sanskrit sesquisyllabicity

A1.2.1 General American English [ɻ] shows a striking property called "sesquisyllabicity" when a high, tense vowel or diphthong is followed by [ɻ] or to a lesser extent [ɫ] (Lavoie and Cohn 1999; Walker and Proctor 2019)

(22) General American English sesquisyllabicity:

/V/	ɻ]$_\sigma$	1σ	2σ	l]$_\sigma$	1σ	2σ
/i/	*peer*	[pɪɻ]	[piː.ɻ]	*peel*	[piːɫ]	[piː.ɫ]
/u/	*lure*	[lʊɻ]	[luː.ɻ]	*pool*	[puːɫ]	[puː.ɫ]
/aj/	*fire*	[fajɻ]	[faj.ɻ]	*file*	[fajɫ]	[faj.ɫ]

A1.2.2 As the examples in (22) show, underlying coda liquids may be realized as either codas or syllabic nuclei, but coda [ɻ] has the further effect of making tense vowels lax when tautosyllabic, as in [pɪɻ] and [lʊɻ].

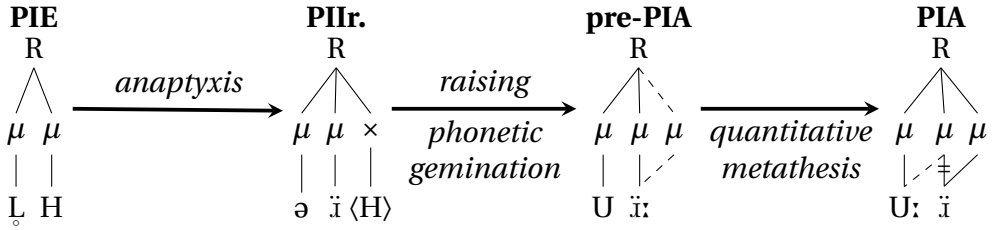
A1.2.3 Walker and Proctor (2019) explain this behavior as a result of conditioned bimoraic production of the General American bunched [ɻ]. In English coda [ɻ] has the pharyngeal tongue body constriction sequentially timed before the palatal tongue tip constriction.

A1.2.4 When the [ɻ] follows a high vowel or diphthong, which involve a palatal tongue body constriction, the initial pharyngeal tongue body constriction of [ɻ] may not overlap with the preceding vowel, resulting in bimoraic coda [ɻ].

A1.2.5 Because English does not allow syllables with more than three morae and because English high vowels and diphthongs are phonetically bimoraic, quadrimoraic forms like [piː$_{\mu\mu}$ɻ$_{\mu\mu}$] repaired by making the vowel lax ([pɪ$_\mu$ɻ$_{\mu\mu}$]) or the coda syllabic ([piː$_{\mu\mu}$.ɻ$_\mu$]). This latter repair recalls Sanskrit *svarabhakti* /VrCV/ → [Vr$^{a/ɹ̥}$.CV] (Kobayashi 2004, pp. 36–37).

A1.2.6 If we assume that Indo-Iranian had a bunched [ɻ] like General American English and that similar articulatory interactions arose, the change PIE *$\underset{\circ}{L}HC$ > Ved. *īrC*/*ūrC* may be analyzed as in (23) and PIE **uLC* > Ved. *īrC*/*ūrC* as in (24).

(23)



(24)

