QAZZU warrai

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in Honor of

Kazuhiko Yoshida

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QAZZU WARRAI

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Motivating Lindeman's Law

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1 Overview of the problem

In Vedic Sanskrit, one finds disyllabic variants of monosyllabic forms beginning with the onset sequence consonant (C) + glide (U̯): besides *sváḥ* 'own (nom.sg.)' one finds *suváḥ*; besides *dyā́m* 'sky (acc.sg.)' one finds *diyā́m*.[1] These stems, however, do not illustrate such alternation between CU̯ and CVU̯ when in polysyllabic forms; thus, *svā́nām* 'own (gen.pl)' but no ˣ*suvā́nām*, *dyúbhiḥ* 'sky (instr.pl)' but no ˣ*diyúbhiḥ* (Barber 2013:48). This pattern, first noted by Lindeman (1965:61–2) and therefore now known as "Lindeman's Law" (LL), has been accepted by most scholars in the field, e.g. Schindler (1977:64) and Mayrhofer (1986:183–4), though Collinge (1995:28–9) is hesitant.

While some, such as Sihler (1971 and 2006) and many within the Leiden School (cf. Beekes 2011:139), have argued for these alternations in syllabicity to be the result of Indic-internal processes, LL is considered by most to be canonical within our contemporary understanding of PIE phonology. Indeed, as Barber (2012:203) correctly points out, its archaic nature is evident within Vedic Sanskrit itself, for "practically all well-attested disyllabic examples exhibit highly restricted, and in some cases demonstrably formulaic, distributions in Vedic verse or prose. None of this is terribly surprising, if one starts from the assumption that this semivowel alternation is ultimately inherited from Indo-European." Of course, as is well known, evidence of its IE provenance exists well beyond Sanskrit, with these disyllabic Lindeman variants (LVs) being found in a number of other IE daughter languages. The opaque, seemingly random distribution of these variants suggests that, as in Sanskrit, LL was an optional rule in PIE as well. Examples of LL (though by no means exhaustive) are given in Table 1 below.

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[1] It is with great pleasure that I write this paper for Kazu Yoshida, a scholar who has contributed much to our knowledge of Indo-European and Anatolian in particular, with ever a mindful eye about the linguistic reality of his reconstructions. I am indebted to Brenna Reinhart Byrd, Dieter Gunkel, Jared Klein, Ryan Sandell, and Brent Vine for their helpful comments; all errors are my own.

Meaning	Monosyll.	Attestations	Lind. Var.	Attestations
'sky god'	*$di̯éus$	Gk. Ζεύς	*$dii̯éus$	Skt. $diyáuḥ$
		Hitt. $šiunaš$		Lat. $di\bar{e}s$
		Lat. $I\bar{u}$-$piter$		
'would be'	*$h_1si̯éh_1t$	Skt. $syát$	*$h_1sii̯éh_1t$	Skt. $siyāt$
		Av. $x́ii\bar{a}t̰$		Goth. $sijai$
				OLat. $siet$
'winter'	*$ĝ^hi̯óm$	YAv. $zii\mathring{a}$	*$ĝ^hii̯óm$	Gk. χίων
				Arm. $jiwn$
'two'	*$du̯óh_1$	Skt. $dvá$	*$duu̯óh_1$	Skt. $duvá$
		OIr. $dá$		Gk. δύω
				Lat. $du\bar{o}$
'on you'	*$tu̯ói̯$	Skt. $tvé$	*$tuu̯ói̯$	Skt. $tuvé$
		Gk. σοί		
'dog'	*$k̂u̯ó$	Skt. $śvá$	*$k̂uu̯ó$	Skt. $śuvá$
				Gk. κύων
				OIr. $cú$
				Lith. $šu\tilde{o}$

Table 1. Examples of Lindeman's Law.

While LVs do exist for monosyllabic forms containing onsets of C + Nasal (N) and C + Liquid (L), particularly in Italic,[2] these are much less common. Aside from the long form of 'human', *$ĝ^hm̥mó$ (Lat. $hom\bar{o}$, OE $guma$; cf. *$ĝ^hmó$ 'human' > Lith. $žmu\tilde{o}$), broader instantiations of the rule applying to monosyllables with onsets of the shape */Cr-, Cl-, Cm-, Cn-/ are quite difficult to reconstruct for the proto-language. For this reason, I will assume for PIE a more restricted version of the law in question and posit that the broader formulation of the rule is a post-PIE development.

(1) Lindeman's Law[3]
     $\varnothing \rightarrow U_1 \,/\, \#C\_\_U_1V(C_0)\#$ (optional)
     In PIE, monosyllabic words beginning with the sequence *$CU̯V$- could optionally be pronounced as *$CUU̯V$-, in which the features of the epenthetic vowel are copied from the immediately following glide.

In this paper, I will attempt to identify why LL initially came into being, which will shed light on its optional nature. I will begin by revisiting Schindler's widely followed

[2]Possible examples include *mr-ei- 'sea (oblique)' > *$mr̥r$-ei- > $mare$- → Lat. $mare$ (cf. OIr. $muir$; Nussbaum 2004), *$kró$ 'portion' > *$kr̥ró$ > Lat. $car\bar{o}$ 'meat' (Weiss 2011:105), *$k̂leh_1i̯eti$ 'is warm' (cf. Skt. $śarad$- 'autumn') > *$kl\bar{e}t$ > *$kl̥l\bar{e}t$ > $calet$ (Vine 2011:272), and *$g^wnáh_2$- > *$g^wn̥náh_2$- > Boeotian Gk. βανά (Jasanoff 1989; cf. OIr. $mná$, Ved. $gnás$-$pati$- 'husband of a divine wife').
[3]Cf. Weiss 2011:40.

formulation of LL and demonstrate that his view is unsatisfactory. I will then turn to another optional phonological rule that is reconstructable for PIE, monosyllabic lengthening, and argue that the two processes are different responses to satisfying the Minimal Word Requirement (MWR) at an early stage of PIE. I will conclude by saying a few words about the loss of the MWR and the maintenance of extrametricality in the Indo-European daughter languages.

2 Revisiting Schindler 1977: Sievers' Law ≠ Lindeman's Law

Schindler's 1977 formulation of LL has unquestionably been the most widely followed view since its publication.[4] He couched his theory in a larger discussion of Sievers' Law (SL), a process by which a high vowel is inserted in the sequences $*/\text{-VRC}\underset{\circ}{U}_1 V\text{-}/$ and $*/\text{-}\bar{V}C\underset{\circ}{U}_1 V\text{-}/.$[5] For Schindler, LL and SL were instantiations of the same process inherited from PIE, since both targeted onsets of the shape $*C\underset{\circ}{U}\text{-}$ in the final syllable of a word (*mar.tyah̥#* → *mar.ti.yah̥#* 'mortal' beside *tyat#* → *ti.yat#* 'that'). Schindler believed that Lindeman variants surfaced "als Folge des Satzsandhis" (Mayrhofer 1986:166), appearing in certain sentential configurations where a monosyllabic form was preceded by a word ending in a heavy syllable. Under this view, PIE 'dog (nom.sg.)' (underlying $*/\hat{k}\underset{\circ}{u}\acute{o}ns/$) appeared as $*\hat{k}\underset{\circ}{u}\acute{o}$ after light syllables (*só $\hat{k}\underset{\circ}{u}\acute{o}$ drah₂t* 'That dog ran') but as $*\hat{k}u\underset{\circ}{u}\acute{o}$ after heavy ones (*sénos $\hat{k}u\underset{\circ}{u}\acute{o}$ drah₂t* 'The old dog ran').

(2) Sievers'/Lindeman's Law (Schindler 1977:64)

$$\begin{bmatrix} -\text{cons} \\ -\text{syll} \end{bmatrix} \rightarrow [+\text{syll}]/\sigma_{\mu\mu}\$[-\text{syll}]\_\_[+\text{syll}][-\text{syll}]_0\#$$

A glide becomes a high vowel when it follows an onset consonant and precedes a vowel, though only when this sequence is preceded by a heavy syllable.

If SL were a postlexical rule in PIE as per Ringe 2017:18 and Byrd 2015:193–207, a sandhi extension of SL would in fact be expected, as postlexical rules are not restricted to words and therefore apply across word boundaries.

However, such an extension of SL would only be anticipated if we viewed SL/LL as a rule that targets $*C\underset{\circ}{U}$-onsets. As I have discussed previously (Byrd 2015:191), it

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[4]Peters 1980:129–30, Mayrhofer 1986:164–8, Meiser 1998:89, Praust 2000, Meier-Brügger 2003:90–1, Weiss 2011:39–40, Fortson 2010:72.

[5]Examples of SL are found in a number of IE languages, including Skt. *martiya-* 'mortal' (← *martya-*), Goth. *hairdeis* 'shepherd' (< *herdijis*), Hitt. *ardumeni* 'we cut with a saw' (< *ard-weni*; Melchert 1994:57–8), and likely a number of Latin stems within the fourth conjugation, such as *sāgīre* 'perceive' (< *sāg-i̯e-*, cf. Weiss 2011:40; contrast *capere* < *kap-i̯e-*).

would be difficult to make such a claim, for there is no reason to believe that a sequence *$C\overset{\circ}{U}$-, which is found in a sizeable number of roots and words in PIE (*$t\underset{\circ}{i}eg^w$- 'withdraw', *$t\underset{\circ}{u}erk$- 'cut', etc.), was disfavored in PIE onsets (cf. Collinge 1985:165). Indeed, if we examine PIE phonotactics more broadly, the number of types of *CR- roots in PIE is large, with at least 73 different *CR- onsets reconstructable for the proto-language (Byrd 2015:279–80). In short, of all consonant clusters reconstructed for PIE, it appears that *CR- onsets were the *least* marked, making it highly unlikely that either SL or LL were directly motivated by the avoidance of *$C\overset{\circ}{U}$- onsets.

For this reason (and others), in Byrd 2010 and Byrd 2015 (chapter 5), I proposed that SL was motivated by the avoidance of superheavy syllables at the postlexical (sentential) level. At first glance, it is not immediately obvious why a superheavy syllable should ever have surfaced in cases of SL, for one would expect a putative PIE */ḱérd^h-$\underset{\circ}{i}$o-s/ 'herdsman' (> Goth. *hairdeis*) to have syllabified as *[ḱér]$_\sigma$[d$^h\underset{\circ}{i}$os]$_\sigma$through Onset Maximization (cf. Kobayashi 2004:23).[6] However, as discussed in Byrd 2015: 244–53, it seems that in PIE, at least in the initial stages of a phonological derivation, speakers parsed syllables by morpheme, which would explain why PIE syllabified */VC_1C_2V/ as *[VC_1]$_\sigma$[C_2V]$_\sigma$, even when C_1C_2 was a perfectly licit onset cluster.[7] Thus, PIE */ḱérd^h-$\underset{\circ}{i}$o-s/ 'herdsman' was initially syllabified as *[ḱérd^h]$_\sigma$[$\underset{\circ}{i}$os]$_\sigma$ in order to align the medial syllable boundary with a morpheme boundary.[8] Later within the derivation, at the postlexical level, *[ḱérd^h]$_\sigma$[$\underset{\circ}{i}$os]$_\sigma$ is resyllabified as *[ḱér]$_\sigma$[d$^h\underset{\circ}{i}$]$_\sigma$[$\underset{\circ}{i}$os]$_\sigma$ to avoid a superheavy syllable, with *[ḱér]$_\sigma$[d$^h\underset{\circ}{i}$]$_\sigma$[$\underset{\circ}{i}$os]$_\sigma$ (candidate [a] in Table 2 below) being preferable to *[ḱér]$_\sigma$[d$^h\underset{\circ}{i}$os]$_\sigma$ (candidate [b]) as it also lacks a complex onset.[9]

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[6]Typically languages will maximize onsets whenever possible; cf. English *ac.tress* (beside *trek*, no $^\times$*ktrek*), *mael.strom* (beside *strum*, no $^\times$*lstrom*).

[7]Thus, */h$_2$eḱ-ro-s/ → [h$_2$áḱ]$_\sigma$[ros]$_\sigma$ 'pointy' alongside forms such as *ḱroth$_2$áịeti 'she loosens'.

[8]In order to satisfy the constraint Align-Morph-L: "The left edge of a morpheme coincides with the left edge of a syllable."

[9]This and past analyses of SL (Byrd 2010 and 2015) have been done within an Optimality Theoretical framework (Prince and Smolensky 2004), specifically Stratal OT (Bermúdez-Otero 2003), though they in no way depend on it. The constraints used here have been taken from Byrd 2015, to which I refer the reader for further discussion, constraint-ranking justification, and references. The constraints are:

1. Dep(F)$_{io}$: Every feature in the output has a correspondent in the input.
2. *Superheavy: No syllable may consist of three or more morae.
3. Faith(σ): If x_i belongs to σ_i in the input, and x_i has an output correspondent x_0, x_0 must belong to syllable σ_0 that corresponds to σ_i. (Do not alter the syllabification of the base form.)
4. *ComplexOnset: Onsets may not contain more than one consonant in the output.
5. Dep-V: Every vowel in the output has a correspondent in the input.
6. No-Spread([F], seg): Feature-segment associations in the output must be reflected by the corresponding elements in the input.

		Dep(F)	*Superheavy	Faith(σ)	*ComplexOnset	Dep-V	No-Spread
	[ḱérdʰ]σ[i̯os]σ						
a. ☞	[ḱér]σ[dʰi]σ[i̯os]σ			*		*	*
b.	[ḱér]σ[dʰi̯os]σ			*	*!		
c.	[ḱér]σ[dʰə]σ[i̯os]σ	*!		*		*	
d.	[ḱérdʰ]σ[i̯os]σ		*!				

Table 2. Sievers' Law with PIE */ḱerdʰi̯os/ 'herdsman' (Byrd 2015:203).

This analysis of SL cannot extend across word boundaries, at least not to the desired monosyllables containing *CU̯- onsets, as Sievers' Law is spurred by the avoidance of a superheavy syllable, not the avoidance of a *CU̯- onset.[10] A violation of Faith(σ) in candidate (a) *[sé]σ[nos]σ[ḱu]σ[u̯ó]σ would result in maintenance of the more faithful candidate (b) *[sé]σ[nos]σ[ḱu̯ó]σ.

		Dep(F)	*Superheavy	Faith(σ)	*ComplexOnset	Dep-V	No-Spread
	[sé]σ[nos]σ[ḱu̯óns]σ						
a. ☹	[sé]σ[nos]σ[ḱu]σ[u̯ó]σ			*!		*	*
b. ☞	[sé]σ[nos]σ[ḱu̯ó]σ				*		
c.	[sé]σ[nos]σ[ḱə]σ[u̯ó]σ	*!		*		*	
d.	[sé]σ[nosḱ]σ[u̯ó]σ		*!	*			

Table 3. Non-application of Sievers' Law in */sénos ḱu̯óns/ 'old dog'.

Of course, I acknowledge that perhaps not everyone follows this analysis of SL, with many continuing to subscribe to Schindler's belief that LL was a sandhi subtype of SL. Doing so, however, becomes increasingly difficult should one consider the following three problems.

The first lies in the restriction of LL to monosyllables. As noted above, Schindler proposed a unification of SL and LL, restricting the process to target only onsets

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[10] Should one follow the formulation of SL as given in Byrd 2010 and 2015, we would actually expect instances of SL in collocations such as */h₂u̯égʰst u̯ih₁rós/ → *[h₂u̯éḱ]σ[stu]σ[u̯ih₁]σ[rós]σ 'The hero drove (a vehicle)', though to my knowledge there is no evidence of vowel insertion in this environment.

of the shape *CU̯-* in the final syllable of a word. Of course, it is true that SL often does not apply word-medially, as seen in the longer vṛddhi formations *vāiśvānará-* 'pertaining to all men' (×*vāiśu̯ānará-*) and *mā́dhyaṃdina-* 'belonging to midday' (×*mā́dhiyaṃdina*), an absence nicely explained by Schindler's formulation (Schindler 1977:60–1). However, as discussed in Barber 2013:48–51, SL does apply frequently in word-medial position. While forms such as *mártiyasya* 'of a mortal', *kā́viyasya* 'inspired, poetical (gen.sg.)' may be explained through analogical leveling, it is more difficult to make such a claim for *-nu-* verbs such as *aśnuvánti* 'they obtain'. In addition, its non-application in longer vṛddhi formations is not compelling evidence of its restriction to word-final position, given that SL is also absent in shorter vṛddhi formations where vowel epenthesis is expected (following Schindler's formulation of SL), such as *paidvá-* 'belonging to Pedu' (×*paiduvá-*) and *tātyá-* (×*tātiyá-*) 'paternal'. If LL truly is a subtype of SL, then it should behave just as SL does, with application in both underlying monosyllables and polysyllables, at least to some extent. But we don't seem to find these same types of exceptions to LL—forms such as *dyúbhiḥ* remain resolutely unlengthened, and any (of the few) instances of lengthened underlying polysyllabic forms belong to paradigms with LL monosyllables or are compounded to such forms (Barber 2012:183).

A second, more serious problem for Schindler's sandhi explanation of LL stems from what the theory would predict about the distribution of Lindeman variants. This view, that LL occurred in monosyllables after words ending in a heavy syllable, predicts that Lindeman variants should appear anywhere *but* sentence-initial position. As Barber (2012) carefully demonstrates, we do find partial complementary distribution in the Rigveda of a number of forms that show alternation (such as, but not limited to, *dyáuḥ/diyáuḥ*, *dyā́m/diyā́m*, and *dvá-/duvá-*). However, these forms are distributed in the *opposite* fashion from what one would expect following Schindler's understanding of LL, with the disyllabic variants nearly always appearing in line-initial position, a fact which cannot be explained by meter alone (Barber 2012).

A third problem lies in the structural description of Schindler's rule itself. As is well known, Schindler demonstrates that SL was blocked in words of the shape **/VTTU̯V/* (e.g. **tetsi̯o-*), where T = any obstruent, which he attributes to the syllabification **[-VTT]σ[U̯V-]σ* (i.e. **tets.i̯o-*). Evidence of non-application includes Skt. *matsya-*, Av. *masya-* 'fish' (< **matsya*, ×*matsiya-*), Gk. (Ion.) δɪξός 'double' (< **dikʰ-tʰi̯ós*, ×*dikʰtʰii̯ós*; cf. δɪχθά 'in two'),[11] and Skt. absolutives of the shape **-tu̯V-* (Skt. *-tvā́, -tvī́, -tvā́ya*), which never scan as **-tu̯uV-* (Skt. ×*-tuvā́,* ×*-tuvī́,* ×*-tuvā́ya*). However, as I argue in Byrd 2015:191–2, the syllabification of **tetsi̯o-* as **tets.i̯o-* is problematic, as there is no direct evidence for this type of syllabification attested in the IE languages, and it is also quite unexpected from a typological point of view. In fact, as I show

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[11]Ruijgh 1992:76.

in my 2015 book, the sequence **tetsi̯o-* could only have been syllabified as **tet.si̯o-* in PIE,[12] given the ban on Sonority Sequencing Principle (SSP)[13] violations in word-medial codas, as expressed by the Maximum Syllable Template (MST).[14]

(3) The MST = CCVCC.
     The maximum PIE syllable consists of two Cs in the onset and two Cs in the coda. The onset may violate the SSP; the coda may not.

Thus, the forms **matsya-*, **dikʰtʰi̯ós*, and the **-tu̯V-* absolutes could only have been syllabified with complex onsets in the second syllable: **mat.sya-*, **dikʰ.tʰi̯ós*, etc. And since SL does not affect such forms, we cannot formulate SL as targeting $CU-$ sequences in final syllables, as Schindler has claimed. And since LL *only* affects the sequence $CU-$ in final syllables in forms such as **du̯oh₁* 'two', SL and LL could not have been the same rule. Indeed, as Ryan Sandell reminds me, the two rules in question cannot be described as involving the same structural change, as LL is clearly sensitive to word boundaries, while SL is not.

    With the rules now disentangled, we no longer have an explanation as to why LL existed in PIE, and we no longer understand the extent of its reach. And its similarity to SL still remains: if the two laws were not the same, then why do they appear to be so?

3   Lindeman's Law: An alternative means to satisfy the Minimal Word Requirement

As suggested above, the haphazard appearance of Lindeman variants in the daughter languages may be due to the fact that, as in Sanskrit, LL was an optional process in PIE. Optional rules must have existed when PIE was spoken—such is the nature of human language (Anttila 2007, Hayes 2009:61, Coetzee and Pater 2011).[15]

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[12] Note that it is not that two consonants were not allowed to be syllabified in a word-medial coda in PIE (cf. */i̯éu̯gtrom/ → *[i̯éu̯k]σ[trom]σ 'cord' > Ved. *yóktram*); rather, while a number of complex word-final codas were possible in word-final position, many of these complex margins were banned word-medially. Thus, while **u̯ḗk̂st* 'carried by vehicle' contains a tripartite sequence **-k̂st* at word's edge, no such sequence is reconstructable in word-medial position (×*u̯ḗk̂st.prom*).

[13] "[B]etween any member of a syllable and the syllable peak only sounds of higher sonority rank are permitted" (Clements 1990:284).

[14] Byrd 2015:85–134. It is not just the case that we are unable to reconstruct SSP violations in word-medial positions in PIE; we may identify three separate phonological rules as being driven by such violations (Lex Schmidt-Hackstein [Hackstein 2002], the *métron* rule, and the deletion of **t* in the derivative of **h_xok̂(t)h_xtí-* '80' in Indo-Iranian).

[15] Well-known examples of optional rules include coronal stop deletion in English (*wes(t) side*), assibilation and apocope in Finnish (/lentä-i/ → *lénti, lénsi, lént, léns*), and the deletion of dat.sg. *-e* in German (*Diebe* ∼ *Dieb* 'thief').

Variant forms are commonplace within the reconstructed morphology; for instance, alongside the archaic acrostatic genitive singular **péts* 'foot' must have existed a morphologically renewed **pedós* or **pedés* 'foot' (> Lat. *pedis*, Gk. ποδός, Skt. *padáḥ,* etc.). While variation is less commonly posited for the phonology, at least one optional rule can be reconstructed for the proto-language, monosyllabic lengthening (MSL), the process by which a vowel is lengthened in an underlyingly monomoraic monosyllabic word to create a bimoraic form at the surface.

MSL occurs in languages where there is a Minimal Word Requirement (MWR), which requires stress-bearing units to consist of at least two morae.[16] Suggested by Hirt (1927–37:2.227) and discussed more recently in Kapović 2006 and Byrd 2015:113–7, it is clear that short and long variants existed for a number of core PIE words, including pronouns, conjunctions, and particles.[17] Five such instances are cited in Table 4 below.

Meaning	Short Form	Attestations	Lengthened	Attestations
'me (acc.)'	**me*	Gk. ἐμέ	**mē*	Skt. *mā*
		OIr. *mé*		Lat. *mē-d*
		Goth. *mi-k*		Gaul. *mi*
'now'	**nu*	Skt. *nú*	**nū*	Skt. *nū́*
		OIr. *nu, no*		OCS *ny-ně*
		Latv. *nu*		Lith. *nū-naĩ*
'you (nom.)'	**tu*	Gk. σύ	**tū*	Lat. *tū*
		Latv. *tu*		Hom.Gk. τύνη
		OE *þu*		OE *þū*
'not'	**ne*	Skt. *ná*	**nē*	Lat. *nē*
		OCS *ne*		
'disjunctive'	**u̯e*	Lat. *-ve*	**u̯ē*	Skt. *vā*
		Skt. *i-vá*		

Table 4. MSL in Words of the Shape CV.

Following Sandell and Byrd in preparation, it appears likely that MSL occurred in forms of the shape CVC as well. Examples include (but are not limited to):

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[16]McCarthy and Prince 1986 [1996]:6–7. See also Golston 1991 and Mester 1994.

[17]It is quite common for languages to have short and long variants of function words (Spencer and Luís 2012:92–3), though the short variants are often reduced forms of the long ones (e.g. German *dū* ∼ *də* 'you', *īm* ∼ *m̥* 'him [dat.sg.]'; Eng. *wɪl* ∼ *l* ∼ *l̩* 'will', *ænd* ∼ *n̩* 'and'). In PIE, the long forms are strengthened versions of the short forms.

Meaning	Short Form	Attestations	Lengthened	Attestations
'on high'	**ud*	Skt. *úd*	**ūd*	Eng. *out*
'us'	**nos*	Skt. *nas* Hitt. *-naš* Gk. *νόσ-φιν*	**nōs*	Lat. *nōs*
'up'	**ub*	Lat. *s-ub*	**ūb*	OHG *ūf*
'poison'	**u̯is-*	Skt. *viṣá-*	**u̯īs-*	Av. *vīš̆*

Table 5. MSL in Words of the Shape CVC.

The manifestation of MSL due to the MWR in a word of the shape CV is straightforward: $/CV_\mu/ \rightarrow [CV_{\mu\mu}]$ (C$\bar{V}$). But it is less obvious why a word of the shape CVC would exhibit vowel lengthening, as one would expect in a language where coda consonants were moraic (Byrd 2018:2067) that the sequence $*/CV_\mu C/$ would be realized as $*[CV_\mu C_\mu]$, hence no lengthening. Unexpected lengthening of this type is found in a number of languages, including MHG (Seiler 2009), in which the words /glas/ 'glass', /tal/ 'valley', and /veg/ 'way' surface as [glaːs], [taːl], and [veːk], respectively. Monosyllabic lengthening in words of the shape CVC is typically attributed to word-final extrametricality, where the final consonant of a word is prosodically invisible, rendering that segment non-moraic (Gordon et al. 2010). It is for this reason that MSL also occurred in PIE words like */úd/ 'on high'; the phonology viewed the words as containing only a single mora.

(4)   The Minimal Word Requirement in PIE: Monosyllabic Lengthening

	Underlying Form		Extrametricality		MWR (MSL)
1.	*/úd/ 'on high'	→	$*[ú_\mu \langle d \rangle]_\sigma$	→	$*[ú̄_{\mu\mu} \langle d \rangle]_\sigma$
2.	*/nós/ 'us'	→	$*[nó_\mu \langle s \rangle]_\sigma$	→	$*[nó̄_{\mu\mu} \langle s \rangle]_\sigma$
3.	*/úp/ 'up'	→	$*[ú_\mu \langle b \rangle]_\sigma$	→	$*[ú̄_{\mu\mu} \langle b \rangle]_\sigma$
4.	*/u̯ís/ 'poison'	→	$*[u̯í_\mu \langle s \rangle]_\sigma$	→	$*[u̯í̄_{\mu\mu} \langle s \rangle]_\sigma$

The process of MSL in PIE reminds us of LL in three regards. First, both short- and long-vowel variants are reconstructable for the proto-language, making it likely that MSL was an optional rule in late PIE. Second, MSL takes forms that are underlyingly short and makes them into forms that are at the surface longer. Third, as Jared Klein reminds me, the distribution of the Rigvedic monosyllabic particle /nú/ 'now' echoes the position of Lindeman variants such as *duvá-*, as both occur with great frequency in line- and clause-initial position.[18] When found in first position of a clause, /nú/ occurs in its lengthened form *nū́* 65 times, versus a single *nú* in that position

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[18]There are of course other reflexes of MSL in the Rigveda, such as in the particles *tū́* and *sū́*, which are never

(Klein 2019:47). For Klein, the function of a fronted *nū́* is to represent a "strong focalization of present time" and the "lengthening…in this position is a function of its strong focalizing value." I suspect that in PIE, as in the Rigveda, the primary reason for the lengthening and fronting (if possible) of a number of monomoraic monosyllables was focalization.[19]

Should we follow Sandell and Byrd in preparation, as above, in reconstructing extrametricality for PIE, many of the forms which undergo LL begin as monomoraic and are derived into forms that are at the surface bimoraic. Of course, instead of vowel lengthening, we find vowel insertion, illustrated in (5) below.

(5)   The Minimal Word Requirement in PIE: Lindeman's Law

	Underlying Form		Extrametricality		MWR (LL)
1.	*/du̯óh₁/ 'two'	→	*[du̯ó⟨h₁⟩]$_\sigma$	→	*[du]$_\sigma$[u̯ó⟨h₁⟩]$_\sigma$
2.	*/su̯ós/ 'one's own'	→	*[su̯ó⟨s⟩]$_\sigma$	→	*[su]$_\sigma$[u̯ó⟨s⟩]$_\sigma$
3.	*/tu̯ói̯/ 'you (loc.sg.)'	→	*[tu̯ó⟨i̯⟩]$_\sigma$	→	*[tu]$_\sigma$[u̯ó⟨i̯⟩]$_\sigma$
4.	*/dʰǵʰi̯és/ 'yesterday'	→	*[dʰǵʰi̯é⟨s⟩]$_\sigma$	→	*[dʰǵʰi]$_\sigma$[i̯é⟨s⟩]$_\sigma$

We thus see that LL and MSL participate in a phonological conspiracy, both occurring to satisfy the MWR. To cite an example that is directly comparable to the one discussed above, in Chitonga (Mkochi 2009), a Bantu language spoken in the southern and western provinces of Zambia, one finds MSL in words that are of the shape CV (*toː* 'take', *peː* 'get subdued', *koː* 'catch') and epenthesis in forms of the shape CCV (*iswa* 'break!', *ilya* 'eat!', *ifwa* 'die!'). Vowel epenthesis occurs in roots with complex onsets in both Chitonga and PIE for the same reason, to satisfy the MWR and—along the way—also to satisfy the constraint *ComplexOnset (see Byrd 2015:197–200).

[du̯ó⟨h₁⟩]$_\sigma$	MWR	*ComplexOnset	Dep-V
a. [du̯ó⟨h₁⟩]$_\sigma$	*!	*	
b. ☞ [duu̯ó⟨h₁⟩]$_\sigma$			*
c. [du̯ő⟨h₁⟩]$_\sigma$		*!	*

Table 6. High Vowel Epenthesis in Lindeman's Law.

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fronted to clause-initial position as they are clitics. These long variants only surface when length is required by the meter (Klein 1982:1, 12).

[19] Of course, all of this falls within the natural, expected parameters of language, with the lengthened monosyllables and Lindeman variants being what are traditionally called citation forms (Ladefoged and Johnson 2010:107), words which are uttered in isolation, which are topicalized or focalized, or which have been introduced into the discourse for the first time. One would also expect these lengthened variants to be prevalent within PIE motherese *Nū́ duu̯óh₁ h₁(ə)bdʰi!* 'Now take two!' and *Dʰǵʰi̯és tód tuu̯ói̯ h₁est?* 'Was that on you yesterday?'

Satisfying *ComplexOnset on the side directly parallels what occurs in Sievers' Law, though there the trigger of resyllabification is motivated by the avoidance of a superheavy syllable (Byrd 2015:199), and not the avoidance of a light monosyllable. It is for this reason that SL and LL look so similar.[20]

[ḱérdʰ]σ[i̯os]σ		Dep(F)	*Superheavy	Faith(σ)	*ComplexOnset	Dep-V	No-Spread
a. ☞	[ḱér]σ[dʰi]σ[i̯os]σ			*		*	*
b.	[ḱér]σ[dʰi̯os]σ			*	*!		
c.	[ḱér]σ[dʰə]σ[i̯os]σ	*!		*		*	
d.	[ḱérdʰ]σ[i̯os]σ		*!				

Table 7. High Vowel Epenthesis in Sievers' Law.

A similar type of vowel epenthesis does not occur in forms such as **/nós/* 'us' for two reasons. First, there is no complex onset to resolve, and second, vowel epenthesis would violate the constraint Onset (for constraint ranking justification, see Byrd 2015:173):

[nó⟨s⟩]σ		MWR	Onset	Dep-V
a.	[nó⟨s⟩]σ	*!	*	
b. ☞	[nó⟨s⟩]σ			*
c.	[o]σ[nó⟨s⟩]σ		*!	*

Table 8. The Derivation of **/nos/*.

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[20]A careful reader will perhaps note that the ranking MWR ≫ Faith(σ) ≫ *ComplexOnset ≫ *Dep-V predicts **du̯ómμμ⟨h₁⟩* to be a more optimal candidate than **du̯u̯ómμ⟨h₁⟩* within my reconstruction of PIE constraint rankings. This problem may be handled in a number of ways. First, one may assume a faithfulness constraint Ident-IO(V-length) "Corresponding input and output segments have identical values for the feature [length]" (cf. Nishihara, van de Weijer, and Nanjo 2001), as the ranking MWR ≫ Ident-IO(V-length) ≫ Faith(σ) will produce the desired output **du̯u̯ómμ⟨h₁⟩*. One could also assume a markedness constraint *V̄ that bans long vowels (also ranked above Faith(σ)), though this seems unwise given the prevalence of such segments within PIE (both underlying and derived). Finally, one could assume variable rankings between Faith(σ) and *ComplexOnset (i.e. sometimes Faith(σ) ≫ *ComplexOnset, sometimes *ComplexOnset ≫ Faith(σ)). This would lead to the creation of two variants, **du̯ómμμ⟨h₁⟩* (> Skt. *dvā́*, etc.) and **du̯u̯ómμ⟨h₁⟩* (> Skt. *duvā́*), though I suspect this solution would produce unwelcome results, as it may predict other types of non-existent sporadic vowel epenthesis. Further research is necessary to determine the best solution.

4   The loss of the MWR and the continuation of extrametricality

In this paper, I have shown that Lindeman's Law was not the same phonological process as Sievers' Law (as is commonly believed), but rather has much in common with another phonological process reconstructable for PIE, monosyllabic lengthening (MSL), in that both are optional means to satisfy the MINIMAL WORD REQUIRE-MENT. Given their optionality, it is likely that the forms reconstructable for late PIE reflect a stage at which the MWR had ceased to exist as a highly-ranked constraint within the proto-language, with MSL and LL thereby becoming moribund. However, as with the long variants created by MSL, Lindeman variants remained an optional pronunciation, although speakers no longer understood the original domain in which the rule of vowel epenthesis applied. It is in this way that speakers began to extend it to heavy monosyllables (e.g. *dyā́m* 'sky (acc.sg.)' → *diyā́m*) and to other sonorants, perhaps nasals first (if the long variant of *ĝʰm̥mṓ* 'earthling' should be traced back to PIE), followed by liquids.

While the MWR appears to have disappeared in late PIE, there is no reason to believe the same to be true of extrametricality. As discussed in detail in Sandell and Byrd in preparation, there is a substantial amount of evidence that suggests that extrametricality was productive in the majority of ancient IE languages. Evidence includes: (1) the requirement of extrametrical consonants for a correct analysis of recessive accent in Attic-Ionic and Aeolic Greek (see Gunkel 2011:92, Gunkel 2014:323); (2) the non-application of Osthoff's Law in final syllables closed by just a single consonant in Greek (Rix 1992:56), in Old Latin and South Picene (Weiss 2011:125), and in Old Germanic (cf. Ringe 2017:94); (3) the fact that /CVC/ does not satisfy the MWR, as seen in MHG, and in Old Germanic more generally (Seiler 2009); and (4) the existence of Kuiper's Law in PIE (see Mayrhofer 1986:149, with references), the evidence for which comes from short scansions of vocatives to *ah_2-stems in the Rigveda, the short vowel vocative *-ă* in Greek (e.g. *νύμφă* 'O nymph'), and the vocative *-o* (< *-ă) in OCS (e.g. *ženo* 'O woman'). Given that *-h_2 was not weight-bearing in word-final position, compensatory lengthening did not occur upon its later deletion.

For the time being, two matters must remain unsolved and unaddressed. First, we do not yet understand precisely how and why the MWR can be lost in a language. As a tentative suggestion, perhaps its loss is somehow connected to the shift from a stress-based language to a pitch-accent language, as is often assumed for the early prehistory of PIE. Or perhaps, as Ryan Sandell has suggested to me,[21] the MWR was never lost in PIE, which would entail that LL and MSL were obligatory rules in the PIE grammar. For him, the apparent sporadic nature of the attestations found in the IE daughter may perhaps be attributed to the fact that "under given prosodic conditions (e.g. cliticization, but possibly other still unknown conditions) the MWR would not have been in force. Consequently, the forms for which we have both long

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[21]P.c. 12 May 2018.

and short-vowel or LL and non-LL forms both existed under determinate conditions." Further research is necessary to determine which view is preferable in light of the evidence given.

The second matter that needs to be addressed is the apparent overabundance of abstractness assumed for PIE, with the reconstruction of extrametrical segments in absolute word-final position alongside word-initial and word-final extrasyllabic consonants. What was the relationship between the two? Were extrasyllabic consonants a subtype of extrametrical consonants? In words such as **u̯éḱst* 'carried by vehicle' (which, following Byrd 2015, contains two extrasyllabic consonants), were the extrasyllabic consonants **-st* both extrametrical, or was only the final segment non-moraic? Or are these abstract categories independent of one another? While no immediate answers present themselves, both of these problems will be handled in much greater detail in Sandell and Byrd in preparation.

References

Anttila, Arto. 2007. "Variation and optionality." In *The Cambridge Handbook of Phonology*, ed. Paul de Lacy, 519–536. Cambridge, UK: Cambridge University Press.

Barber, Peter. 2012. "Re-examining Lindeman's Law." In *Laws and Rules in Indo-European*, ed. Philomen Probert and Andreas Willi, 182–205. Oxford: Oxford University Press.

———. 2013. *Sievers' Law and the History of Semivowel Syllabicity in Indo-European and Ancient Greek*. Oxford: Oxford University Press.

Beekes, Robert S. P. 2011. *Comparative Indo-European Linguistics: An Introduction*. 2nd ed. rev. Michiel de Vaan. Amsterdam: Benjamins.

Bermúdez-Otero, Ricardo. 2003. "The acquisition of phonological opacity." In *Variation Within Optimality Theory*, ed. Jennifer Spenader, Anders Eriksson, and Östen Dahl, 25–36. Stockholm: Department of Linguistics, Stockholm University.

Byrd, Andrew Miles. 2010. "Motivating Sievers' Law." In *Proceedings of the 21st Annual UCLA Indo-European Conference*, ed. Stephanie W. Jamison, H. Craig Melchert, and Brent Vine, 45–67. Bremen: Hempen.

———. 2015. *The Indo-European Syllable*. Leiden: Brill.

———. 2018. "The phonology of Proto-Indo-European." In *Handbook of Comparative and Historical Indo-European Linguistics*, ed. Jared S. Klein, Brian Joseph, and Matthias Fritz, vol. 3, 2056–79. Berlin: Mouton de Gruyter.

Clements, George N. 1990. "The role of the sonority cycle in core syllabification." In *Papers in Laboratory Phonology 1: Between the Grammar and Physics of Speech*, ed. John Kingston and Mary E. Beckman, 283–333. Cambridge, UK: Cambridge University Press.

Coetzee, Andries, and Joe Pater. 2011. "The place of variation in phonological theory." In *The Handbook of Phonological Theory*, 2nd ed., ed. John Goldsmith, Jason Riggle, and Alan Yu, 401–31. Malden: Blackwell.

Collinge, N. E. 1985. *The Laws of Indo-European*. Amsterdam: Benjamins.

———. 1995. "Further laws of Indo-European." In *On Languages and Language: The Presidential Addresses of the 1991 Meeting of the Societas Linguistica Europaea,* ed. Werner Winter, 27–52. Berlin: de Gruyter.

Fortson, Benjamin W. IV. 2010. *Indo-European Language and Culture: An Introduction*. 2nd ed. Chichester: Wiley-Blackwell.

Golston, Chris. 1991. "Both lexicons." Ph.D. dissertation, University of California, Los Angeles.

Gordon, Matthew, Carmen Jeny, Carlos Nash, and Nobutaka Takara. 2010. "Syllable structure and extrametricality: A typological and phonetic study." *Studies in Language* 34:131–66.

Gunkel, Dieter. 2011. "The emergence of foot structure as a factor in the formation of Greek verbal nouns in -μα(τ)-." *Münchener Studien zur Sprachwissenschaft* 65:77–103.

———. 2014. "The Law of Limitation." In *Encyclopedia of Ancient Greek Language and Linguistics,* ed. Georgios K. Giannakis, Vit Bubenik, Emilio Crespo, Chris Golston, Alexandra Lianeri, Silvia Luraghi, and Stephanos Matthaios, vol. 2, *G–O,* 323–5. Leiden: Brill.

Hackstein, Olav. 2002. "Uridg. CH.CC > C.CC." *Historische Sprachforschung* 115:1–22.

Hayes, Bruce. 2009. *Introductory Phonology*. Malden: Wiley-Blackwell.

Hirt, Hermann. 1927–37. *Indogermanische Grammatik*. 7 vols. Heidelberg: Winter.

Jasanoff, Jay H. 1989. "Old Irish *bé* 'woman'." *Ériu* 40:135–41.

Kapović, Mate. 2006. "Reconstruction of Balto-Slavic personal pronouns, with emphasis on accentuation." Ph.D. dissertation, University of Zagreb.

Klein, Jared S. 1982. "Rigvedic *tú* and *sú*." *Die Sprache* 28:1–26.

———. 2019. "Rigvedic *nú*: Configurational syntax, semantics, and poetics." *Transactions of the Philological Society* 117:35–57.

Kobayashi, Masato. 2004. *Historical Phonology of Old Indo-Aryan Consonants*. Tokyo: Fujiwara.

Ladefoged, Peter, and Keith Johnson. 2010. *A Course in Phonetics*. 6th ed. Boston: Wadsworth.

Lindeman, Fredrik Otto. 1965. "La loi de Sievers et le début du mot en indo-européen." *Norsk Tidsskrift for Sprogvidenskap* 20:38–108.

Mayrhofer, Manfred. 1986. *Indogermanische Grammatik*. Vol. 1, part 2, *Lautlehre (Segmentale Phonologie des Indogermanischen)*. Heidelberg: Winter.

McCarthy, John J., and Alan Prince. 1986 [1996]. *Prosodic Morphology.* Available at https://scholarworks.umass.edu/linguist_faculty_pubs/13.

Meier-Brügger, Michael. 2003. *Indo-European Linguistics*. Berlin: de Gruyter.

Meiser, Gerhard. 1998. *Historische Laut- und Formenlehre der lateinischen Sprache*. Darmstadt: Wissenschaftliche Buchgesellschaft.

Melchert, H. Craig. 1994. *Anatolian Historical Phonology*. Amsterdam: Rodopi.

Mester, Armin R. 1994. "The quantitative trochee in Latin." *Natural Language and Linguistic Theory* 12:1–61.

Mkochi, Winfred. 2009. "Bimoraic word minimality condition in Chitonga: OT analysis." *SKY Journal of Linguistics* 22:277–85.

Nishihara, Tetsuo, Jeroen van de Weijer, and Kensuke Nanjo. 2001. "Against head-edness in compound truncation: English compounds in Japanese." In *Issues in Japanese Phonology and Morphology*, ed. Joroen van de Weijer and Tetsuo Nishi-hara, 299–324. Berlin: de Gruyter.

Nussbaum, Alan J. 2004. "A -*t*- party: Various IE nominal stems in *-(o/e)t-.*" Paper presented at the 16th Annual UCLA Indo-European Conference.

Peters, Martin. 1980. *Untersuchungen zur Vertretung der indogermanischen Laryngale im Griechischen*. Vienna: Verlag der Österreichischen Akademie der Wissen-schaften.

Praust, Karl. 2000. "Altindisch *dr̥-/dr̥̄ – seṭ* oder *aniṭ*?" In *Indoarisch, Iranisch und die Indogermanistik: Arbeitstagung der Indogermanischen Gesellschaft vom 2. bis 5. Ok-tober 1997 in Erlangen*, ed. Bernhard Forssman and Robert Plath, 425–41. Wies-baden: Reichert.

Prince, Alan, and Paul Smolensky. 2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden: Blackwell.

Ringe, Donald A. 2017. *A Linguistic History of English*. Vol. 1, *From Proto-Indo-Euro-pean to Proto-Germanic*. 2nd ed. Oxford: Oxford University Press.

Rix, Helmut. 1992. *Historische Grammatik des Griechischen: Laut- und Formenlehre*. 2nd ed. Darmstadt: Wissenschaftliche Buchgesellschaft.

Ruijgh, C. J. 1992. "Chronologie relative: Le grec. Sur les traitements préhistoriques des sonantes." In *Rekonstruktion und relative Chronologie: Akten der VIII. Fachta-gung der Indogrmanischen Gesellschaft*, ed. Robert S. P. Beekes, Alexander Lubot-sky, and Jos Weitenberg, 75–99. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.

Sandell, Ryan, and Andrew Miles Byrd. In preparation. *The Life Cycle of a Sound Law: Szemerényi's Law as Study in the Diachrony of Phonological and Morphological Acquisition*.

Schindler, Jochem. 1977. "Notizen zum Sieversschen Gesetz." *Die Sprache* 23:56–65.

Seiler, Guido. 2009. "Sound change or analogy? Monosyllabic lengthening in Ger-man and some of its consequences." *Journal of Comparative Germanic Linguistics* 12:229–72.

Sihler, Andrew. 1971. "Word-initial semivowel alternation in the Rigveda." *Language* 47:53–78.

———. 2006. *Edgerton's Law: The Phantom Evidence*. Heidelberg: Winter.

Spencer, Andrew, and Ana R. Luís. 2012. *Clitics: An Introduction*. Cambridge, UK: Cambridge University Press.

Vine, Brent. 2011. "Initial **mo-* in Latin and Italic." *Münchener Studien zur Sprachwis-senschaft* 65:261–86.

Weiss, Michael. 2011. *Outline of the Historical and Comparative Grammar of Latin*. 2nd corrected printing. Ann Arbor: Beech Stave.