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Heavy syllable endings and the origin of Pre-PIE mobility

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Abstract

Proto-Indo-European featured a complex system of accentual and ablaut paradigms. In this paper, I outline a proposal for the development of accentual mobility in Pre-PIE. The accent-ablaut system is mostly described as a morphologically conditioned, but its diachronic origin is likely phonetic. Based on the behavior of the most archaic lexical and morphological layer, root nouns and verbs, I argue that ending morphemes with heavy syllables attracted stress, which results in accentual mobility. While the rule was not phonetically active in PIE, it leaves traces and allows us to explain some forms that were difficult to explain. The rule also provides a simple phonetic motivation for a complex morphophonological system of PIE accentual mobility.

1 Introduction

PIE accentual and ablaut system has been subject to detailed investigations and much debate. Based on evidence from Vedic, Avestan, Greek and other branches, a set of accent-ablaut paradigms has been established that govern the accent placement and vocalic grades of morphemes in PIE nominal and verbal morphology (Pedersen, 1926; Kuiper, 1942; Beekes, 1972; Schindler, 1972, 1975a,b; Hoffmann, 1968, 1976; Narten, 1968).¹

While the descriptive facts are well established, the origins of such a system remain a puzzle. In this paper, I outline a potential scenario for how the accent-ablaut paradigms could have developed at the Pre-PIE stage. I hypothesize a basic, but highly phonetically motivated rule whereby the accent of root nouns shifts from the root to the ending if the latter contains a heavy syllable. I present peculiarities in the nominal and verbal paradigms that the rule explains. I also outline an explanation for the N pl. ending.

Because the PIE accent-ablaut system early on developed into a complex paradigmatic and morphological process, not every property can be explained by sound laws. In fact, several paradigmatic levelings had to operate at the post-PIE period regardless of underlying assumptions about the origin of the system.

1.1 Prior work

The accent-ablaut paradigms have a long history of scholarship. Several descriptive properties of the system have been described (Pedersen, 1926; Kuiper, 1942; Beekes, 1972; Schindler, 1975a,b; Hoffmann, 1968, 1976; Narten, 1968). Relatively fewer works exist on the origins of this system. Below, I survey a few most relevant proposals.

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¹For a review of the literature and the most recent summaries of the paradigms, see Fritz & Meier-Brügger (2021); Weiss (2020); Fortson (2010); Lundquist & Yates (2018).

Kortlandt (2004b,a) posits a rule where open root syllables lose accent to the following syllable, which becomes strong if closed: “An open strong syllable becomes weak and loses its (primary or secondary) stress to the following syllable, which becomes strong if it is closed (but not if it is open).” The condition is on the syllable that gives the stress up; the closedness of the following syllable governs only its strength. This formulation predicts open syllables to lose stress and closed syllable to retain it. Crucially, if a root of the shape CVC is followed by an ending CVC, Kortlandt (2004b) would predict the stress to be retained on the root. For example, *padbhís* (<*ped-b^his) is predicted to be root-accented. Likewise, **h₁és-mes* and **h₁és-te* are predicted to be root accented because the ending’s initial consonant would close the root syllable. The 1st and 2nd plural forms are thus expected to feature a full grade with equal rates. As will be argued below, my proposed rule predicts the root to be stressed in 2nd pl., but ending in 1st plural forms, which is supported by a higher rates of strong stems in the 2nd plural forms compared to 1st plural.

The proposal in Kortlandt (2004b) only outlines four paradigms and does not provide a comprehensive explanation of the nominal and verbal accentual paradigms. Kortlandt (2004a,b) also follows the long-standing assumption that vocalism is largely automatic on the basis of stress placement. I depart from this view at least to some degree. Some endings had to phonologically contain the vowel, while others lacked it. Under the radical assumption, every ending has a fully predictable $\emptyset$ -, *e*-, and *o*-grade based exclusively on accent placement of the identified ablaut paradigms. It is, however, clear that the dative and locative endings had to be phonologically differentiated as **e_i* and **i* or that the nominative and genitive ending had to be phonologically distinct.

Kiparsky (2010) proposes a morphological account of accentual paradigms with his Basic Accentuation Principle. According to this proposal, suffixes that have “relatively low-sonority nuclei” are preaccenting. In other words, the sonority of the syllable determines its ability to bear accent. The Basic Accentuation Principle then determines the stress of the word by erasing all accents except the leftmost one. His rule, however, does not explain why some ending with high sonority are not accented, while other with low sonority are. Kiparsky (2010) specifically mentions **-su* and **-es* ending as exceptions and states that **-m* can be accented “when it is followed by something else”. The difference between A sg. **-m* and A pl. *-m̃s* suggest that sonority cannot be the main driver of the stress. Kloekhorst (2013) briefly proposes a different, penultimate rule, which makes different predictions from those outlined here.

2 The heavy syllable rule

PIE morphological system distinguishes strong and weak cases and verb forms. The nominative, accusative, and vocative cases are strong, others weak. The notable exception to this generalization is the locative case (which is strong, but should be weak) and the accusative plural (which is weak, but should be strong). Likewise, in the verbal paradigm, the singular forms are mostly strong with the accent on the root, while the plural forms are weak with much debate about the symmetry between 1st and 2nd plural and 3rd plural. Watkins (1969), for example, reconstructs them as strong with full root grade remnants in languages as continuing the original state. Malzahn (2004) reconstructs the 2nd pl. forms as strong, but analogical to the imperative forms, which themselves are analogical to the singular imperative bare stem.

This paper argues for a simple phonetic origin of the mobile paradigms. I establish that there is a high correlation between the strong/weak distinction and the syllabic weight of the ending. I propose the *heavy syllable* rule, which predicts the accent placement in root nouns and verbs. I hypothesize that at a Pre-PIE stage, the stress moved from the root in root nouns and verbs to the following morpheme if the morpheme was a heavy syllable.

- (1) In Pre-PIE, the primary stress was attracted from the root to the ending if the ending formed a heavy syllable, but stayed on the root if the syllable was light.

At the PIE, this prosodic rule ceased to be fully productive and the accent-ablaut paradigms governed the stress placement with several paradigmatic levelings. However, I argue that there is evidence for a prior stage where the accent placement was conditioned on the syllable weight of the ending. This constitutes one of the most phonetically motivated explanations for the origins of PIE mobility. Cross-linguistically, accent shifts are frequently conditioned by the following syllable weight (Gordon, 2002; Gordon et al., 2008). In the paper, I focus on root formations, as they likely reflect and preserve the most archaic layer of the proto-language.

3 Evidence from the nominal paradigm

3.1 Conforming cases

The most archaic layer of the PIE nominal paradigms are likely root nouns. The ending system of the nominal paradigm has been subject to much debate. Here, I adopt a standard reconstruction of endings for most cases (based on Fortson 2010; Lundquist & Yates 2018; Fritz & Meier-Brügger 2021 and others), with the exception of the plural ending **-es*.

Table 1 illustrates one paradigm and tests its accentual predictions against the rule in (1). I use Greek and Vedic ablauting root nouns $\pi\omicron\upsilon\varsigma$ and *pāt* to illustrate the distribution. Forms that are either monosyllabic or disyllabic with a light ending are strong, while forms that have a heavy ending are weak (with the most notable exception being the N pl.; for a discussion, see below).

For example, the acc. sg. **-m̥* is light, which is why the stress stays on the root. The acc. pl. **-ms* is heavy, on the other hand, which is why the stress advances and makes the case weak.

In general, it is assumed that the nominative, vocative, and accusative singular, dual, and nominative and vocative plural are strong cases, the rest are weak. It is perhaps not a coincidence, that the only two cases that often defy this division are the locative singular and the locative plural, both ending with non-heavy endings (or $\emptyset$ -ending). The locative singular and plural are weak cases in PIE, but our rule predicts them to be strong. For example, Vedic *dyávi* exists besides the more common *diví*. L pl. in Old Avestan *nāšū* could point to the strong form as well. There is evidence for strong stem in Old Irish: *ís* for **pēd-su* (Neri, 2013).

The neuter paradigm also largely conforms to the observed principle. The neuter dual **-ih₁* constitutes a heavy syllable and is largely consistent with a weak case ablaut and accent, e.g. *saṃyatī*.

3.2 Nominative plural

The generalization in (1) is most notably violated in the nominative plural form. The nominative plural ending **-es* stands out as resisting the traditional ablaut paradigms: N pl. m./f. is a strong form,² but the ending features an unaccented *e*-vocalism. No explanations outlined in Section 1 captures the nominative plural strong stem accentuation. Tichy (2009) proposes that **-es* goes back to **-ss* with an epenthetic **e* after the ablaut paradigms ceased to be productive, which would explain the unusual accentual and ablaut behavior (see also Stausland Johnsen 2021). While this is a possible scenario for the evolution of **-es*, I believe there is a more plausible explanation that unites the structural parallels between nominative dual and plural endings as well as their functional commonalities, since the dual is not securely reconstructed to the Pre-PIE and the two likely had common origins. Finally, the proposal I outline here explains the strong stem of the nominative plural forms.

²There is some evidence suggesting that rule in (1) might have been active at the post-Pre-PIE period, as some Vedic forms show a weak N pl. Ved. *dívas* is perhaps the strongest case (though not securely a N pl.), with *mahás* and *aryás* being more problematic. *apás* is attested in AV, not RV, which maybe indicative of these forms being secondary. *paśvāḥ* in RV 8 63 9 *yávam ná paśvāḥ ādāde* is not securely a nominative sg. Similarly, Young Avestan has. *zəmō* as a weak stem.

N sg.	-s	pód-s	πούς	pát	mono	strong
A sg.	-m	pód-m̄	πόδᾱ	pádam	light	strong
V sg.	-∅	pod			mono	strong
G Ab sg.	-es	ped-és	ποδός	padás	heavy	weak
D sg.	-eĭ	ped-éĭ		padé	heavy	weak
I sg.	-eh ₁	ped-éh ₁		padá	heavy	weak
L sg.	-i	péd-i		padí	light	(strong)
NAV du.	-h ₁ e	pód-h ₁ e	πόδε	pádā	light	strong
NV pl.	-h ₁ e(-s)	pód-h ₁ es	πόδες	pádas	heavy	strong
A pl.	-m̄s	ped-m̄s	πόδᾱς	padás	heavy	weak
G pl.	-om	ped-óm	ποδῶν	padám	heavy	weak
Ab D pl.	-b ^h os	ped-b ^h os			heavy	weak
I pl.	-b ^h is	ped-b ^h is		padbhís	heavy	weak
L pl.	-su	ped-su		patsú	light	(strong)

Table 1: Nominal paradigms of Greek πούς and Vedic pát with PIE reconstructions illustrating the generalizations predicted by (1).

The intricacies of the plural suffix can largely be explained if we assume that the plural suffix is directly related to the dual suffix. I hypothesize that the **-h₁e* ending was at the Pre-PIE stage a general pluralizing morpheme that denoted both dual and plural nouns. We can imagine a stage with N sg. **pód-s*, A sg. **pód-m̄*, Npl. **pód-h₁e*, Apl. **pod-m̄s*. Our rule correctly predicts root accent on N sg., A sg., and N pl. and predicts that A pl. will have the accent on the ending which is a heavy syllable.

It has long been known that Apl. ending **-m̄-s* is a combination of the accusative suffix **-m* and the plural suffix **-s*. Without the overt plural suffix, the number distinction would be absent. The reconstructed N pl./du. ending was distinctly plural, and did not require additional plural marking. As is clear from the rest of the endings in the plural paradigm, however, almost all cases are marked as plural with the **-s* morpheme. The analogical paradigmatic pressure to add **-s* to **-h₁e* is thus clear. I hypothesize that it happened after the rule to shift stress to the heavy final syllable was active, which explains the strong grade with root accent in both N, V pl. and N, A, V du. Across families, the formal distinction between the nominative and vocative dual and plural is only in the additional **-s*. Table 2 illustrates that formally, dual and plural forms differ exclusively in the presence of **-s*.

	dual	plural	
Greek	πόδε	πόδες	foot
Vedic	pádā	pádas	foot
Avestan	pāḍa		foot
Avestan	āpa	āpō	water
Avestan	spāna	spānō	dog
Avestan	nara	naras-ca	man
Old Lithuanian	žmūne	žmónės	man

Table 2: Dual and plural forms illustrating that in Greek, Avestan (and presumably reconstructed Vedic), and Old Lithuanian the only formal difference between dual and plural forms is in the presence of *-s*.

Cuneiform Luwian *tāwa* ‘eyes’ and *iš(ša)ra* ‘hands’ could point to the **-h₁e* dual as well, (while the thematic version cannot be rule out based on phonology; see Lundquist & Yates 2018). While Luwian

innovated the plural morpheme (to *-anzi, -inzi*), paralleling Cuneiform Luwian *iš(ša)ra* ‘hands’ to Hittite³ *kiššariš* ‘hands’ also provides an additional parallel to the ones listed in Table 2 for N du. **-h₁e* vs. N pl. **-h₁es*.⁴

That **-e* can have a pluralizing function is suggested by its presence in the plural verbal endings (**-me* vs. sg. **-m, *-te* vs. sg. **-s, *-ent* vs. sg. **t*). Willi (2018) speculates that the plural **-es* could consist of the “pluraliser” **e* and ergative **s*. According to my proposal, the **-h₁e* was initially a common dual/plural suffix, which got reinforced by the **-s* plural marker along with other case endings in the paradigm. There is a direct historical parallel to this development: in Lithuanian, the dual suffix gets additionally marked by *-s* for plurality. As Schmalstieg (1977) points out, *abidvis rankis* ‘both hands’ result from additional *-s* marking of the dual forms *abidvi ranki*.

Reconstructing **-s* in the Npl. ending as a late addition allows us to explain its strong status with rule in (1). The strong-weak distinction is thus nearly perfectly predictable from the syllabic structure of the ending.

This rule perhaps also explains the retracted accents of vocatives in thematic **-e*. The generalization that light final syllables (of the vocative ending **-e*) could not be stressed can result in the vocative stress retraction from thematic oxytona.

4 Evidence from the verbal paradigm

4.1 The present system

In the verbal paradigm, the 1st–3rd present active singular forms are always strong. This is predicted by the non-syllabic or light nature of the **-m(i), *-s(i), *-t(i)* endings. The ablaut status of the plural forms is, however, highly disputed (Watkins, 1969; Malzahn, 2004). It is clear that the 3rd plural form is weak. This is explained by the heavy syllable ending in **-ent*. The status of 1st and 2nd plural, is highly variable. Especially the 2nd plural form is sometimes hypothesized to be strong, sometimes both 1st and 2nd are (Malzahn, 2004).

While 3rd plural **-ent* is heavy which unequivocally predicts the weak form, the 2nd plural ending **-te* is a light syllable which predicts a strong form. The 1st pl. ending **-me* would also predict the strong version as the syllable is not heavy. However, ending **-me* has a frequent **-mes* variant in the present system (but not the aorist), which does not exist in the 2nd pl. **-te*. This syllable weight asymmetry between the 1st pl. ending (heavy when the *s*-variant is present) vs. 2nd pl. ending (light) neatly predicts that 3rd plural features the weak stem, 2nd plural more frequently the strong stem and 1st plural more frequently the weak stem.

In the root present paradigm, the evidence for the full grade in the 2nd plural is more sparse, perhaps because the 1st plural is predicted to be a weak stem as the ending is often extended with **-s*, thus closing the syllable and requiring the stress shift.

Nearly all cases with full grade in the present stem in Indo-Iranian are from the 2nd pl. forms. Our rule predicts the asymmetry between 1st and 2nd plural forms due to the different weight profiles of **-mes* vs. **-te*, while other competing proposals outlined in Section 1 fail to explain the asymmetry. Old Avestan *mraotā* is an injunctive form of the 2nd pl. *mrū-* ‘to speak’. In the Rigveda, *nethā* is attested once, but the form is not secured as a present indicative.

The imperfect paradigms features unexpected strong form as well, precisely in the 2nd pl. forms: *abravīta*, parallel to 2nd pl. *mrū-* ‘to speak’ (compared to the predicted 3rd dual *mrutō*).

³Hittite forms are mostly taken from Puhvel (1984–2021); Hoffner & Melchert (2024); Kloekhorst (2014).

⁴While Vedic meter cannot be a criterion for laryngeal reconstruction (see Kümmel 2014), the Rigveda (including the family books) feature five conspicuous cases of N pl. *nāras* in cadences (Gipert, 1997) where the reading of long root syllable (perhaps closed by a approximant geminate caused by the laryngeal) would repair the irregular cadences in four out of five attestations.

This asymmetry is also reflected in Hittite. For example, Hittite verb *eku-* ‘to drink’ has both the strong *eku-* and the weak *aku-* variants attested in the 1st pl. forms (including in Old Hittite), whereas only the strong forms attested in the 2nd plural form (in OH): 1st pl. *a-ku-e-ni* (Old Hittite, Old Script) vs. *e-ku-te-ni* and *e-ku-ut-te-ni* (Old Hittite, New Script).

The unexpected full grades in 2nd pl. forms are also attested in ablauting non-root class, such as Vedic *akṛṇóta* and Avestan *dəbnaotā*.

In other languages, the ablauting paradigm is mostly limited to relics, such as the copula paradigm. However, there too, there exist an asymmetry between 1st, 2nd, and 3rd plural forms, as (1) would predict. The original distribution according to (1) is perhaps preserved in Latin root present of the copula, when only the 2nd plural contains the strong stem: 1st pl. *sumus*, 2nd pl. *estis*, 3rd pl. *sunt*. In Old Church Slavic, the 1st pl. has the strong form, but the 2nd and 3rd pl. forms predictably follow (1): OCS *jesmъ*, *jeste*, *sotъ*. Greek and Armenian also have the strong stem in 1st and 2nd pl. but weak in 3rd pl. forms.

The majority of full grade forms in the 2nd pl. forms of the present system come from the imperative paradigm, especially in Vedic. Vedic has 2nd pl. imperatives *éta* (beside *itá*), *stota*, *sotana*, *hantana*. Outside of the root present, the ablauting nasal classes also show the strong form: *kṛṇóta*, *śṛṇóta*, *sunóta*, *hinóta*, *tanota* as well as *yunákta*. Young Avestan has *staota* imperative attested.

The dual forms and middle indicative paradigms are explained by (1) as most endings are heavy. However, the weak stem was likely generalized to the middle paradigm of the aorist system analogically. In aorist middles, the weak stem is generalized stem despite the endings being largely light.

4.2 The aorist system

The aorist paradigm differs from the present paradigm in that the 1st pl. ending is not extended with **-s* or **-n*. This means that the 1st pl. forms are expected to be less often weak. The 1st and 2nd plural forms in the root aorist are indeed substantially more often strong than in the present paradigm, which is predicted by (1). The 3rd plural is a weak form in both the aorist and present paradigms, because the ending contains a heavy syllable. Table 3 illustrates the aorist paradigms of two verbs, **g^uém-* and **k^uér-* in Vedic, Avestan and Hittite. The distribution of strong vs. weak forms is perfectly predicted by (1).

Pre-PIE	Vedic	Avestan	Hittite
*g ^u ém-m̐	ágamam		
*g ^u ém-s	ágan		
*g ^u ém-t	agan	jōn	
*g ^u ém-ma	áganma		
*g ^u ém-te			
*g ^u m-ént	ágman	j ^ə nən	
*k ^u ér-m̐	karam		ku-ir-mi
*k ^u ér-s	kar		
*k ^u ér-t	kar	cōr ^ə t	ku-e-ir-zi
*k ^u ér-ma	ákarma		ku-e-ru-e-n[i]
*k ^u ér-te	karta		
*k ^u r-ént	kran		ku-ra-an-zi

Table 3: Root aorist paradigms illustrating the effects of the rule in (1). The Hittite forms are synchronically present forms.

There are other overt forms that confirm the distribution predicted by (1). Vedic 1st pl. *áhema*, 2nd pl. *áhetana* is contrasted with 3rd pl. *ahyan*. Homeric 3rd du. βᾱτην points to a predicted weak grade.

While Hitt. *ku-e-ru-e-n[i]* can also be read as *ku-e-ru-un* (as in Melchert), the pattern with a strong stem in 1st and 2nd plural vs. weak stem in the 3rd plural is confirmed by other similar e/Ø-ablauting verbs, such as Hitt. *kuenatteni* vs. *kunanzi* and *hūekuwanī* vs. *hukanzi*.

Non-indicative paradigms also follow the pattern. The 3d sg. aorist imperative is strong: RV 3rd sg. *gantu*, 2nd pl. *gānta* (<**g^hem-te*). The same is true in Hittite: *ku-e-er-du* vs. *ku-ra-an-du*.

The 2nd dual and plural imperative forms of the root aorist provide additional support. In the plural, the root is accented because the ending is light: RV *kārta*, in the dual, the ending is heavy therefore accented: RV *kr̥tām*. The imperative of the verb *śru-* has the following predicted forms based on the weight of the ending: 3rd sg. *śrótu*, 2nd du. *śrutām*, 2nd pl. *śróta*.

The 2nd sg. imperative forms in *-dhi* have mostly a zero grade, contradicting (1). However, there are three forms that nevertheless feature a strong stem: *yódhi*, *bodhí* from *bhū-* and *bodhi* from *budh-* that could continue the original distribution (for a different explanation, see Jasanoff 2002). There is also a Greek form with an unexpected strong stem in the 2nd sg. aorist imperative Aeolic πῶθι (beside the more common πῖθι ‘drink’). The other 2nd sg. imperative suffix, *-tāt*, predictably attract stress as the ending is heavy, therefore the stem appears in the weak forms. It is possible that the **-tōd* ending would influence the accentuation of the **-d^hi* endings.

The middle paradigm potentially provides additional evidence in favor of (1). In RV 4.1.17, a 3rd sg. injunctive middle form *arta* is attested (analyzed as a full grade in Gotō 2013), pointing to the full grade to the light **-to* ending.

The perfect system is predicted in the singular forms, but not in the plural forms. The weak stems in the plural might be a later analogical innovation. Accentuation of the perfect stem with a potential initial accent on the reduplicated syllable would mean that the rule in (1) would not apply.

5 Conclusion

This paper outlines a phonetically motivated rule that might have operated at the Pre-PIE stage that gave rise to the PIE mobility in accentual and ablaut paradigms. I argue that endings with heavy syllables caused stress advancement in root nouns and verbs. I offer a unified analysis of the plural ending morpheme that connects it to the dual ending. Several forms previously analyzed as analogically strong or weak can now be explained as regular relics of a more archaic system. Because the rule operated at the Pre-PIE stage and resulted in morphophonological system with paradigmatic levelings, several issues remain unexplained and outstanding. Why some roots maintain the accent and exhibit the acrostatic paradigm or the status of the perfect system remain unclear.

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