

Accent and Ablaut: Emergent Cyclicity

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1 Accent and ablaut

The well-studied nominal accentuation systems of Baltic and Slavic are known to require cyclic derivations (Halle & Kiparsky 1979, Melvold 1990). The present essay is a preliminary exploration of a group of convergent accent/ablaut shifts in “late” (post-Anatolian) Indo-European and Indo-Iranian in which the compositional approach to accentuation reveals a common rationale: they all involve a shift from noncyclic to cyclic derivation.

Although the connection between accent and ablaut in Indo-European words is systematic, it is complex and opaque for several reasons. One source of its complexity and opacity is that ablaut is conditioned by the lexical ACCENTS of morphemes, not by the surface ICTUS of words (Kiparsky 2010). Another is that accent and ablaut affect each other: accent triggers ablaut, but the loss of an accented syllable due to zero grade ablaut causes accent shift (SECONDARY MOBILITY). Finally, the derivation is morphologically controlled in certain cases, with accent assignment and ablaut taking effect CYCLICALLY, i.e. from innermost constituents outwards.

The compositional approach to Indo-European accent and ablaut provides a perspicuous treatment of the system behind these interactions, and of the historical changes that are conditioned by the system. A key idea is that a morpheme may be inherently accented, unaccented, or preaccenting. Therefore a word may have as many underlying accents as it has morphemes, possibly fewer, or even none. But it always surfaces with exactly one ICTUS, in virtue of the application, at the word level, of the BASIC ACCENTUATION PRINCIPLE (BAP):

- (1) a. At the word level, put the ictus on the leftmost accented syllable in a word.
- b. If there is no accent, put the ictus on the leftmost syllable/mora.

Zero grade is conditioned by the underlying accents borne by morphemes, not by the single ictus with which words are pronounced. The rule is that an accented morpheme triggers zero grade on the vowels to its left. Certain vowels – such as thematic vowels – are however not susceptible to zero grade and block the further spread of zero grade.

2 Verb inflection

The accent and ablaut patterns associated with verb inflection are relatively simple. Morphemes can be inherently unaccented or accented. Suffixes can also be preaccenting, meaning that they

assign an accent to the preceding syllable. Technically, we can assume that they carry an accent but cannot bear it themselves; many have no accentable nucleus, others are extrametrical. DOMINANT suffixes erase the accent of the stems to which they are added, and impose their own accent on the resulting derived stem; RECESSIVE suffixes have no accentual effect. Vedic inflectional suffixes line up as follows:

- (2) a. The singular non-past person/number desinences and subjunctive are preaccenting. I notate the preaccenting property of a morpheme with a preposed accent, e.g. *-'a*.
- b. Other person/number desinences and the theme suffixes are accented.
- c. The optative and the participial endings are unaccented.
- d. Desinences, tense/mood morphemes, and most participles are recessive, but future *-syá*, denominative *-yá*, passive *-yá*, and perf.part. *-tá* are dominant, e.g. *dhāráyati* → fut. *dhārayiṣyáti* ‘will hold’, *vṛṣa-* → **vṛṣāyáte* ‘desires’ (denominative), *tákṣ* → *taṣṭá-* ‘fashioned’.

I assume the following ablaut rule (Kiparsky 2010).

(3) *Zero grade (IE)*

Apophonic e,o → ∅ before an accented morpheme, unless a non-deletable vowel intervenes.

This suffices to account for the core of the reconstructed IE verb paradigm.

I illustrate the analysis with the athematic unaccented root **mleuh* ‘say’ and the thematic oxytones Act. **teud* ‘strike’, Mid. **neud* ‘push’ in (4). The first line in each group gives the reconstructed underlying form of “late” (past-Anatolian) Indo-European, the second the reconstructed output (the set of pronounced forms) of the same stage,¹ the third the attested Sanskrit forms. Note in particular that the optative morpheme is unaccented, and the subjunctive morpheme is preaccenting.

¹See Harðarson 1993, Ch. 1, Weiss 2011, Ch. 35; for **bruvīmá* > *brūyáma* see Hoffmann 1968. In a few of the cells, Indo-Iranian has innovated suffixes, and the reconstructions given here incorrectly project them into Indo-European in order to highlight the continuity of the accentual pattern. For example, the 3.Pl. Optative athematic ending is assumed to have been **-ent*, as in the thematic verbs in the next table, replaced in Indo-Iranian by *-ur*, with the same accentual features. The main point is that the complex accent and ablaut patterns of verbs can be easily generated in the compositional approach.

(4)	3Sg.	1Pl.	3Pl.
Act.Ind.	*/mleuh-'t(-i)/ *mléuət(i) brāvūt(i)	*/mleuh-més(-i)/ *mluhmés(i) brūmás(i)	*/mleuh-ént-i/ *mluhénti bruvánti
Mid.Ind.	*/mleuh-ó-i/ *mluhóĩ bruvé > brūté	*/mleuh-méd ^h h ₂ / *mluhméd ^h ə ₂ *brūmáhi > brūmáhe	*/mleuh-ént-ó-i/ *mluuhútoĩ bruváte
Act.Opt.	*/mleuh-ieh ₁ -'t/ *mluhíéh ₁ t brūyāt	*/mleuh-ieh ₁ -mé/ *mluhih ₁ mé *bruvīmá > brūyáma	*/mleuh-ieh ₁ -ĩs/ *mluhíh ₁ ĩs brūyúr
Act.Subj.	*/mleuh-'e-'t(-i)/ *mléuáhát(i) brávat(i)	*/mleuh-'e-mé/ *mléuamé brávāma	*/mleuh-'e-ánt/ *mléuent brávan
Act.Ind.	*/teud-é-'t-i/ *tudéti tudáti	*/teud-é-més(-i)/ *tudémés(i) tudāmas(i)	*/teud-é-ént-i/ *tudénti tudánti
Mid.Ind.	*/neud-é-ó-i/ *nudéĩ nudé	*/neud-é-méd ^h h ₂ / *nudéméd ^h ə ₂ nudāmahe	*/neud-é-ént-ó-i/ *nudéntóĩ nudánte
Act.Opt.	*/teud-é-ieh ₁ -'t/ *tudéih ₁ t tudét	*/teud-é-ieh ₁ -mé/ *tudéih ₁ mé tudéma	*/teud-é-ieh ₁ -ĩs/ *tudéih ₁ ĩ tudéyur
Act.Subj.	*/teud-é-'e-'t(-i)/ *tudéť(-i) tudát(i)	*/teud-é-'e-mé/ *tudémé tudāma	*/teud-é-'e-ént/ *tudéňt tudān

Some athematic roots (the so-called Narten roots) are inherently accented. They lengthen the root vowel to *-é-* in the active singular. On the strength of Avestan evidence, the weak forms of these roots originally had full grade (Narten 1968). In Vedic they are normalized to zero grade, except where syllable structure constraints forbid it, as in the suffix-accented forms of *takṣ-*, e.g. 3pl. */tétk-énti/ $\xrightarrow{\text{BAP}}$ *tétk-enti > Skt. *tákṣati*.

One analysis would be that inherently accented roots have a lengthened vowel, and (3) is generalized as mora deletion ($\bar{e} \rightarrow e$, $e \rightarrow \emptyset$). The Vedic shift to zero grade would then amount to ordering the lengthening *after* (3). (5) illustrates this with *tétk 'fashion'.²

²I assume as usual that the present and imperfect here and in (4) are historically derived from injunctive forms:
 Injunctive */tétk-'t/ */tétk-mé/ */tétk-ént/
 Present */tétk-'t-i/ */tétk-mé-s/ */tétk-ént-i/
 Imperfect */é-tétk-'t/ */é-tétk-mé/ */é-tétk-ént/ (Sanskrit *átāt*, *átakṣma*, *átakṣan*).

(5)	Act.Ind.	*/tétk̂-'t(-i)/	*/tétk̂-mé(-s)/	*/tétk̂-ént(-i)/
		*tétk̂ti	*tétk̂mes	*tétk̂ñti
		táṣṭi	tákṣmas	tákṣati
	Act.Opt.	*/tétk̂-ieh ₁ -'t/	*/tétk̂-ieh ₁ -mé/	*/tétk̂-ieh ₁ -ís/
		*tétk̂ih ₁ t	*tétk̂ih ₁ mé	*tétk̂ih ₁ rs
		tákṣīt	*(tákṣ-ī-ma) > tákṣyāma	takṣyúr

In both stages, zero grade is again sensitive to accent rather than to ictus, in accord with (3).

Within the inflectional system, accented desinences trigger zero grade both on the theme and on the root.

- (6) a. 1pl. */seu-neu-més/ → *sunumés > *sunumás*
b. 3sg. */seu-neu-'ti/ → sunéuti > *sunóti*

The morpheme *-nó/-nu-* is unaccented – otherwise the paradigm would have columnar accent, viz. **su-nú-mas*, like *pitṛṣu*. So the zero grades in (6), as well as in (7) and in (8), must be triggered by the desinences, which are inherently accented in the (a) forms and preaccenting in the (b) forms.

- (7) a. */ieṽ-ne-g-més/ > *iungmés > *yuñjmáh*
b. */ieṽ-ne-g-'ti/ → *iunékti > *yunékti > *yunákti*
- (8) a. *peṽ-né-h-més > *punhmés > *punīmás*
b. *peṽ-ne-h-'ti > *punéhti > *punāti*

Judging from the cognates in (9), this across-the-board mode of ablaut application is inherited.

- (9) a. δάμνημι (Aeol. δάμνᾱμι) ‘I tame’, δάμναμεν, OIr. *damnaim* (IE *dem-n-éh₂-mi > dm̄-n-éh₂-mi, *dem-ne-h₂-mén > *dm̄-n-h₂-mén)
b. ἄρνευμαι ‘I win, gain, acquire’, Arm. *aṛnum* ‘take’, aor. *aṛi*, Av. *əṛnuuaiti* ‘they grant’ < *h₂r-nu- (Beekes 2009)

Although there is no evidence for cyclic morphology-phonology interleaving in the inflectional morphology of verbs, there is in verbal derivation. An example is the passive of the causative in Sanskrit, whose (synchronic) derivation is shown in (10).

- (10) a. Causative stem: bhaj- → bhaj-ay- \xrightarrow{BL} bhājay-
b. Active: bhājay- → bhājay-'a- → bhājáyā- → bhājáyā-'ti → bhājáyāti → \xrightarrow{BAP} bhājáyati
c. Passive: bhājay- → bhājay-yá- → bhājyá → bhājyá → bhāj∅yá-té \xrightarrow{BAP} bhājyáte
d. Infinitive: bhāj-ay- → bhājay-a → bhājaya-'dhyai → bhājáyádhyai

The morphological derivation begins with the formation of the causative stem in (10a), which underlies both the active and the passive. The unaccented causative morpheme /-ai-/ causes the root vowel to be lengthened in an open syllable by Brugmann’s Law. I adopt Kuryłowicz’ view that Brugmann’s Law is not a sound change, but evolved as part of the ablaut system, and assume in particular that it applied to ablaut-susceptible vowels in the context of a following *unaccented* morpheme. (This will become important below.) The resulting causative stem then becomes the input to the layers of derivation where finite and nonfinite verb forms are built. When followed by the preaccenting present tense suffix *-a-*, the causative suffix gets accented, and eventually receives the ictus by the BAP (just as the root gets accented and receives the ictus in *bhár-a-ti*). The causative morpheme that lengthens the root at stage (10a) is itself deleted by the passive morpheme in (10c), leaving behind the *vr̥ddhi* it triggered. The upshot is that BL takes effect cyclically in the causative stem, and that it is impervious to later morphological and accentual perturbations. Such cyclicity is a hallmark of lexical morphophonological processes.

3 Nominal inflection

The morphophonology of nouns is generally more complex than that of verbs (Smith 2011). This generalization certainly holds for Indo-European accentuation and ablaut. In Greek, verbs have fixed recessive accent, while nouns are movable. In Sanskrit, nouns have more patterns of mobility than verbs: root nouns have overtly movable accent, but derived disyllabic and polysyllabic nouns have columnar accent, albeit with an ablaut pattern in some types of polysyllabic nouns that mirrors the accent mobility of monosyllabic nouns. This contrasts with the more transparent relation between accent and ablaut seen in verbs (cf. (6)). What is more, barytone and oxytone stems ablaut identically regardless of their accentual difference. Finally, ablaut in noun inflection is restricted to the morpheme immediately preceding the triggering accent (*cellule prédésinentielle*, Saussure 1876). For example, we have Instr.Sg. /kar-tar-á/ → *kartrá*, not **krtrá*, contrasting with the across-the-board reduction seen in (6)-(9).

All three special properties that distinguish noun inflection from verb inflection – the restriction of movable accent to root nouns, the identical ablaut of barytone and oxytone stems, and the inapplicability of ablaut across morphemes – are traceable to the cyclic application of accent and ablaut at two levels: stems and words. Cyclic application works as follows. A derived stem – a stem formed from a root or from another stem by a derivational suffix – constitutes a domain (or “phase”) to which phonological processes apply. The addition of inflectional endings to stems then forms words, which again become subject to phonology. The phonological constraints on words may differ from those that apply to stems.

Consider first the derivations in (11).

- (11) a. Skt. /dáru-nā/ → (3) *drú-nā* → (1) *drú-nā* ‘wood’.
 b. Gk. /gónu/ → *gónu-sí* → (3) *gnú-sí* → (1) *gnú-si* = γνύσι
 c. Nom.pl. /arí-as/ > *ary-ás*
 d. */g^{wh}ren-/ > Gk. /phren-/ → *phren-sí* → *phrḗ-sí* → *phra-sí* (>> φρεσί)

Examples (11a,b,c) show that when a syllable is eliminated, its accent shifts to the next syllable. I’ll refer to this as SECONDARY MOBILITY. Note the contrast between secondary mobility in the

polysyllabic stems (11a,b) and primary mobility in the monosyllabic root noun (11d) (Forssman 1964). Secondary mobility turns out to be the key to the columnar accent pattern in the nominal declension.

An important process which together with cyclicity and secondary mobility is responsible for the special morphophonology of nouns is the OXYTONE RULE. It assigns an accent to the final accentable syllable of inflected noun stems. The Oxytone Rule neutralizes the distinction between oxytone and unaccented nominal stems in this environment, and plays a fundamental role in the development of Baltic, Slavic, and (pre-)Germanic accentuation, as well as in the synchronic accent system of Vedic and Indo-European.

(12) OXYTONE RULE: the final syllable of an inflected nominal stem is accented.

$$\sigma \rightarrow \acute{\sigma} /]_{\text{stem}} + \text{Case}$$

Instead of (12) we could suppose that all case endings are preaccenting (on top of any other accentual properties they may have). These alternatives are virtual notational equivalents, but I will go with (12) here since it makes the generalization explicit.

Evidence for underlyingly unaccented oxytone sonorant stems which become oxytone before case endings comes from derivatives with the possessive suffix *-vánt-*, *-mánt-* ‘having —’. Not being a case ending, it does not trigger (12), and oxytone nouns appear before it as unaccented, like root nouns, as (13) shows.

(13)	<i>pitár-</i>	‘father’	<i>pitṛmánt-</i>
	<i>paśú-</i>	‘cattle’	<i>paśumánt-</i>
	<i>rayí-</i>	‘wealth’	<i>rayimánt-</i>
	<i>agní-</i>	‘fire’	<i>agnimánt-</i>
	<i>arcí-</i>	‘ray’	<i>arcimánt-</i>
	<i>āśú-</i>	‘speedy’	<i>āśumánt-</i>
	<i>ātmán-</i>	‘soul’	<i>ātmanvánt-</i>
	<i>akṣán-</i>	‘eye’	<i>akṣanvánt-</i>
	<i>asthán-</i>	‘bone’	<i>asthanvánt-</i>
	<i>dant-</i>	‘tooth’	<i>datvánt-</i>
	<i>pad-</i>	‘foot’	<i>padvánt-</i>
	<i>dyu-</i>	‘sky’	<i>dyumánt-</i>

The suffix *-mánt-*, *-vánt-* is accented, as shown by the fixed columnar accent throughout its declension, and by the zero grade of the preceding stem syllable (*pitṛmánt-*, *dyumánt-*). And it is recessive, since it yields to the accent of its stem, e.g. *taviṣ-mant-*, *prajā-vant-*, *mádhu-mant-*, *rátha-vant-*, *gó-mant-*, not **taviṣ-mánt-* etc. If we assume that oxytone stems such as those in (13) are unaccented, the apparent accent shift in (13) follows. The derivation is straightforward: */pitar-mánt-/* → *pitṛmánt-*, */paśu-mánt-/* → *paśumánt-*, */pad-vánt-/* → *padvánt-*.

We now have an explanation for the generalization that barytone and oxytone stems have identical ablaut patterns. Consider the derivations in (14).

(14)	/ph ₂ ter	ph ₂ ter	ph ₂ ter	b ^h réh ₂ ter	b ^h réh ₂ ter	b ^h réh ₂ ter/
Inflection	pə ₂ ter-m̄	pə ₂ ter-éh ₁	pə ₂ ter-sú	b ^h ráh ₂ ter-m̄	b ^h ráh ₂ ter-éh ₁	b ^h ráh ₂ ter-sú
Oxytone	pə ₂ tér-m̄	pə ₂ tér-éh ₁	pə ₂ tér-sú	b ^h ráh ₂ tér-m̄	b ^h ráh ₂ tér-éh ₁	b ^h ráh ₂ tér-sú
∅ grade	—	pə ₂ tr-éh ₁	pə ₂ tṛ-sú	—	b ^h ráh ₂ tr-éh ₁	b ^h ráh ₂ tṛ-sú
BAP	—	—	pə ₂ tṛ-su	b ^h ráh ₂ ter-m̄	b ^h ráh ₂ tr-eh ₁	b ^h ráh ₂ tṛ-su
Sanskrit	<i>pitár-am</i>	<i>pitṛ-ā</i>	<i>pitṛ-ṣu</i>	<i>bhrátar-am</i>	<i>bhrátr-ā</i>	<i>bhrátr-ṣu</i>

The ablaut patterns are the same because the triggering accents of the underlying affixes are the same. It is also evident that the “hysterokinetic” behavior of *pitár-* is a side effect of ablaut, a case of secondary mobility like those in (11). This analysis presupposes that stems like *pitár-* get their stem-final accent from the Oxytone Rule. The Oxytone Rule must be of Indo-European date since the merger of oxytone and unaccented noun stems is seen in all Indo-European languages that preserve any trace of accent mobility (Kiparsky 2010).

The Vedic synchronic derivation (15) is a fairly faithful continuation of the reconstructed late Indo-European synchronic derivation (14):

$$(15) /pitar/ \rightarrow /pitar-sú/ \xrightarrow{(12)} pitár-sú \xrightarrow{(3)} pitṛ-sú \xrightarrow{(1)} pitṛ-su \rightarrow pitṛṣu$$

Monosyllabic root nouns such as *yudh-*, *bhū-*, *dhī-* do not undergo the Oxytone Rule, and therefore, as long as they are themselves inherently unaccented, exhibit accentual mobility. At least in the historically attested Greek and Sanskrit, this is almost completely determined by monosyllabicity (cf. Greek Dat.Pl. ὀφρύ-σι ‘brows’ vs. σῦ-σί ‘pigs’), which would point to prosodic rather than morphological causes. Derivatives from roots, whether prefixed, such as *yavī-yúdh-*, *pari-bhū-*, *ā-dhī-*, or suffixed (*yúdh-van-*, *bhavi-tr-*, *dhī-tí-*) always undergo the Oxytone Rule and inflect with fixed stem-final ictus.³

A small class of disyllabic suppletive nouns, such as Sanskrit *púmāms-* ‘male’ and *pánthān-* ‘path’, pattern with root nouns in not undergoing the Oxytone Rule. This produces a so-called amphikinetic accent pattern, alternating between initial ictus by the BAP if the inflectional suffix is unaccented, and final ictus if it is accented. The amphikinetic pattern is preserved in *púmāms-*. The oxytonesis of the weak case allomorph *pathí-* might be due to its reanalysis as an *i*-stem, a type which regularly undergoes the Oxytone Rule.⁴

(16)	AccSg.	<i>púmāms-am</i>	GPI.	<i>pumṣ-ām</i>	LPI.	<i>pum-sú</i>	‘male’
	AccSg.	<i>pánthān-am</i>	GPI.	<i>path-ām</i>	LPI.	<i>pathí-ṣu</i>	‘path’

The inflectional paradigms of derived nominals pose some challenges for the analysis. In the derivation of *han-tár-* ‘killer’, from **g^{wh}en-tér-*, why does the agent suffix *-tár* not cause zero grade of the root, which would give ***g^{wh}ntér-* > ***ha-tár-*? Or rephrasing the question in terms of our analysis, why does the Oxytone Rule (12) not feed zero grade ablaut by (3)? Moreover, the same question arises again about the accented case endings: why do they trigger zero grade of the derivational suffix, but not of the root? For example, why Instr.Sg. *han-tr-ā* (< **g^{wh}en-tr-éh₁*), rather than ***ha-tr-ā* (< **g^{wh}nn-tr-éh₁*)?

³Secondary mobility is of course *always* found in polysyllabic stems, e.g. Acc.Sg. *vṛtra-hán-am*, *vṛtra-ghn-ā*, *-han-* ‘Vṛtra-destroyer’.

⁴Greek γυνή ‘woman’ has a suppletive inflected stem that is disyllabic yet mobile, e.g. Nom.Pl. γυναιῶν-ες, Gen.Sg. γυναικ-ός. Here the cas forts must be preaccenting, not just unaccented.

A key to the solution comes from the observation that while *accented* suffixes cause the morphemes that precede them to be *reduced* by zero grade ablaut, *unaccented* suffixes cause them to be *strengthened* by Brugmann’s Law. Unaccented suffixes seem to assign to the syllables preceding them a prosodic property which causes their vowels to become lengthened if they are in an open syllable. The obvious candidate for this property is a bimoraic foot. Brugmann’s Law would then be a process that bulks up a one-mora foot to its required two-mora minimum. Conversely, blocking of zero grade would be a way of preventing a two-mora foot from becoming subminimal, as in in forms like *hantāram*, *hantrā*, where zero grade ablaut, if it were to take effect, would produce a one-mora foot. In short, both the lengthening by Brugmann’s Law and the blocking of zero grade enforce the bimoraic minimum.

The analysis presupposes that nominal inflection is cyclic, and that bimoraic feet are assigned on each cycle *after* the zero grade rule takes effect (transparent order, consistent with an OT implementation). The illustrative derivations in (17) are given with Sanskrit forms, since I will argue below that they are innovations, but if they were to be reconstructed for Indo-European **g^{wh}en-ter-* they would not differ in any essential way. The strong (preaccenting) case endings are assumed to be extrametrical, hence unfooted, as noted above.

- (17) a. Cycle 1: han-tar- → (han)-tar-
 Cycle 2: (han)-tar- → (han)-tar-’ṃ → (han)-tár-ṃ → (han)-(tár)-ṃ → *hantāram*
- b. Cycle 2: (han)-tar- → (han)-tar-’ā → (han)-tár-ā → (han)-(tr-ā) → *hantrā*
- c. Cycle 2: (han)-tar- → (han)-tar-’sú → (han)-tár-sú → (han)-tṛ-sú → (han)-(tṛ-su) → *hantṛsu*

Since the zero grade rule is applicable only to unfooted syllables, the root is protected from reducing on the second cycle by the foot assigned to it on the first. Neither the accent on stem-final *-tér-* assigned by the preaccenting case endings, nor the accent on a case ending can touch it.

4 The drift to cyclicity

We have concluded that nouns require a cyclic derivation. They are submitted to the phonology before the case suffixes are added, and again after they are added.

Comparative evidence suggests that the cyclicity attested in the nominal domain in Sanskrit is an innovation, and that nominal inflection originally worked like verb inflection, where the inflectional desinence does induce zero grade on the root across an intervening suffix. For some branches of IE do have instances of weak grade roots before accented formatives such as *-tár*:

- (18) a. Lat. *dātor* ‘giver’, *praetor* < **prai-itōr* (but *pōtor*, *stātor*)
 b. ἀναδοτήρ ‘repayer’, στατήρ ‘debtor’, ποτήρ
 c. Av. *yūxtar-* ‘yoker’?⁵

⁵But *ā-bārətər-*, *fra-bārətər-* ‘bringer forth’, *aipi-karətər-* ‘cutter off’, *aīḷiḷastar* (Benveniste 1948) are dubious (Tichy 1995:45, de Vaan 2003: 579), also because accented *-tár* does not combine with prefixed verbs in Sanskrit (cf. (*prābhartā rátham* RV 1.178.03, see Kiparsky 2016).

If these paradigms with zero grade roots (analogous to that of the verbs) are residues of an older system, we can conclude that nouns originally worked noncyclically like verbs.

An analogous spread of cyclicity can be observed in participles. In Indo-European, the derivation of participles was evidently non-cyclic. This is still the case in Sanskrit for athematic participles in *-ant*. In acc.sg. *dviṣ-ánt-am*, dat.sg. *dviṣ-at-é*, the zero grade of the root cannot be conditioned by an inherent accent on *-ant-*, since the weak form would then be ***dviṣ-át-e*. So the zero grades on the root and on the suffix must both be conditioned by the desinence.

(19)	Pres.Act.Part.	*/teud-é-ent-'m̥/	*/mleuh-ent-'m̥/	*/tétk-ent-'m̥/
	(acc.sg.)	* <i>tudéntm̥</i>	* <i>mluhéntm̥</i>	* <i>tétk̄ntm̥</i>
		<i>tudántam</i>	<i>bruvántam</i>	<i>tákṣatam</i>
	Pres.Act.Part.	*/teud-é-ent-éi/	*/mleuh-ent-éi/	*/tétk-ent-éi/
	(Dat.sg.)	* <i>tudéntéi</i>	* <i>mluhntéi</i>	* <i>tétk̄ntéi</i>
		* <i>tudánte</i> > <i>tudaté</i>	<i>bruvaté</i>	<i>tákṣate</i>
	Pres.Mid.Part.	*/geus-é-meh ₁ n-ó-/	*/mleuh-m̥eh ₁ n-ó/	*/k̄ei-m̥eh ₁ n-ó-/
		* <i>gusémeh₁nó-</i>	* <i>mluhm̥h₁nó</i>	* <i>k̄*éim̥h₁n-ó-</i>
		* <i>juśámāna-</i>	<i>bruvāná-</i>	<i>śáyāna-</i>

Thematic active participles likewise seem to have had a noncyclic derivation. Its hallmark is the invariant suffix **-ont-*, to which Av. *fšuyentē*, φέρωντ-, λιπόντ- and Goth. *qīband-* correspond (Kuryłowicz 1968: 35), reflecting invariant **-ont-* from a noncyclic derivation:

(20)	teud-é-ont-éh ₁	
	tud-é-nt-éh ₁	ablaut bleeds truncation (transparent order), the thematic vowel is non-deletable
	* <i>tudántā</i>	BAP, other rules

This would have given Sanskrit **tudántā*. Attested Sanskrit ablauting Dat.Sg. *tudatā* results from the cyclic derivation (21).⁶

(21)	teud-	
	Cycle 1	[teud-é] morphology
		[tud-é] ablaut
	Cycle 2	[tudé]-ont morphology
		[tudont] truncation
	Cycle 3	[tudont]-éh ₁ morphology
		[tudnt]-éh ₁ ablaut
		<i>tudatā</i>

The perfect active participle is another likely case of the same development, as the comparison between Goth. *weitwōds*, ‘witness’, and Skt. *vidvāms-* suggests. The dossier could also include the *devī*-type feminine declension, whose Greek descendants ὄργυια, -ν, ὄργυιῆς, εἰδώς, ἰδυῖα have

⁶I am not proposing that (21) is the synchronic derivation of the Sanskrit form. Rather, the form is historically descended from an earlier stage in which it was synchronically derived as in (21). It is not difficult to show that syllabic nasals no longer exist synchronically in the abstract phonology of even the earliest attested stage of Sanskrit.

been deemed to testify to an old amphikinetic pattern; Lundquist (2017, Ch. 2) however makes a strong case for a quite different Greek-internal explanation of this accent alternation.

Instance of the shift from noncyclic to cyclic derivations are not entirely absent even in verbs. The rise of fixed accent in the Sanskrit optative *-yā-* (*kr̥-nu-yā-m*, 1.pl. **kr̥-nv-ī-má* (later > *kr̥-nu-yā-ma*) is a fairly clear case.

In terms of Lexical Phonology and Stratal OT, the observed trajectory from noncyclic to cyclic derivation is to be expected. In the life-cycle of phonological processes from phonetics through morphophology to the lexicon (Bermúdez-Otero 2015), “cyclification” can be seen as the first stage of morphologization.

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