(Reconstructing) stress assignment in Hittite and Proto-Indo-European

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§1 Introduction

Today I'll be discussing stress assignment in Hittite, and in turn, its implications for reconstructing stress in Proto-Indo-European, as well as for our understanding of prosodic change in the Indo-European languages. To this end, we'll begin with the proto-language — specifically, our starting point, at §1.1 on the handout, will be the hypothesis advanced in a ground-breaking 1977 paper by Kiparsky and Halle, who develop synchronic analyses of word stress in Lithuanian, Russian, Ancient Greek, and Vedic Sanskrit; they show that these archaic Indo-European languages have lexical accent systems, and argue that stress assignment in each is governed by the BASIC ACCENTUATION PRINCIPLE — or BAP — which is given in example (1) and states:

If a word has more than one accented syllable, the leftmost of these receives word stress. If a word has no accented syllable, the leftmost syllable receives word stress.

§1.1 Archaic IE stress: Kiparsky and Halle (1977) (K&H) argue that Lithuanian, Russian, Ancient Greek, and Vedic Sanskrit have LEXICAL ACCENT systems in which STRESS assignment is synchronically governed by the BAP in (1) (cf. Kiparsky 2010, forthcoming):

(1)

BASIC ACCENTUATION PRINCIPLE (BAP):

If a word has more than one accented syllable, the leftmost of these receives word stress.
If a word has no accented syllable, the leftmost syllable receives word stress.

In view of the agreement between these archaic Indo-European languages, Kiparsky and Halle reconstruct this principle for their common ancestor, Proto-Indo-European. However, two issues potentially problematize this reconstruction.

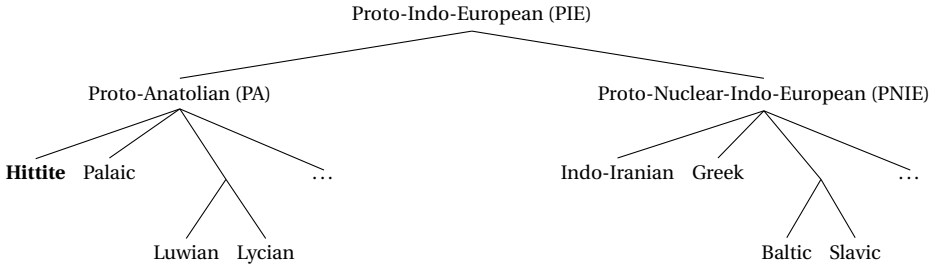
First, Kiparsky and Halle's reconstruction departs significantly from traditional, so-called "paradigmatic" approaches to PIE stress assignment, which posit at least some stress alternations that cannot be accommodated neatly under Kiparsky and Halle's analysis; and almost forty years later, these paradigmatic approaches still dominate Indo-European scholarship.

The second — and more significant — issue is that all of Kiparsky and Halle's evidence for the BAP comes from the Nuclear-Indo-European languages. As you can see in the schematic family tree in (2), these languages have a proximate common ancestor, Proto-Nuclear-Indo-European — or PNIE — which is properly a daughter of PIE, and in all likelihood, a kind of sister to Proto-Anatolian, which is generally held to be the first branch to split off from the rest of the Indo-European family. Thus while Kiparsky and Halle's reconstruction may be basically correct for PNIE — and here, I assume that it is— that doesn't mean it's guaranteed for PIE itself; rather, secure reconstruction for this stage depends crucially on the Anatolian evidence…

§1.2 Stress assignment in PIE? K&H consequently reconstruct the BAP for Proto-Indo-European (PIE); however:

- K&H's analysis radically departs from traditional analyses of PIE word stress (e.g. Kuiper 1942; Schindler 1972; Rix 1992), still the mainstream approach (Ringe 2006; Weiss 2011; Gotō 2013, etc.).
- All of K&H's evidence comes from Proto-Nuclear-Indo-European (PNIE) languages; secure reconstruction for PIE itself depends crucially on Anatolian, which was first to diverge from their common parent language, i.e (2):

(2)



· For recent assessments of the relationship between Anatolian and PNIE — and on the "Indo-Hittite hypothesis" (Sturtevant 1929, 1933) — see Rieken (2009), Eichner (2013), Oettinger (2013–14), and especially Melchert (fthc.) (cf. Garrett 2006; Chang et al 2015).

…which brings us — at §1.3 on the handout — to Hittite, which is by far the best attested and best understood of the Anatolian languages. It has long been recognized that surface stress patterns in Hittite are similar or identical to those observed in cognate lexical items in other archaic IE languages. This is encouraging for Kiparsky and Halle's reconstruction; however, no comparable synchronic analysis of Hittite stress assignment has been previously advanced, thus a principled basis for assessing whether Hittite provides evidence for the BAP or not is lacking.

§1.3 Hittite stress assignment: Long known that surface stress patterns in Hittite — the major representative of the extinct Anatolian branch of PIE — are similar to those observed in cognate lexical items in other archaic IE languages (e.g. Melchert 1994; Kloekhorst 2008, 2014), yet these still await systematic *synchronic* analysis.

· Traditional IE scholarship (e.g. Schindler 1967, 1975; cf. Kloekhorst 2013) has focused on the implications of these Hittite stress patterns (and even more so, related ABLAUT alternations) for PIE stress and esp. its deep prehistory (i.e. Pre-PIE; cf. Hale 2010); but without a secure reconstruction of stress in "shallow" PIE, assessing the ablaut evidence is problematic — for a case where reconstruction on the basis of apparent ablaut evidence fails, see Lundquist (2015a).

The first aim for today — now at the top of page 2 — is to address this deficiency: In §2, it will be demonstrated that the BAP is synchronically operative in Hittite; to this end, I'll develop an optimality-theoretic implementation of this phonological principle and show that it correctly generates attested patterns of word stress across Hittite inflectional paradigms.

The second goal is to evaluate the implications of Hittite stress for reconstructing stress assignment in PIE — I'll argue that Hittite supports the reconstruction of the BAP for PIE proper, and in turn, consider how its reconstruction bears upon our understanding of prosodic change in the Indo-European languages. In particular, we'll examine a pattern of historical stress "retraction" observed in Hittite, Vedic Sanskrit, and Ancient Greek that I'll argue can only be understood as a diachronic manifestation of the BAP.

§1.4 Toward a reconstruction of PIE stress: Aims for today:

(i) Demonstrate that the BAP is synchronically operative in Hittite — develop an optimality-theoretic implementation of the BAP, and show that it generates attested inflectional stress patterns. (§2).

(ii) Establish that Hittite supports the reconstruction of the BAP for PIE, and assess the implications of this reconstruction for understanding a pattern of prosodic change in the IE languages. (§3)

§2 Hittite stress assignment & the BAP

On, then, on to §2, where I'd like to begin with some background on Hittite.

Hittite is the oldest recorded Indo-European language. It is attested from the 16th through the 13th centuries BCE in extensive multi-genre administrative texts on primarily clay tablets found across what is now central Turkey and northern Syria. The language is written in a cuneiform mixed syllabic-logographic script. In their syllabic interpretation, signs may have the value *CV, VC, V* or — less commonly — *CVC*.

§2.1 Historical & orthographic preliminaries: Some background on Hittite:

- Oldest recorded IE language — attested 16th–13th c. BCE in extensive multi-genre administrative texts (primarily) on clay tablets found across (now) central Turkey and northern Syria, the majority from the Hittite capital of Ḫattuša near modern Boğazkale.
- Written in a cuneiform mixed syllabic-logographic script — signs with syllabic value are *CV, VC, V* or (less commonly) *CVC*.
  - The language is chronologically stratified into three stages: Old Hittite (OH), Middle Hittite (MH), and New Hittite (NH) (Hoffner and Melchert 2008:xvii); though very problematic to quantify, a reasonable approximation for the size of the corpus is ~136,000 words (cf. Kloekhorst 2008:222), the majority of which occur in NH texts.

Extracting prosodic information from this script is a difficult problem, but as we'll see at §2.2, not an intractable one. While the Hittite scribes — unfortunately — didn't indicate word stress in their orthography, we can nevertheless diagnose the position of word stress by its observable effects on vowel quantity and quality.

The first and most important of these diagnostics is plene writing — the repetition of an identical *V* sign in the spelling of vowels or diphthongs — which is optionally used by Hittite scribes to indicate vowel length, which closely coincides with stress due to a combination of historical and synchronic processes that shorten unstressed long vowels and lengthen most stressed short vowels.

§2.2 Orthography-phonology interface: Hittite orthography does not directly encode stress, but does encode its effects on vowel quantity/quality:

- PLENE WRITING — the optional repetition of an identical *V* sign in the spelling of vowels or diphthongs, e.g. <*CV-**V**-VC*> (Kimball 1999) — indicates vowel length (Hrozný 1917:xii; Melchert 1994:27).

  · Vowel length and stress closely coincide due to historical and synchronic processes that shorten unstressed long vowels and lengthen most stressed short vowels.

The other major diagnostic for Hittite word stress is vowel reduction. Besides the shortening of unstressed long vowels just mentioned, we observe in unstressed syllables a strong tendency for non-peripheral vowels to reduce to peripheral vowels, as well as a limited pattern of vowel deletion in pre-tonic syllables, which is clearly a reflex of inherited Indo-European ablaut.

In the examples presented below, I'll be abstracting away from a formal analysis of these processes; you'll see stress-conditioned vowel reduction in the tableaux, but it's used here only as a diagnostic for word stress. If you're interested in these processes, I'd encourage you to see the bibliography cited on the handout, or I'd be happy to take questions later.

That said, these two orthographic practices allow us to formulate two — only somewhat simplified — generalizations for determining word stress: First, if a vowel is written plene, then it is long, and therefore stressed. Second, vowels that undergo reduction of any kind must be unstressed.

- VOWEL REDUCTION — in unstressed σ, shortening of long vowels; strong tendency for non-peripheral vowels to reduce to [i, u, a] (cf. Crosswhite 2001); and limited pre-tonic deletion.
- Two generalizations for diagnosing word stress:

  ⇒ **If plene, then long/stressed.**

  ⇒ **If reduced, then unstressed.**

· The relationship between plene writing and word stress is much more complicated than depicted here, and vexed by philological problems; for details, see Melchert (1994:133, 146–7) and Yates (2015c), mostly contra Kloekhorst (2014) (cf. Kimball 2015).

Applying these generalizations, at §2.3, a general picture of the Hittite prosodic system begins to emerge. What we find is that Hittite shares at least three features with other archaic Indo-European languages. The first is CULMINATIVITY — each word has a single most prosodically prominent syllable, which I refer to here as STRESS. Stress is also free; it can occur on any syllable of a word, with no clear window restrictions or the like. The last, and most typologically interesting property is that Hittite has what is generally referred to as lexical accent — in such systems, morphemes may be lexically specified as preferred hosts of word stress, an underlying feature which I'll call here ACCENT. The position of word stress is then a function of the accentual properties of a word's constituent morphemes and some language-specific phonological principles — which are here understood as phonological constraints.

§2.3 Hittite stress in typological perspective: Hittite prosodic system shares features with other archaic IE languages (Vedic Sanskrit, Ancient Greek, Balto-Slavic; cf. Kiparsky 2010), which include:

- CULMINATIVITY (e.g. Hyman 2006) — each word has a single surface prominence (STRESS).
- FREE STRESS (e.g. Hayes 1995:31)— stress can occur on any syllable of a word.
- LEXICAL ACCENT (Revithiadou 1999; Alderete 2001) — stress is a function of the lexically specified properties (ACCENT) of a word's constituent morphemes and language-specific phonological principles (i.e. constraints/rules).

· Greek right-edge trisyllabic stress window is demonstrably an innovation (e.g. Probert 2012); stress-conditioned developments in Germanic (Verner 1877; cf. Ringe 2006:102–12) and Italic (Vine 2006, 2012) are indicative of the prehistoric operation of PIE lexical accent.

The table at the top of page 3 illustrates these features. In these Hittite examples — which are given both in so-called "broad transcription" in italics, with plene writing marked by a macron, and in an approximate phonetic transcription, where stress is marked with an acute accent — there is a single stress that can fall on any syllable, which is thus written plene.

The examples are also intended to show that stress cannot be predicted on the basis of purely phonological factors, such as metrical structure or syllable weight; rather, its position appears to depend on its morphological constituency — we can see, in the 3rd and 4th columns, that all abstract nouns containing the suffix *ātar* are stressed on the first vowel of the suffix; and in the 2nd and 3rd columns in the bottom two rows, that all nouns with the suffix *ūl* are stressed on this suffix. This morphological dependency is a characteristic feature of lexical accent systems, and is typically explained by the assumption that certain morphemes are accented — here, for example, the derivational suffixes *ātar* and *ūl* — and so are preferentially assigned stress.

(3)

1ST σ	2ND σ	3RD σ	4TH σ+
ēšḫar 'blood'	*išḫāš* 'master'	*alwanzātar* 'sorcery'	*kukupalātar* 'deception'
[é:sχ:ar]	[isχ:á:s]	[alwant͡sá:tar]	[kukupalá:tar]
pēdan 'place'	*aššūl* 'well-being'	*antuḫšātar* 'humanity'	*annitalwātar* 'capacity to be
[pé:tan]	[as:ú:l]	[antuχ:sá:tar]	[an:italwá:tar] a mother'
nēpišaš 'heaven' (GEN.S.)	*takšūl* 'peace'	*išḫiūl* 'binding; treaty'	*išḫanattarātar* 'marriage bond'
[né:pisas]	[taksú:l]	[isχ:ijú:l]	[isχ:anat:ará:tar]

- Representative exx. in (3) show that Hittite stress cannot be predicted on the basis of purely phonological factors (e.g. metrical structure, syllable weight); they instead exhibit the strong correlation between word stress and morphological constituency characteristic of lexical accent systems.
  - · Correlation explained by assumption that certain derivational morphemes (e.g. /–á:tar/, /–ú:l/) are accented and thus preferentially assigned stress.

· All Hittite examples in (3) *sqq.* are given in "broad transcription," where plene writing is marked with a macron ($\bar{V}$), together with an approximate phonetic transcription, where word stress is marked with acute accent (ˊ).

Now at §2.4 on the handout, we come to the primary set of synchronic stress alternations that must be explained. These alternations reflect MOBILE stress, that is, stress shifts within a word's inflectional paradigm.

Mobile stress — or traces thereof — are evident in both the nominal and verbal systems of virtually all ancient Indo-European languages. Vedic Sanskrit, in particular, shows synchronically productive mobile stress alternations within nominal inflectional paradigms, yet in Hittite, evidence for mobile stress in the nominal system is extremely limited, and almost strictly confined to the most archaic stratum of the lexicon. One such archaism is the inherited word for 'earth', which shows root stress in the nominative singular [téːkan], but suffixal stress in the genitive singular [takn-áːs].

Since it's not clear whether these forms are in any real sense generated by the synchronic grammar of Hittite speakers, and there are in any case very few such alternations, the nominal system can't tell us much about synchronic stress assignment in Hittite.

§2.4 IE mobile stress: A common feature of archaic IE languages is MOBILE stress, i.e. the position of word stress changes within a word's inflectional paradigm.

- Although clearly a feature of nominal inflection in (esp.) Vedic Sanskrit, evidence for mobile stress in Hittite nominals is quite limited, generally restricted to archaisms such as (4):

(4) *tēkan* [téːkan] 'earth' (N.NOM/ACC.S.) : *taknāš* [takn-áːs] 'earth' (N.GEN.S.)

Better evidence comes from the verbal system, where stress mobility is regularly observed in radical verbs, that is, verbs formed by adding inflectional suffixes directly to a verbal root. Synchronically-speaking, radical verbs in Hittite belong arbitrarily to one of two conjugational classes, the *mi*– or the *ḫi*– conjugation, which have phonologically distinctive singular inflectional endings, although as we can see in example (5), mobile stress is a feature of both classes.

Thus in (5a), a Hittite *mi*-verb like *epp*– 'take' has root stress in the 3rd singular [éːpːt͡si], where stress is confirmed by plene writing, and suffixal stress in the 3rd plural [apːánt͡si], where it's indirectly indicated by the reduced vowel [a] in the root. Similarly, in (5b), the *ḫi*-verb *tā*– , which also means something like 'take', has root stress in the 3rd singular [táːj], and suffixal stress in the 2nd plural [tatːéːni], and in this case, both stressed syllables are written plene.

- However, mobile stress patterns are clearly evident in the Hittite verbal system — RADICAL (ROOT + INFL) verbs of both conjugational classes (*mi*-, *ḫi*-conjugations) show regular stress alternations between verbal root in the singular and inflectional endings in the plural, e.g. (5):

(5) a. Mobile *mi*-verbs:
Hitt. *ēpzi* [éːpː-t͡si] 'takes' (3S.NPST.ACT.) : *appanzi* [apː-ánt͡si] 'they take' (3PL.NPST.ACT.)
Hitt. *šēšzi* [séːs-t͡si] 'sleeps' (3S.NPST.ACT.) : *šašanzi* [sas-ánt͡si] 'they sleep' (3PL.NPST.ACT.)

b. Mobile *ḫi*-verbs:
Hitt. *dāi* [táː-j] 'takes' (3S.NPST.ACT.) : *dattēni* [ta-tːéːni] 'you take' (2PL.NPST.ACT.)
Hitt. *kānki* [káːnkː-i] 'hangs' (3S.NPST.ACT.) : *kankanzi* [kankː-ánt͡si] 'they hang' (3PL.NPST.ACT.)

However, while radical verbs overwhelmingly exhibit mobile stress, there is also a small set of radical verbs that instead has fixed root stress. This class includes at least *wek*– 'demand', a *mi*-verb, and two *ḫi*-verbs, *arr*– 'wash', and *anš*– 'wipe'; all three are given in (6), where notably, the plural forms show evidence of root stress — for *wek*–, fixed root [e]-vocalism, and for *arr*– and *anš*–, plene writing of the root [a] vowel.

- Dominant mobile stress pattern contrasts with FIXED root stress in a small set of verbal roots — *wek–* 'demand', *arr–* 'wash', and *anš–* 'wipe' in (6):

(6)

Hitt. *wēkzi* 'demands' [wéːk-t͡si] (3S.NPST.ACT.)	:	*wekanzi* [wéːk-ant͡si] 'they demand' (3PL.NPST.ACT.)
Hitt. *ārri* 'washes' [áːrː-i] (3S.NPST.ACT.)	:	*ārranzi* [áːrː-ant͡si] 'they wash' (3PL.NPST.ACT.)
Hitt. *ānši* 'wipes' [áːns-i] (3S.NPST.ACT.)	:	*ānšanzi* [áːns-ant͡si] 'they wipe' (3PL.NPST.ACT.)

· Mobile stress in (5) contrasts with FIXED stress in (3), where stress remains on the same syllable throughout the word's inflectional paradigm. As emphasized esp. by Sandell (2015a), it is important to distinguish further between MOBILE stress and PSEUDO-MOBILITY, viz. when stress shift is conditioned purely by phonological factors, such as deletion of a prominence-bearing syllabic nucleus (ABLAUT), or stress window restrictions (as in Greek).

§2.5 — at the top of p. 4 — lays out what I believe are the three crucial ingredients to an analysis of this synchronic contrast between mobile and fixed root stress.

The first of these is an underlying accentual contrast in verbal inflectional endings: I assume that the singular endings — *–mi, –si* and *–zi* in the *mi*-conjugation, and in the *ḫi*-conjugation, *–ḫḫi, –tti,* and *–i* — are underlyingly unaccented, while the plural endings — which are effectively the same in both conjugations, *–weni, –tteni* or *–steni,* and *–anzi* — are accented on their first syllable.

§2.5 Toward an analysis: Synchronic contrast between MOBILE and FIXED root verbal formations falls out from three assumptions:

(i) An underlying accentual contrast in inflectional endings — singular endings are unaccented, plural endings accented, i.e. (7)

(7)

	mi-CONJUGATION				*ḫi*-CONJUGATION			
	SINGULAR		PLURAL		SINGULAR		PLURAL	
1ST	*–mi*	/–mi/	*–weni*	/–wéni/	*–ḫḫi*	/–χːi/	*–weni*	/–wéni/
2ND	*–ši*	/–si/	*–tteni*	/–tːéni/	*–tti*	/–tːi/	*–(š)teni*	/–(s)tːéni/
3RD	*–zi*	/–t͡si/	*–anzi*	/–ánt͡si/	*–i*	/–i/	*–anzi*	/–ánt͡si/

The second assumption is that there is a similar accentual contrast in verbal roots — specifically, that those verbs which show mobile stress — which again, is the majority — are built to unaccented roots, while the restricted set of verbs with fixed root stress are accented.

(ii) An underlying accentual contrast in verbal roots — verbs with mobile stress have unaccented roots, (rare) verbs with FIXED root stress have accented roots, i.e. (8):

(8)

UNACCENTED		ACCENTED
/epː–/ 'take'	/kaːnkː–/ 'hang'	/wék–/ 'demand'
/ses–/ 'sleep'	/taː–/ 'take'	/áːrː–/ 'wash'
	…	/áːns–/ 'wipe'

The third and final component of the analysis is the BAP — or more precisely, the ranking of phonological constraints that generates the relevant stress assignment function.

The four basic constraints in (10) are needed to produce this pattern: Culminativity, to enforce the requirement that words have a single stress; two faithfulness constraints penalizing deletion or insertion of lexical accents; and an alignment constraint, ALIGN-LEFT, that prefers leftmost word stress. When ranked as in (11), with CULMINATIVITY at the top of the grammar, and MAX(Accent) dominating DEP and ALIGN-L, the leftmost accented syllable will bear word stress, or else stress defaults to the word's left edge.

(iii) The operation of the BAP, repeated in (9) — the left-edge oriented stress pattern it dictates emerges from the constraints in (10) as ranked in (11):

(9)

BASIC ACCENTUATION PRINCIPLE (BAP):

If a word has more than one accented syllable, the leftmost of these receives word stress. If a word has no accented syllable, the leftmost syllable receives word stress.

(10) a. CULMINATIVITY (CULM): A prosodic word must have exactly one stressed syllable.
b. MAX(Accent): A lexical accent in the input must correspond with a stressed syllable in the output.
c. DEP(Accent): A stressed syllable in the output must correspond with a lexical accent in the input.
d. ALIGN-L(Pk, *ω*) (ALIGN-L): Assign one violation (*) for each syllable between a stressed syllable and the left edge of a prosodic word.

(11) CULM ≫ MAX(Accent) ≫ DEP(Accent), ALIGN-L

· An additional constraint — *FLOP-(LA) (vel sim.) — is required to enforce faithfulness between lexical accents and their input associations (see Alderete 2001:23–5, Revithiadou 1999:53–4); candidates violating this constraint are not considered here.

These constraints are applied to the Hittite data in §2.6 — provided with an unaccented verbal root like /ses–/ 'sleep' and the inflectional endings outlined in (7), we can see stress mobility in examples (12) and (13). In (12), there are no accented morphemes. The faithful candidate (a) is ruled out by CULMINATIVITY, which must be satisfied by insertion of an accent. Candidate (b), where the inserted accent associates with the 1st syllable is then preferred to (c), which gratuitously violates ALIGN-LEFT.

In (13), however, there is an accented morpheme, the 3rd plural suffix *–anzi* —here the faithful candidate (b) is optimal, only violating low-ranked ALIGN-LEFT, while candidate (c), which better satisfies ALIGN-LEFT, is ruled out because it violates higher-ranked MAX-ACCENT.

I'll pass over the tableaux in (14–15), which are effectively identical to those above and simply show that mobile stress in the *ḫi*-conjugation can be derived in the same way.

§2.6 Deriving mobile stress: Mobile stress surfaces whenever the verbal root is unaccented — in the *mi*-conjugation, e.g. /ses–/ 'sleep' in (12–13), and in the *ḫi*-conjugation, /ta:–/ 'take' in (14-15):

(12) a. Hitt. /ses – t͡si/ → *šēšzi* [sé:st͡si] 'sleeps' (3S.NPST.ACT.)

b.

/ses - t͡si/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	sest͡si	*!			
b. ☞	sé:st͡si			*	
c.	sest͡sí:			*	*!

(13) a. Hitt. /ses – ánt͡si/ → *šašanzi* [sasánt͡si] 'they sleep' (3PL.NPST.ACT.)

b.

/ses - ánt͡si/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	sasant͡si	*!	*		
b. ☞	sasánt͡si				*
c.	sé:sant͡si		*!	*	
d.	sé:sánt͡si	*!		*	*

(14) a. Hitt. /ta: – i/ → *dāi* [tá:j] 'takes' (3S.NPST.ACT.)

b.

/ta: - i/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	taj	*!			
b. ☞	tá:j			*	

(15) a. Hitt. /ta: – t:éni/ → *dattēni* [tat:é:ni] 'you take' (2PL.NPST.ACT.)

b.

/ta: - t:éni/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	tat:eni	*!	*		
b. ☞	tat:é:ni				*
c.	tá:t:eni		*!	*	
d.	tá:té:ni	*!		*	*

§2.7 turns to verbs with fixed root stress. The surface stress pattern of these verbs contrast with the mobile type only in the plural; thus tableaux for the 3rd plural of the *mi*-verb *wek–* and the *ḫi*-verb *anš–* are given in (16) and (17) respectively, although once again, they have the same violation profile. In each case, there are two lexical accents in the input. Satisfying top-ranked CULIMINATIVITY necessitates deleting one; the winning candidate (b) is then preferred to (c) because it performs better on ALIGN-LEFT, with stress falling on the leftmost lexically accented syllable.

§2.7 Deriving fixed stress: Fixed stress arises as a direct consequence of root accentedness — in the (pl.) *mi*-conjugation, e.g. /wék–/ 'demand' in (16), and in the (pl.) *ḫi*-conjugation, /á:ns–/ 'wipe' in (17):

(16) a. /wék – ánt͡si/ → *wekanzi* [wé:kant͡si] 'they demand' (3PL.NPST.ACT.)

b.

/wék - ánt͡si/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	wé:kánt͡si	*!			*
b. ☞	wé:kant͡si		*		
c.	wakánt͡si		*		*!
d.	wekant͡si	*!	**		

(17) a. /á:ns – ántsi/ → *ānšanzi* [á:nsantsi] ‘they wipe’ (3PL.NPST.ACT.)

b.

/á:ns - ántsi/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	á:nsántsi	*!			*
b. ☞	á:nsantsi		*		
c.	ansántsi		*		*!
d.	ansantsi	*!	**		

· I assume that absence of plene writing in the 3rd plural of Hitt. *wek–* owes to orthographic, not phonological factors; the invariant lenited root-final velar stop — in particular, in the marked imperfective (cf. Melchert 2014:255 n. 8) — is indicative of a prehistoric paradigmatic **é* (whether original per Sandell (2014) or analogically generalized), and the consistent root *e*-vocalism suggests that [é:] is maintained synchronically (cf. Yates 2015c). For arguments that “Narten presents” are synchronically derived from reduplicated presents in PIE, see Sandell (2014); and for their historical reanalysis, §4.2 in the Appendix.

The BAP constraint ranking thus accounts for the synchronic stress contrast between accented and unaccented roots in their basic inflectional paradigm; and at §2.8, we can see that it also generalizes to morphologically complex formations with multiple accented inflectional affixes, predicting a “leftmost wins” pattern

§2.8 Leftmost wins: The BAP/constraint ranking in (11) also generalizes to more complex formations with multiple accented affixes, the leftmost bearing stress:

This situation arises in the formation of Hittite imperfective verbal stems, a very productive process that involves adding an accented suffix *–ške–* to a verbal root or stem prior to person/number endings. Because this suffix is accented, imperfectives exhibit fixed suffixal stress in combination with unaccented roots – for example, we observe 2nd singular [ak:uské:si] ‘you drink’ in (18a). The more interesting data-point, though, is the plural, where there are two accented affixes present; here, the BAP correctly predicts that the leftmost affix — the imperfective suffix — will bear word stress as in (18b) [ak:usk:é:wani] ‘we drink’; the relevant tableaux is provided in example (18c).

- Hittite productively forms marked imperfective stems via suffixation of *–ške–* /–sk:é–/ to verbal roots of both conjugational classes — imperfectives to unaccented roots show (18) fixed suffixal stress, incl. in combination with accented inflectional endings, i.e. (18b)/(18c):

(18) a. /ek^{w} – sk:é – si/ → *akkuškēši* [ak:uské:si] ‘you drink’ (IPFV-2S.NPST.ACT.) (cf. 3S. *ēkuzi*)

b. /ek^{w} – sk:é – wéni/ → *akkuškēwani* [ak:usk:é:wani] ‘we drink’ (IPFV-1PL.NPST.ACT.) (cf. 3PL. *akuanzi*)

c.

/ek^{w} - sk:é - wéni/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	ak:usk:é:wé:ni	*!			*****
b. ☞	ak:usk:é:wani		*		**
c.	a:k:usk:ewé:ni		*		***!
d.	é:kusk:ewani		**!	*	

The constraint ranking also works for the imperfective stems of accented verbal roots, which predictably show fixed root stress, the lexical accent of the suffix yielding to the accent of the root to its left in accordance with the same “leftmost wins” pattern. Imperfectives to *mi*-verb forming and *ḫi*-verb forming roots are given with tableaux in (19) and (20), where observe root-stressed imperfectives [wé:kisk:itsi] and [á:nsik:itsi].

- Imperfectives to accented verbal roots predictably show fixed root stress:

(19) a. /wék – skːé – t͡si/ → ***wekiškizzi*** [wéːkiskːit͡si] ‘demands’ (IPFV-3S.NPST.ACT.) (cf. 3s. *wēkzi*)

b.

/wék - skːé - t͡si/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	wéːkiskːéːt͡si	*!			**
b. ☞	wéːkiskːit͡si		*		
c.	wakiskːéːt͡si		*		*!*

(20) a. /áːns – skːé – t͡si/ → ***ānšikizzi*** [áːnsik(ː)it͡si] ‘wipes’ (IPFV-3S.NPST.ACT.) (cf. 3s. *ānši*)

b.

/áːns - skːé - t͡si/		CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a.	áːnsikːéːt͡si	*!			**
b. ☞	áːnsikːit͡si		*		
c.	ansikːéːt͡si		*		*!*

Another productive verbal category in Hittite is the participle, which is formed by suffixation of an accented suffix *–ant–* to a verbal root or stem. These work just like the imperfectives: when built to unaccented roots as in (21), they show fixed stress on the participle suffix, and when built to accented roots as in (22), stress is fixed on the root.

- The same split observed in imperfectives between (un)accented roots also occurs in participles formed by suffixation of *–ant–* /–áːnt–/ — (21) participles to unaccented roots show fixed suffixal stress vs. fixed root stress in (22) participles to accented roots:

Finally, the BAP constraint ranking correctly accounts for prefixed verbal forms. Prefixing is an extremely limited operation in Hittite — there’s only one real prefix, *pe–*, which indicates motion away from the speaker; it’s accented, and so attracts stress even in combination with an accented inflectional ending to its right, as you can see in (23) [péːtatːeni].

(21) a. /epː – áːnt – s/ → ***appānza*** [apːáːnt͡s] ‘taken’ (PTCP.C.ACC.S.) (cf. 3s. *ēpžzi*)

b. /aːr – áːnt– s/ →***arānza*** [aráːnt͡s] ‘arrived’ (PTCP.C.NOM.S.) (cf. 3s. *āri*)

(22) a. /wék – áːnt – an/ → ***wekantan*** [wéːkantan] ‘demanded’ (PTCPL.C.ACC.S.) (cf. 3s. *wēkzi*)

b. /áːns – áːnt – s/ → ***ānšanza*** [áːnsant͡s] ‘wiped’ (PTCPL.C.NOM.S.) (cf. 3s. *ānši*)

- Prefixation is extremely limited in Hittite; however, the directional prefix *pe–* /pé–/ is stressed in preference to accented inflectional endings, e.g. (23):

(23) /pé – taː – tːéni/ → ***pēdatteni*** [péːtatːeni] ‘you take there’ (DIR-2PL.NPST.ACT.)

· On the epenthetic [u] and [i] vowels in (18–20) (and on epenthesis in Anatolian generally), see Kavitskaya (2001) and Yates (2014).

§2.9 raises a question — or perhaps a challenge — that might be advanced from an extreme historical perspective, namely, whether the stress patterns we've just looked at could plausibly be viewed as just historical "residue" — that is, surface forms somehow transmitted directly from an earlier prosodic system, such as the one posited under traditional approaches to Indo-European word stress, potentially with some analogical developments along the way — rather than the result of the synchronic operation of the BAP.

This seems to me very unlikely. First, we've seen that, by assuming the BAP constraint ranking, we arrive at an economical account of stress alternations across what are clearly synchronically productive verbal categories, such as imperfectives and participles. And what is even more telling, we find that the BAP applies to forms that are demonstrably Hittite innovations. Returning again to the imperfectives, we find that the accented roots *anš–* and *arš–* each have multiple attested forms, some archaic and some generated by the application of synchronic phonological processes; yet both the archaic forms in (24) and the younger, Hittite internal-creations in (25) show the exact same stress patterns, which are exceptional in their morphological category due to the fact that these are accented roots. I therefore find it hard to imagine an analogical scenario that will yield this outcome, which is in any case *predicted* by a synchronic Hittite BAP.

§2.9 Synchronic status of the BAP? Could these stress patterns be plausibly viewed as historical "residue" rather than the result of the synchronic operation of the BAP in Hittite? Unlikely:

- BAP accounts for stress alternations across productive morphological categories, e.g. imperfectives, participles.
- Applies persistently to innovative Hittite forms — beside the archaic imperfectives in (24), it produces "exceptional" fixed root stress (which cannot be analogical) in the synchronically "renewed" imperfectives in (25) (cf. Kimball 1999:198–9; Melchert 2013:179):

(24) a. *ānšikizzi* [á:nsik(:)it͡si]
b. *āršikitta* [á:r:sik(:)it:a]

(25) a. *ānaškizzi* [á:nsk:it͡si] / *ānšiškizzi* [á:nsiskit͡si] 'wipes' (IPFV-3S.NPST.ACT.)
b. *ārriškizzi* [á:r:isk:it͡si] 'washes' (IPFV-3S.NPST.ACT.)

· The phonological constraint driving epenthesis in /–*R*s./ (*R* = sonorant) syllabic codas is an archaic and probably inherited feature in Hittite given its affinities to the PIE ban on /–*RF*./ (*F* = fricative) codas that motivates SZEMERÉNYI'S LAW (Szemerényi 1970 [1989]; cf. Sandell and Byrd 2014); its relative demotion appears to be an innovation of the post-OH period.

§2.10 briefly recaps the results of this section. I've argued, first, that synchronic stress assignment in Hittite inflectional paradigms is governed by the BAP — or equivalently, the constraint ranking in example (11): stress is assigned to the leftmost accented morpheme, or else defaults to the left-edge of the word.

I've also proposed an accentual split in verbal roots — the majority are unaccented, but a few are accented. The interaction between these accentual properties and the BAP yields, for accented roots, the pattern of mobile stress that dominates the verbal system, and for the rare accented roots, fixed root stress. Cross-categorical minimal pairs for stress are given in (26) — unaccented *epp–* shows stress mobility to accented inflectional morphemes, while accented *wek–* has only root stress; this situation is predicted by the BAP.

§2.10 Overview of Hittite stress: Proposed features of Hittite inflectional stress assignment:

- Synchronic stress assignment is governed by the BAP/constraint ranking in (11) — stress is assigned to the leftmost accented morpheme, or else defaults to the left edge of the word.
- The majority of verbal roots are unaccented, thereby yielding the pattern of mobile stress that dominates the verbal system.
- A small class of verbal roots are accented and consequently exhibit fixed root stress.

(26)

Root		NPST-3SG	NPST-3PL	IPFV-3SG	PTCP.
/epː–/	‘take’	[éːpːt͡si]	[apːántsi]	[apːisk:éːt͡si]	[apːáːnt͡s]
/wék–/	‘demand’	[wéːkt͡si]	[wéːkant͡si]	[wéːkisk:it͡si]	[wéːkantan]

§3 Reconstructing PIE stress & prosodic change

At §3.1, we move from primarily synchronic to diachronic questions — foremost among them, what does Hittite tells us about Proto-Indo-European stress assignment? This at least seems pretty straightforward. Hittite has synchronic evidence for the BAP, which wholly aligns with Kiparsky and Halle’s reconstruction for PNIE on the basis of Vedic, Greek, and Balto-Slavic. This agreement strongly argues that BAP should be reconstructed for PIE itself, which I take to imply the constraint ranking in (27).

§3.1 Implications for PIE stress: Hittite evidence for the BAP converges with Kiparsky and Halle’s (1977) reconstruction for PNIE, strongly arguing for its projection back to PIE itself — thus (27) for PIE:

(27)

PIE STRESS ASSIGNMENT:					**(⇒ BAP)**
CULMINATIVITY	≫	MAX(Accent)	≫	DEP(Accent), ALIGN-L(Pk, ω)	

If this is correct, then it should be possible to determine the stress of a PIE word simply by reconstructing the accentual properties of its constituent morphemes. §4.1 in the Appendix lays out how this reconstruction might proceed in more detail; but in general, reconstructing the underlying accentual properties of morphemes seems like a natural extension of the comparative method, so I won’t dwell on it here.

§3.2 Reconstructing PIE stress: With (27) established, determining the stress of a PIE word (of arbitrary morphological complexity) requires only reconstructing the accentual properties of its component parts (roots, affixes) (see §4.1 for details).

· The (underlying) accentual properties of (PIE) morphemes should be reconstructible by the normal application of the comparative method (e.g. Weiss 2014) — where cognate morphemes exhibit identical accentual properties across languages, the same properties can (with normal caveats) be assumed for the proto-language.

· This proposed model of stress assignment is extremely restrictive, but for this very reason, worth pursuing — where (if?) it fails should inform about how the model must be enriched — e.g. with a more refined (harmonic) constraint grammar (Sandell 2015a,b). Moreover, by reducing reconstruction to a computational system (i.e. constraints) plus lexical items, it avoids issues that arise in comparing purely surface forms, where identity may be accidental (cf. Walkden (2013, 2014) on syntactic reconstruction).

Moving ahead, then, to §3.3 — in addition to providing a more secure foundation for reconstructing PIE stress assignment, the BAP seems to offer insight into a pattern of prosodic change observed in several ancient Indo-European languages that is otherwise very difficult to motivate — namely, diachronic "retraction" of stress to the left edge of a prosodic word.

This pattern has been a major focus of research in recent Indo-European scholarship. What we find is that certain PIE lexemes that we reconstruct with non-initial stress due to the presence of an accented affix are nevertheless attested in the daughter languages with initial stress — or in Greek, so-called "recessive accentuation," whereby stress falls as far to the left as possible within the licit stress window.

§3.3 Understanding prosodic change: Establishing the BAP for PIE additionally offers insight into a pattern of prosodic change observed in several IE languages — viz. diachronic "retraction" of stress to(ward) the left edge of the prosodic word:

- Certain PIE lexemes reconstructed with non-initial lexical accent are attested in the daughter languages with initial (in AGk., "recessive" — leftmost within right-edge window) stress:

  We see this pattern, first, in the development of PIE thematic adjectives in Ancient Greek — these have accented root-suffixed morphemes like */–ro–/ and */–lo–/ in PIE, but in some cases — especially when they've become substantivized — they've developed "recessive" accentuation in Greek.

  It also observed in Anatolian nasal-infix verbs, which were formed in PIE by inserting an accented infix */–né–/ into the verbal root. But rather than showing expected word-internal stress, this class surfaces categorically with leftmost stress — we can see it, for example, in Hittite [ní:nik:t͡si] 'mobilizes', but the fact that "retraction" is also in Palaic [sú:nat] 'filled' — that is, in a closely-related and usually quite archaic Anatolian language — almost certainly tells us that this change was happening already in Proto-Anatolian.

  Finally, we see the same change in Vedic Sanskrit, where PIE abstract nouns formed by suffixation of accented */–tí–/ to the root frequently occur with initial stress. In this case, however, we can actually see the change proceeding within the history of the language — the oldest layer of texts contains forms with suffixal stress that, in later texts, surface with leftmost stress.

  · PIE thematic adjectives (e.g. */–ró–/, */–ló–/) in Ancient Greek — PIE **d^{h}m̥b^h-ró-s* > AGk. *táp^{h}ros* 'ditch'; PIE **b^{h}uh$_2$-ló-n* > AGk. *p^{h}ûlon* 'race, tribe' (Probert 2006).

  · PIE nasal-infix (*/–né–/) presents in Anatolian — e.g. PIE **ni-né-k-ti* > Hitt. *nīnikzi* [ní:nik:t͡si] 'mobilizes'; PIE **su-né-h$_3$-t* > Palaic *šūnat* [sú:nat] 'filled' (Yates 2015a).

  · PIE */–tí–/ abstract nouns in Vedic Sanskrit — e.g. PIE **mn̥-tí-s* > Early Vedic *matíḥ* 'thought' > Late Vedic *mátiḥ* 'id.' (Lundquist 2015b; cf. Sandell 2015a,b).

So what is this change? Well — at §3.4 — what's more clear is what it's not. There's no evident phonetic motivation that extends to all three languages, let alone all the individual examples, nor is there a viable source for intra- or inter-paradigmatic analogy.

However, what we can observe is that all examples of "retraction" are unified by the fact that, over time, they develop the maximally unmarked stress pattern under the constraint ranking that obtains in Proto-Indo-European and in these daughter languages — that is, fixed leftmost stress. The way in which this pattern diachronically emerges is — as Vedic shows most clearly — gradual; it proceeds on an item-by-item basis, although in some cases, it ultimately may affect an entire morphological category, as in the Anatolian nasal-infix presents. Moreover, given its prosodically regularizing character, "retraction" shows strong similarities to dialectal changes in English stress, which have been analyzed as cases of lexical diffusion.

§3.4 Motivating "retraction"? No clear phonetic motivation for stress "retraction," nor source for (intra- or inter-)paradigmatic analogy.

- However, change is unified by the diachronic emergence of the phonologically unmarked stress pattern under the BAP constraint ranking in (27).
- "Retraction" is gradual, item-by-item, and phonologically regularizing — a lexically-diffusing change? (cf. Kiparsky 1996; Bermúdez-Otero 2012:34).

  The analyses of the Indo-European data cited above also show broad agreement about what factors drive diachronic stress "retraction," calling attention, in particular, to the role of morphological processing. All these studies converge on at least two criteria that make a word susceptible to the change: The first is non-productivity — as the productivity of a word's morphological category becomes decreasingly productive over time, it seems to be increasingly probable that will develop leftmost stress. And the second, in a similar vein, is morphological transparency: words whose connection to a productive category is rendered opaque by semantic change or ordinary, Neogrammarian phonological change are also more likely to undergo "retraction". The common thread here seems to be that, in either situation, old morphological boundaries are becoming obscured and perhaps eventually, lost entirely; this historical loss of morphological structure is referred to in these analyses as DEMORPHOLOGIZATION.

- Change appears to be linked to morphological processing (e.g. Hay and Baayen 2002) — it tends to occur when:
  - A word's category diachronically becomes (completely) non-productive.
  - A word's synchronic connection to a productive category is rendered opaque by semantic change and/or (phonetically-driven) phonological change (DEMORPHOLOGIZATION).

· On lexical diffusion generally, see e.g. Labov (1994:421ff.), Phillips (2006); and on phonetically-driven change (i.e. by production/perception factors), e.g. Ohala (1993, 2005), Blevins (2004).

And yet, at §3.5, it's still not clear that this is enough to explain the change — even assuming that a historically complex word can't be synchronically parsed into its constituent morphemes or built up out them, it's hard to explain why these formerly complex structures can't be learned as simplex words or stems with lexically listed stress — after all, what is the difference between learning the accentual properties of a morpheme that was historically complex but is now treated as a simplex from those of a morpheme that has always been simplex?

Nevertheless, acquisition eventually seems to fail, with language learners preferring to overapply phonologically unmarked leftmost stress. Why this change occurs thus constitutes an interesting research question. As a preliminary hypothesis, we might consider the function of stress in lexical accent systems: if it is to cue morphological structure as is often held, we might expect default stress to emerge when prosodic structure is lost; but more explicit quantitative models of the Indo-European data may tell us whether or not this hypothesis is on the right track, as well as give us the means to evaluate other possibilities — for example, if some kind of learning bias is involved.

§3.5 The (mis)acquisition problem: No obvious reason why historically complex words cannot be learned as simplex words/stems with lexically listed stress; nevertheless, acquisition (eventually) fails more often than might be expected, learners instead (over)applying unmarked leftmost stress — why?

- If stress functions to cue morphological structure in lexical accent systems (e.g. Revithiadou 1999), "retraction" might be expected to go hand in hand with demorphologization (cf. Sandell 2015a,b).
- More explicit (quantitative) modeling of the change in these IE languages (e.g. Pater and Moreton 2012, Hayes 2015) may shed light on the question.

And still more generally — and this, at last, is §3.6 — I think that the PIE reconstruction advanced today is really just a starting point for investigating prosodic change in the ancient Indo-European languages. These languages — especially Hittite, Vedic, Ancient Greek — have large, diachronically stratified corpora and are relatively well-understood, at least as far as these things go. They're thus ideally positioned to answer some broader questions about prosodic change in lexical accent system cross-linguistically — for example, what factors contribute to stability of lexical accent such that it can persist from PIE in 4erhaps 6000 BCE into modern Indo-European languages like Greek and Russian? And how can accentual change occur within outwardly stable lexical accent systems?

A case of this is briefly outlined in the Appendix in §4.1 — in short, at least in some cases it seems to involve the same kind of pathways that lead to the emergence of lexical accent systems — and if you're interested in hearing more about these kind of developments, I'll be talking about a relevant case in some Uto-Aztecan languages tomorrow morning at 11:30 over in the Mt. Vernon room.

And finally, there is the converse question —- what kinds of factors lead to the elimination of lexical accent, as in the Germanic and Italic branches of the family? In this case, it seems plausible to me that the pattern of stress "retraction" just discussed had a significant role to play, restricting the amount of stress mobility in the system, and so limiting the available cues for the accentual properties of morphemes —- but answering these and other questions calls for much further research.

Thank you.

§3.6 IE & the evolution of lexical accent: IE data bears upon broader questions of prosodic change in lexical accent systems — e.g.:

- What factors contribute to the diachronic stability of lexical accent (PIE ~4000 BCE > Modern Greek, Russian)?
  - How does accentual change occur within outwardly stable lexical accent systems? (cf. §4.2)
- Conversely, What factors lead to the elimination of lexical accent (Italic, Germanic) (cf. Halle 1997)?
  - Could diachronic "retraction" have played a role?

· The causes of accentual change within lexical accent systems are often similar to those that drive the emergence of these systems — on pathways to lexical accent, see generally Kabak and Revithiadou (2009), and for a case study in Cupan (Takic, Uto-Aztecan), Yates (2016) tomorrow at ~11:30 AM in Mt. Vernon Square room.

§4 Appendix — On reconstructing stress & prosodic change

How this accentual reconstruction can proceed is outlined at §4.1 at the top of p. 8. Reconstruction of accentual properties is simplest and most secure where cognate lexical items show both identical surface stress patterns and these stress patterns are generated by the same morphophonological principles within their individual synchronic prosodic systems.

A clear case of this "strict" type of correspondence relation is found between Hittite and Vedic. The BAP is synchronically operative in both languages; both form radical verbs to a root meaning 'sleep' that can be traced back to the same PIE source; and in both, these radical verbs show mobile stress in combination with what are historically the same inflectional endings.

From this we conclude that, from a synchronic perspective, Hitt. /ses–/ and Ved. /sas–/ are unaccented; and that the verbal inflectional endings hare unaccented in the singular, and accented in the plural in both languages. Finally, since there is exact agreement between these languages for the accentual properties of these cognate morphemes, we can securely reconstruct these properties for the proto-language — thus an unaccented root */ses–/ 'sleep', and inflectional endings just like those in Hittite and Vedic. And when these interact with the BAP constraint, it properly generates the PIE paradigm that directly yields the attested Hittite and Vedic forms.

§4.1 Accentual reconstruction: Reconstruction of accentual properties is maximally secure when cognate items exhibit "strict" correspondence across languages, i.e. identical stress patterns generated by the same morphophonological principles (cf. Kiparsky 2015):

- (27) is synchronically operative in Hittite and Vedic.
- Hitt. *šeš–* and Ved. *sas–* 'sleep' are cognate — radical verbs to each root show the same mobile stress pattern in combination with cognate inflectional endings; thus on system-internal grounds:
  - · Hitt. /ses–/ 'sleep' and Ved. Skt. /sas–/ 'sleep' are both synchronically unaccented.
  - · Singular verbal inflectional endings are unaccented (e.g. 3S. Hitt. /–t͡si/, Ved. /–ti/), plural endings accented (3PL. Hitt. /–ánt͡si/, Ved. /–ánti/).

    ⇒ An unaccented root */ses–/ is reconstructible for PIE.

⇒ Singular verbal inflectional endings are unaccented (e.g. 3S. */–ti/), plural endings accented (3PL. */–énti/).

- The PIE paradigm in (28) — which directly yields Hitt. and Ved. surface forms — is a consequence of the accentual properties of these morphemes and (27).

(28) a. */ses – ti/ → **sésti* 'sleeps' (3S.PRS.ACT.) > Hitt. *šēšzi* [sé:st͡si], Ved. *sásti*

b. */ses – énti/ → **səsénti* 'they sleep' (3PL.PRS.ACT.) > Hitt. *šašanzi* [sasánt͡si], Ved. *sasánti*

c.

*/ses - énti/	CULM	MAX(Accent)	DEP(Accent)	ALIGN-L
a. *sesenti	*!	*		
b. ☞ *səsénti				*
c. *sésenti		*!	*	

Furthermore, having built up the system on the basis of examples where "strict" correspondence obtains, we can make reasonable inferences about the properties of PIE morphemes where it cannot be established. For example, in the absence of counter-evidence we can provisionally reconstruct PIE unaccented verbal roots whenever its Hittite or Vedic descendant is accented on synchronic, system-internal grounds.

- Securely reconstructed examples like (28) allow provisional reconstruction of PIE unaccented roots when Hittite or Vedic verbal roots are synchronically accented but lack external comparanda — e.g. Hitt. /e:p–/ < PIE */$h_1$ep–/, Ved. /kṣay–/ < PIE */tk̂ei–/ (cf. *LIV*^{2} s.vv.).

Now, in the interest of time, I'll just briefly summarize §4.2 — in short, the accentedness of Hitt. /wék–/ is not original, but instead arises via a well-established diachronic pathway to lexical accent, namely, lexicalization of the surface stress pattern of an older derived structure; and if you're interested in hearing more about this type of change in lexical accent systems, I'll be discussing some interesting Uto-Aztecan cases tomorrow morning.

§4.2 Reconstructing accentual innovation: Because this approach makes strong empirical predictions, it is possible to precisely identify morphological innovations — e.g.:

- Mobile stress paradigm shows Ved. /vaś–/ 'want' is unaccented, implying PIE */wek̂–/ in (29):

(29) a. */wek̂ – ti/ → **wékti* 'want' (3S.PRS.ACT.) > Ved. *váṣṭi*

b. */wek̂ – énti/ → **uk̂énti* 'they want' (3PL.PRS.ACT.) > Ved. *uśánti*

- Yet PIE */wek̂–/ is unquestionably the source of accented Hitt. /wék–/ (cf. §2.7) — how?
  - PIE **k* normally yields Hitt. [k:]; the invariant root-final [k] of Hitt. /wék–/ must be due to PA LENITION, conditioned by a preceding prehistoric long vowel (cf. Eichner 1973; Adiego 2001).
  - This phonological context is supplied by "Narten presents" (Narten 1968)— a (likely moribund) derived verbal category in PIE (Kümmel 1998; Melchert 2014) — which had fixed root stress and lengthened **é* root vocalism in (at least) the singular (i.e. PIE **wékti*).

⇒ Hitt. /wék–/ is the result of RESTRUCTURING (Kiparsky 1982) — fixed root stress was lexicalized as a feature of the root when "Narten" derivation was prehistorically lost.

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