Lexical accents as foot edges: Evidence from Vedic Sanskrit and Modern Greek

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- Principal question addressed today:

  - **How is accentedness represented in the lexicon?**

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  (i) An abstract prominence autosegmentally linked to an input vowel, which is thus preferentially incorporated into metrical structure (Revithiadou 1999, 2007, Alderete 2001a, *i.a.*).

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(i) An abstract prominence autosegmentally linked to an input vowel, which is thus preferentially incorporated into metrical structure (Revithiadou 1999, 2007, Alderete 2001a, *i.a.*).

(ii) Metrical structure directly pre-specified in the input (Inkelas 1999, McCarthy 2000a,b, Özçelik 2014, *i.a.*).

Hypothesis (i) — lexical accent as autosegment

- A lexical accent is an underlying prominence (∗), autosegmentally linked to a vocalic peak (Revithiadou 1999, 2007, Alderete 2001a, *i.a.*):

(2) a. UNACCENTED ROOT

/CVCV/

b. ACCENTED ROOT

/CV́CV/

∗

- Accented vowel preferentially receives primary stress by incorporation into head of word's head foot — e.g., assuming right-aligned trochees:

(3) a. /CVCV-CV/ → ω(CV.Σ_{HD}(CV́.CV)) *(default)*

∗

b. /CV́CV-CV/ → ω(Σ_{HD}(CV́.CV).CV) *(non-default)*

∗ ∗

Hypothesis (ii) — lexical accent as metrical structure

- A lexical accent is a metrical head foot directly specified in the input (Inkelas 1999, McCarthy 2000a,b, Özçelik 2014, *i.a.*).

(4) a. UNACCENTED ROOT: /CVCV/ b. ACCENTED ROOT: /$_{\Sigma_{\text{HD}}}$(CVCV)/

- Head foot is preferentially preserved in output and "accented vowel" stressed as the foot's head — e.g., assuming right-aligned trochees:

(5) a. /CVCV-CV/ → $_{\omega}$(CV.$_{\Sigma_{\text{HD}}}$(CV́.CV)) *(default)*

b. /$_{\Sigma_{\text{HD}}}$(CVCV)-CV/ → $_{\omega}$($_{\Sigma_{\text{HD}}}$(CV́.CV).CV) *(non-default)*

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- **Claim**: Only underlying metrical structure can account for distribution of word stress in Vedic Sanskrit.

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- Metrical representation of accentedness makes it possible to reconcile two seemingly contradictory patterns within inflectional paradigms:
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  - Rightward stress shifts when accented syllable peaks are eliminated in the output ("secondary mobility"; Kiparsky 2010).

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- **Claim**: Only underlying metrical structure can account for distribution of word stress in Vedic Sanskrit.
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  - A general preference for left edge stress.
  - Rightward stress shifts when accented syllable peaks are eliminated in the output ("secondary mobility"; Kiparsky 2010).
- **Proposal:** Accented morphemes contain a single foot edge in their lexical representation which is preserved in the output due to high-ranking faithfulness (ANCHOR; cf. Özçelik 2014, Yawney 2018).

Roadmap

§1 Introduction

§2 Inflectional stress in Vedic

- Language background
- Core data
- Proposal & analysis

§3 "Secondary mobility" in Vedic

§4 Analyzing "secondary mobility"

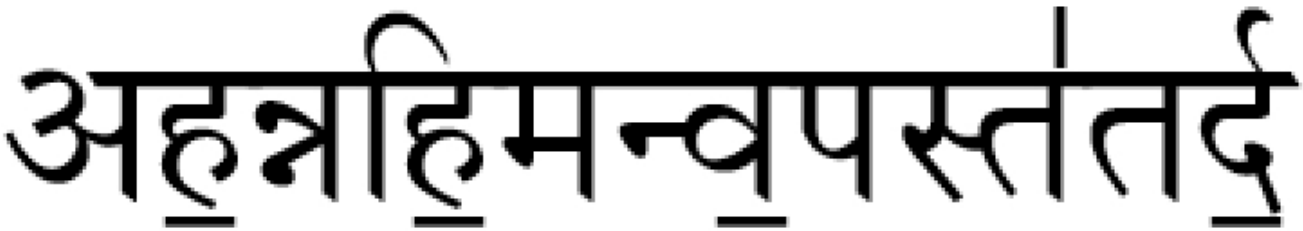
- ✓ Under the metrical representation
- ✗ Under the autosegmental representation

§5 Extending the proposal: Modern Greek

- Unified analysis of ACCENTED, PRE-, and POST-ACCENTING morphemes.
- Captures problematic stress patterns identified by Revithiadou (2007).

§6 Discussion

What is Vedic Sanskrit?



áhann áhim ánu apás tatarda

'(Indra) slew the serpent. He bored out the waters.' (RV I.32.1c)

- Vedic Sanskrit (~1500–1000 BCE) — spoken mostly in modern Pakistan and northern India.
- *Rigveda* (RV) — large collection of orally-transmitted texts that represent the oldest stage of Sanskrit (see Jamison and Brereton 2014).
- Vedic texts provide direct evidence for word stress:
  - Falling pitch (*svarita* 'sounded') is marked (with _ in RV).
  - High pitch (= stress; *udātta*) occurs on immediately preceding syllable.

Core data — Vedic

- Prosodic contrast in Vedic nominal (and verbal) inflection between two stem types:
  - IMMOBILE: stress fixed on stem throughout inflectional paradigm.
  - MOBILE: stress alternates between stem in the "strong" cases (NOM, ACC), and inflectional endings in the other "weak" cases.
- Compare IMMOBILE monosyllabic stems in (6) with MOBILE (7):

		STRONG		WEAK	
(6)	a.	*nár-as*	:	*nár-as*	(man-M.NOM.PL/GEN.SG)
	b.	*gā́v-as*	:	*gáv-ā*	(cow-NOM.PL/INS.SG)
(7)	a.	*yúj-as*	:	*yuj-ás*	(yoke-M.NOM.PL/GEN.SG)
	b.	*pā́d-am*	:	*pad-ā́*	(foot-M.ACC.SG/INS.SG)

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- Compare IMMOBILE disyllabic stems in (8) with MOBILE (9):

		STRONG		WEAK	
(8)	a.	*rā́jān-am*	:	*rā́jñ-as*	(king-M.ACC/GEN.SG)
	b.	*marút-as*	:	*marút-su*	(Marut-M.NOM.PL/LOC.PL)
(9)	a.	*pánthā-m*	:	*path-ás*	(path-M.ACC/GEN.SG)
	b.	*púmāṃs-am*	:	*puṃ-sú*	(male-M.ACC.SG/LOC.PL)

Core data — Vedic

- Vedic contrast between IMMOBILE and MOBILE stems can be derived from interaction of:
  - A lexical contrast between accented and unaccented morphemes.
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  - A lexical contrast between accented and unaccented morphemes.
  - A phonological preference for the single stress-bearing syllable to coincide with the word's left edge — i.e., Kiparsky and Halle's (1977) BASIC ACCENTUATION PRINCIPLE:

(10) **BASIC ACCENTUATION PRINCIPLE (BAP)**:
If a word has more than one accented vowel, word stress is assigned to the leftmost. If a word has no accented vowel, word stress is assigned to the leftmost syllable.

Core data — Vedic

- Vedic IMMOBILE and MOBILE stems contrast in accentedness.
  - MOBILE stems are lexically unaccented.
  - IMMMOBILE stems are lexically accented.

(11) Unaccented stem + unaccented ending ⇒ default leftmost stress:

a. Ved. /pad-am/ → *pā́d-am* ‘foot’ (foot-GEN.SG)

b. Ved. /pumas-am/ → *púmāṃs-am* ‘male’ (path-ACC.SG)

(12) Unaccented stem + accented ending ⇒ ending attracts stress:

a. Ved. /pad-á́/ → *pad-á́* ‘with the foot’ (foot-INS.SG)

b. Ved. /pumas-su/ → *puṃ-sú* ‘among males’ (male-LOC.PL)

Core data — Vedic

- Vedic IMMOBILE and MOBILE stems contrast in accentedness.
  - MOBILE stems are lexically unaccented.
  - IMMOBILE stems are lexically accented.

(13) Accented stem + unaccented ending ⇒ stem attracts stress:

a. Ved. /gáv-as/ → *gā́v-as* ‘cows’ (cow-NOM.PL)

b. Ved. /marút-as/ → *marút-as* ‘Maruts’ (Marut-NOM.PL)

(14) Accented stem + accented ending ⇒ leftmost accented (=stem) wins:

a. Ved. /gáv-ā́/ → *gáv-ā* ‘with the cow’ (cow-INS.SG)

b. Ved. /marút-sú/ → *marút-su* ‘among the Maruts’ (Marut-LOC.PL)

Analyzing core data — default leftmost stress

- Vedic shows default leftmost stress — e.g.:

(15) Ved. /pad-am/ → *(pā́.dam)* 'foot' (foot-M.ACC.SG)

- This pattern falls out from interaction of:

(16) CULMINATIVITY: A prosodic word has exactly one stressed syllable.
(17) TROCHAIC: Feet have initial prominence.
(18) ALL-FEET-LEFT: Feet must be aligned with the left edge of the prosodic word. Assign one violation (*) for each intervening syllable peak.

(19)

/pad-am/		CULM	TROCH	ALL-FT-L
a.	pā.dam	*!		
b.	(pā.dám)		*!	
c. ☞	(pā́.dam)			
d.	pā.(dám)			*!

Analyzing core data — accented → stressed

- Accented weak case endings attract stress in Vedic — e.g.:

  (20) Ved. *pa.(dā́)* 'with the foot' (foot-M.INS.SG)

- **How is this stress-attracting property encoded in the lexicon?**

Proposal

- Two components of the proposal (cf. Özçelik 2014, Yawney 2018):
  - **Accented morphemes contain the left edge of a head foot in their lexical representation — e.g. (21a) vs (21b):**

(21) a. UNACCENTED ACC.SG
Ved. /-am/

b. ACCENTED INSTR.SG
Ved. /-(ā/

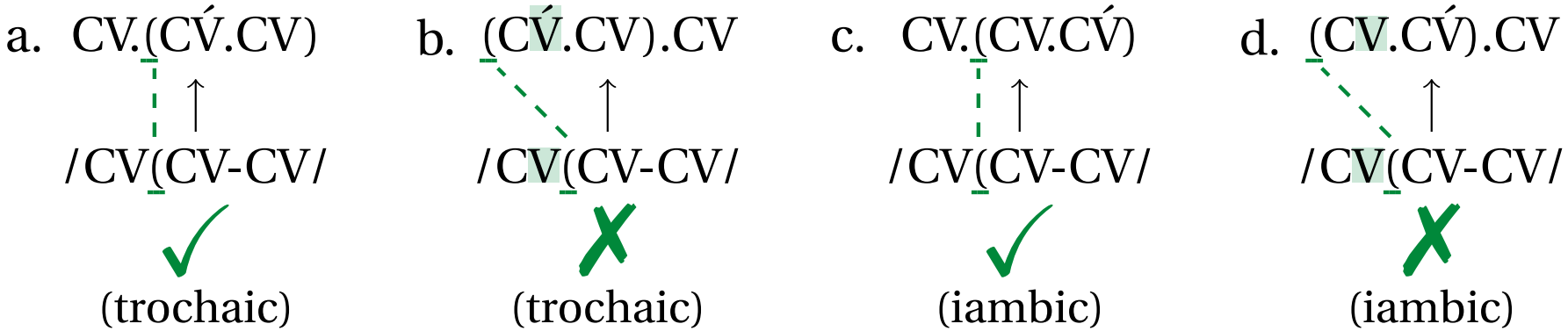
Proposal

- Two components of the proposal (cf. Özçelik 2014, Yawney 2018):
  - **Underlying foot is preserved in output due to high-ranking faithfulness — i.e.,** (22):

(22) ANCHOR-L: The left edge of every head foot in the input corresponds to the left edge of a head foot in the output. Assign a violation (*) if a syllable peak intervenes.

- ANCHOR-L enforces faithfulness to location of left foot edge; foot shape/rhyme type are independently determined:

(23)



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- ANCHOR-L is violated only if a syllable peak intervenes between left edge of input/output foot:

(24) a. CV.CV.(CV́C)
/CVCVC-(VC/ ✓

b. CV.(CV́.CVC)
/CVCVC-(VC/ ✗

Analyzing core data — accented → stressed

- Accented morphemes attract stress in Vedic — e.g.:

(25) Ved. /pad-(ā/ → *pa.(dā́)* ‘with the foot’ (foot-M.INSTR.SG)

- This pattern emerges if ANCHOR-L dominates ALL-FEET-L.

(26)

/pad-$_{\acute{}}$(ā/	CULM	TROCH	ANCHOR-L	ALL-FT-L
a. ☞ pa.$_{\acute{}}$(dā́)				*
b. $_{\acute{}}$(pá.dā)			*!	
c. $_{\acute{}}$(pa.dā́)		*!	*	
d. pa.dā	*!			

- (b–c) violate ANCHOR-L because a σ intervenes.

  ⇒ (a) wins by satisfying ANCHOR-L (i.e., no intervening σ).

Analyzing core data— leftmost wins

- Leftmost wins in Vedic — e.g.:

(27) Ved. /gáv-ā́/ → *gáv-ā* 'with the cow' (cow-INS.SG)

- This pattern is generated by ranking already established:

(28)

/$_i$(gav-$_j$(ā/		CULM	TROCH	ANCHOR-L	ALL-FT-L
a.	$_i$(gá).$_j$(vā́)	*!			*
b. ☞	$_{ij}$(gá.vā)			*	
c.	ga.$_{ij}$(vā́)			*	*!
d.	$_{ij}$(ga.vā́)		*!	*	

- (b) and (c) each have one mis-anchored foot (violating ANCHOR-L).

  ⇒ (b) is preferred because it better satisfies lower-ranked ALL-FEET-L.

“Secondary mobility” in Vedic

- Vedic Sanskrit exhibits stress alternations involving what Kiparsky (2010) terms “secondary mobility:”
  - An accented vowel is eliminated in output by resyllabification or deletion.
  - Accent associated with eliminated vowel appears to shift **rightward** and attract stress to following syllable.
- Such stress alternations occur in different morphological contexts:
  - Three distinct types are observed in Vedic.

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- Such stress alternations occur in different morphological contexts:
  - Three distinct types are observed in Vedic.
- **Now** — examine the three types (in order of increasing robustness).

“Secondary mobility” in Vedic — type 1

- In a first type of “secondary mobility” in Vedic:
  - Stem contains a final accented high vowel, which attracts stress away from word’s left edge — e.g., in NOM.SG.
  - Accented high vowel is resyllabified before **unaccented** vowel-initial strong case ending ⇒ stress surfaces on ending — e.g., in NOM.PL/DU.

(29)

	NOM.SG		NOM.PL/DU	
a.	*arí-s*	:	*ary-ás*	(friend-NOM.SG/PL)
b.	*paśú-s*	:	*paśv-ā́* (RV X.106.3b)	(livestock-NOM.SG/DU)

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b.	*paśú-s*	:	*paśv-ā́* (RV X.106.3b)	(livestock-NOM.SG/DU)	**páśvā*

★ Non-initial stress on NOM.PL/DU requires a lexical accent, but this ending is underlyingly **unaccented** (NOM.PL /-as/, DU /-ā/).

⇒ Stem-final accent has shifted rightward onto ending.

“Secondary mobility” in Vedic — type 2

- In a second type of “secondary mobility” in Vedic:
  - Initial accented /á/ of disyllabic stem attracts stress in strong cases.
  - Accented /á/-vowel is deleted in weak cases ⇒ stress surfaces on **unaccented** stem vowel to its right.

(30)

	STRONG		WEAK	
a.	*sā́nu(-∅)*	:	*snú-ṣu*	(back-N.NOM.SG/LOC.PL)
b.	*dā́ru(-∅)*	:	*drú-ṇā*	(wood-N.NOM.SG/INS)

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★ Failure of accented weak ending to attract stress requires a lexical accent to its left, but stressed stem vowel is **unaccented** (/u/).

⇒ Stem-initial accent has shifted rightward onto stem-final vowel.

“Secondary mobility” in Vedic — type 3

- In a third type of “secondary mobility” in Vedic:
  - Final /á/ of polysyllabic stem stressed in “strong” cases.
  - Stem-final /á/ is deleted and inflectional endings stressed in prevocalic “weak” cases.

(31)

		STRONG		WEAK	
a.	Ved.	*ukṣáṇ-as*	:	*ukṣṇ-ás*	(ox-M.NOM.PL/GEN.SG)
b.	Ved.	*pitár-as*	:	*pitr-é*	(father-NOM.PL/DAT.SG)
c.	Ved.	*dā-tā́r-am*	:	*dā-tr-ā́*	(give-AGT-M.ACC/INS.SG)

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c.	Ved.	*dā-tā́r-am*	:	*dā-tr-ā́*	(give-AGT-M.ACC/INS.SG)

★ Ending attracts stress in preference to accented stem to its left:

⇒ Stem accent is deleted when vowel is deleted (but cf. types 1, 2).

⇒ Or stem accent has shifted rightward onto inflectional ending.

Implications of “secondary mobility”

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  - Emerges from same constraint ranking that accounts for core data.

(ii) Cannot be captured under autosegmental representation of accentedness — basic problem:

  - “Secondary mobility” requires that lexical accents reassociate rightward when vocalic host is eliminated.
  - But rightward reassociation is inconsistent with general preference for left edge stress.

Analyzing Vedic “secondary mobility” — type 2

- Deletion of accented stem-initial /á/ in weak cases triggers “secondary mobility:”

(32) Ved. /(sanu-(su/ → *(snú.ṣu)* ‘on (their) backs’ (back-N.LOC.PL)

(33)

/$_i$(sanu-$_j$(su/	CULM	ANCH-L	ALL-FT-L	MAX-V
a. $_i$(snú).$_j$(ṣú)	*!		*	*
b. ☞ $_{ij}$(snú.ṣu)		*		*
c. snu.$_{ij}$(ṣú)		*	*!	*

- Candidate (a) (faithful modulo deletion) is ruled out by CULMINATITY.
- (b) and (c) each have one mis-anchored foot (violating ANCHOR-L).

  ⇒ ALL-FT-L selects (b) as winner, which satisfies ANCHOR-L w.r.t. underlying foot at word’s left edge.

Analyzing “secondary mobility” — type 1

- Resyllabification of accented high *V* triggers “secondary mobility:”

  (34) Ved. /ar(i-as/ → *ar.(yás)* ‘friends’ (friend-M.NOM.PL)

- Resyllabification driven by constraint against hiatus:

  (35) *VV: Adjacent vowels are not permitted in the output.

(36)

/ar$_i$(i-as/		*VV	*CULM	ANCHOR-L	ALL-FT-L
a.	a.$_i$(rí.as)	*!			*
b. ☞	ar.$_i$(yás)				*
c.	$_i$(ár.yas)			*!	

- (b) satisfies ANCHOR-L by resyllabifying *V́* into onset of head foot.
- Whereas loser (c) (with “leftward reassociation”) violates it.

Analyzing “secondary mobility” — type 3

- Deletion of accented stem-final /á/ in prevocalic weak cases triggers “secondary mobility:”

(37) Ved. /uk(ṣaṇ-(as/ → *uk.(ṣṇás)* ‘of the ox’ (OX-M.GEN.SG)

(38)

/uk$_i$(ṣaṇ-$_j$(as/		CULM	ANCH-L	ALL-FT-L	MAX-V
a.	$_i$(úk).$_j$(ṣṇás)	*!	*	***	*
b. ☞	uk.$_{ij}$(ṣṇás)			*	*
c.	$_{ij}$(úk.ṣṇas)		*!*		*

- (c) with left edge stress is ruled out by its (double) violation of ANCHOR-L.

  ⇒ (b) wins by satisfying ANCHOR-L.

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a.	$_i$(úk).$_j$(ṣṇás)	*!	*	***	*
b. ☞	uk.$_{ij}$(ṣṇás)			*	*
c.	$_{ij}$(úk.ṣṇas)		*!*		*
d.	uk.$_{ij}$(ṣá.ṇas)		*!	*	

★ Deletion in (b) is prosodically optimizing — it allows two underlying feet to stand in perfect correspondence with single output foot.

⇒ (b) is preferred to a hypothetical candidate (d) with unmotivated non-deletion and stem-final stress, which violates ANCHOR-L.

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b. ☞	uk.$_{ij}$(ṣṇás)			*	*
c.	$_{ij}$(úk.ṣṇas)		*!*		*
d.	uk.$_{ij}$(ṣá.ṇas)		*!	*	

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⇒ Implications for diachrony of IE vowel deletion? (cf. Yates 2019a,b)

Vedic inflectional stress assignment — interim summary

- Under a metrical representation of lexical accentedness, it is possible to account for:
  - ✓ Stress assignment in Vedic Sanskrit inflection in general.
  - ✓ All three types of “secondary mobility” adduced by Kiparsky (2010).

Vedic inflectional stress assignment — interim summary

- Under a metrical representation of lexical accentedness, it is possible to account for:
  - ✓ Stress assignment in Vedic Sanskrit inflection in general.
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- Now — analytic comparison:

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  - ✓ Stress assignment in Vedic Sanskrit inflection in general.
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- Now — analytic comparison:
  - **Can this data be accounted for under an autosegmental representation of lexical accentedness?**

Analytic comparison — an autosegmental analysis

- Consider Kiparsky's (2010) ruled-based, autosegmental analysis, which illustrates the central problem.
- Per Kiparsky elimination of accented syllable peaks triggers:

(39) SECONDARY MOBILITY (2^{RY}M): "When a syllable is eliminated, its accent shifts to the next syllable."

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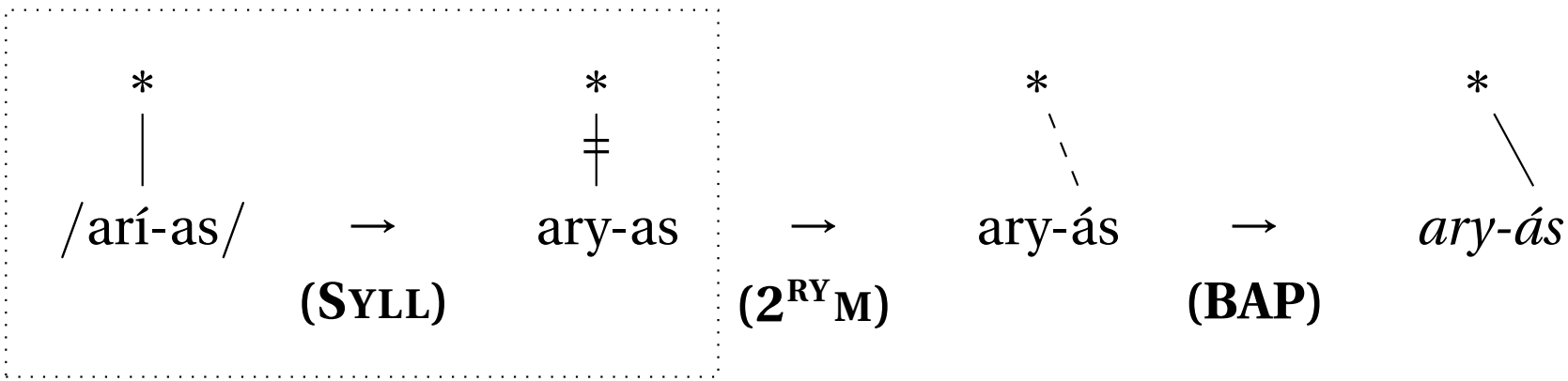

STEP 1: Accented σ eliminated by resyllabification (/i/ → [j]).

Analytic comparison — an autosegmental analysis

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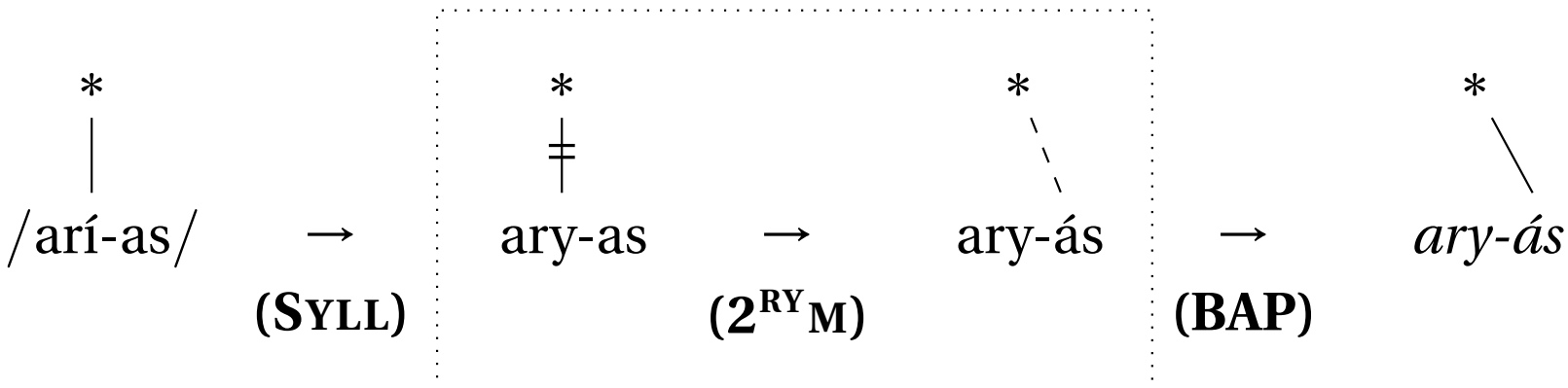

STEP 2: Floating suffixal accent reassociates rightward via 2^{RY}M.

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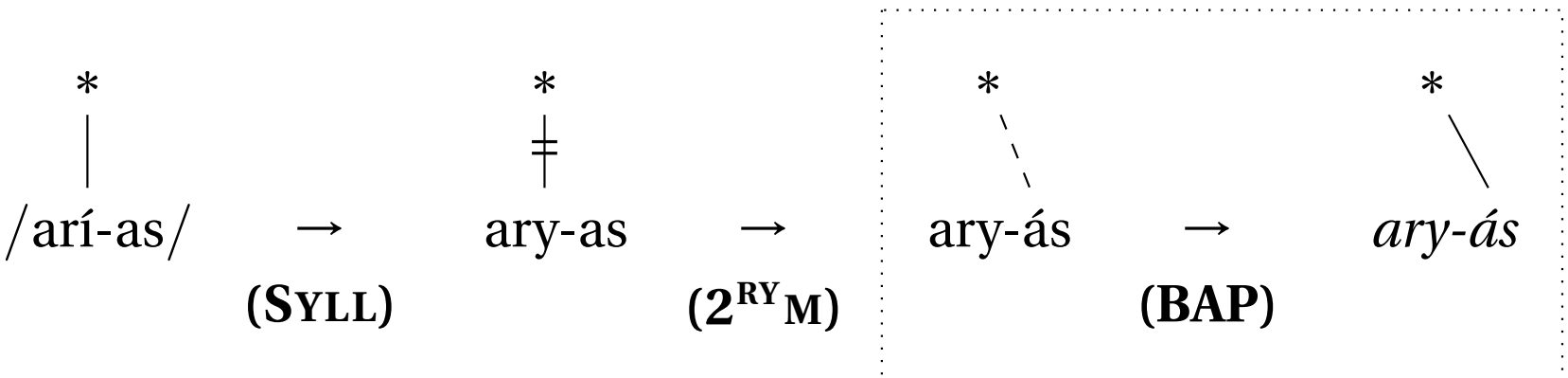
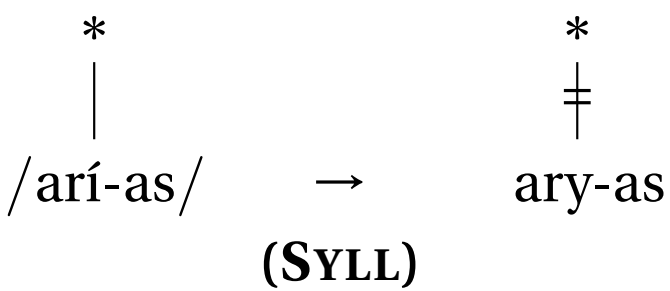


STEP 3: Reassociated accent is assigned stress via BAP.

Analytic comparison — an autosegmental analysis

- Problem arises after resyllabification frees accent to reassociate:



Analytic comparison — an autosegmental analysis

- Problem arises after resyllabification frees accent to reassociate:
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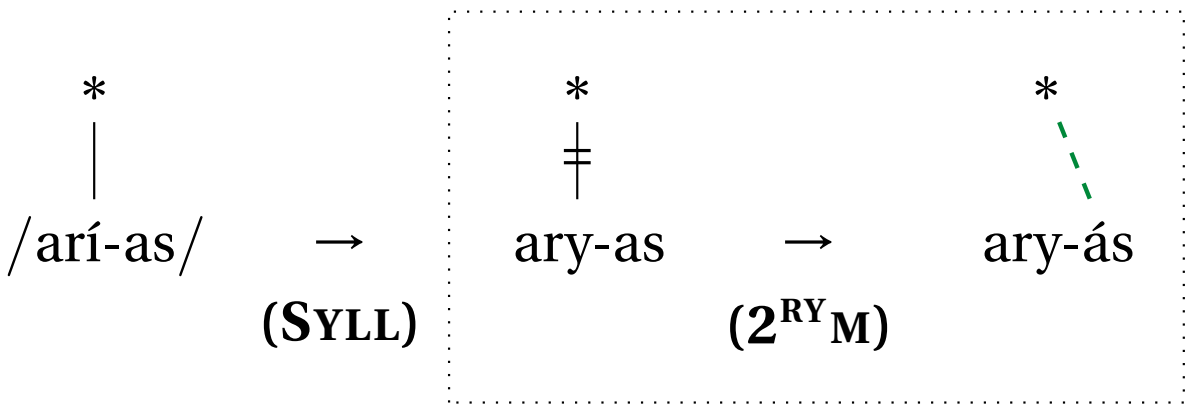

Analytic comparison — an autosegmental analysis

- Problem arises after resyllabification frees accent to reassociate:
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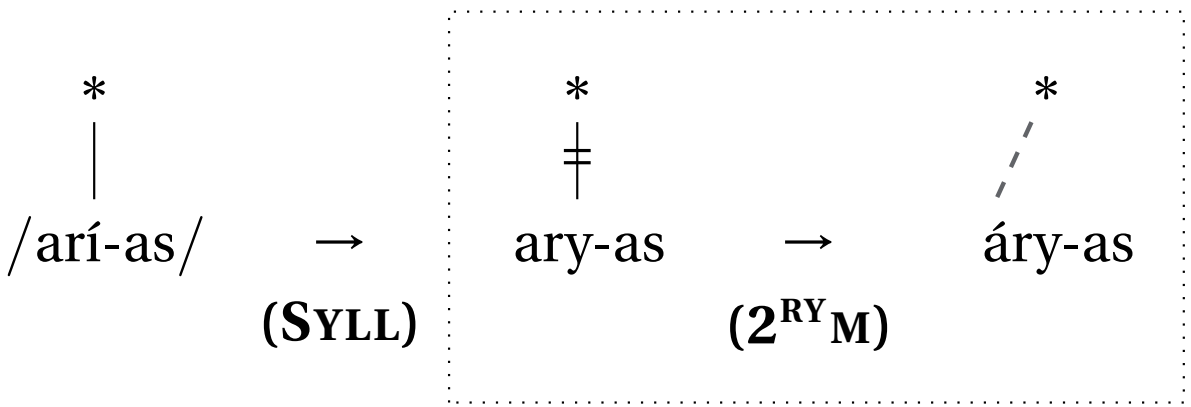
  - But **leftward migration** is expected to satisfy general phonological preference for left edge stress.



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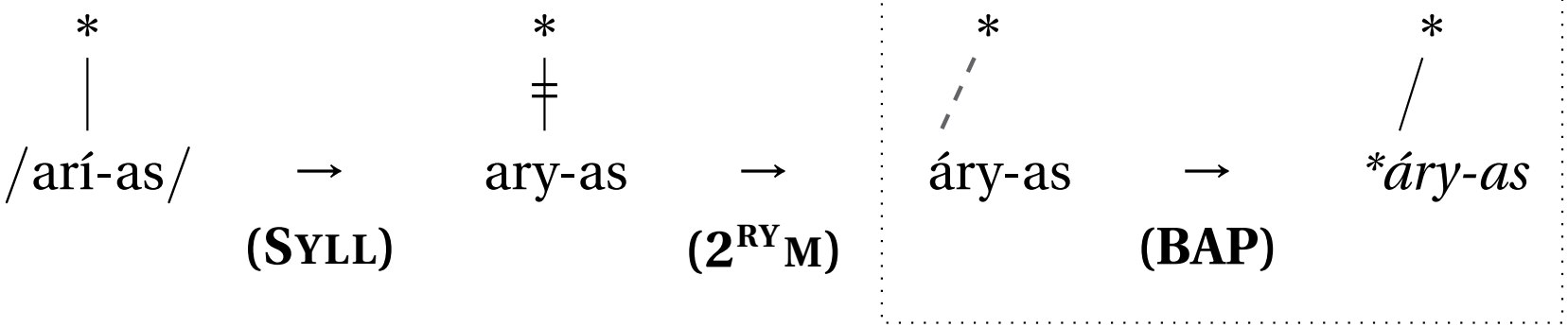
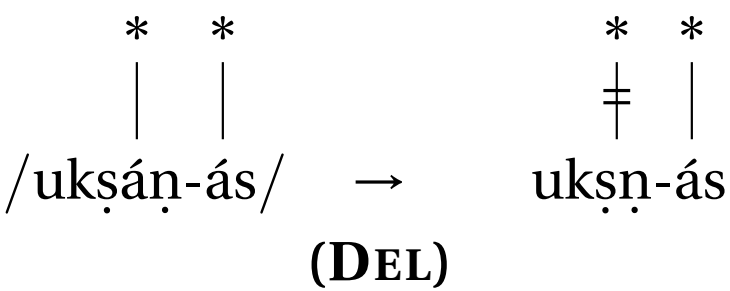


⇒ Constraint-based autosegmental analysis wrongly predicts initial stress in type 1.

Analytic comparison — an autosegmental analysis

- Same problem in type 3 after deletion frees accent to reassociate:



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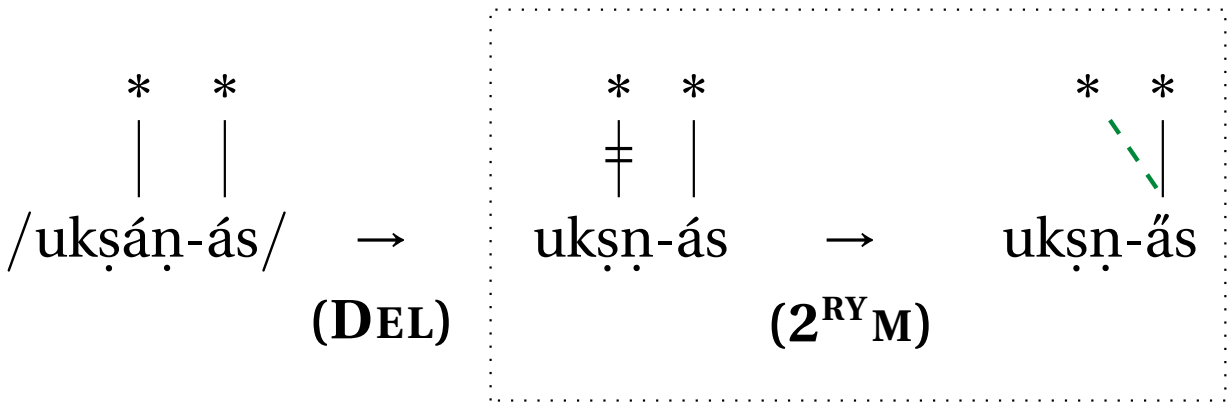

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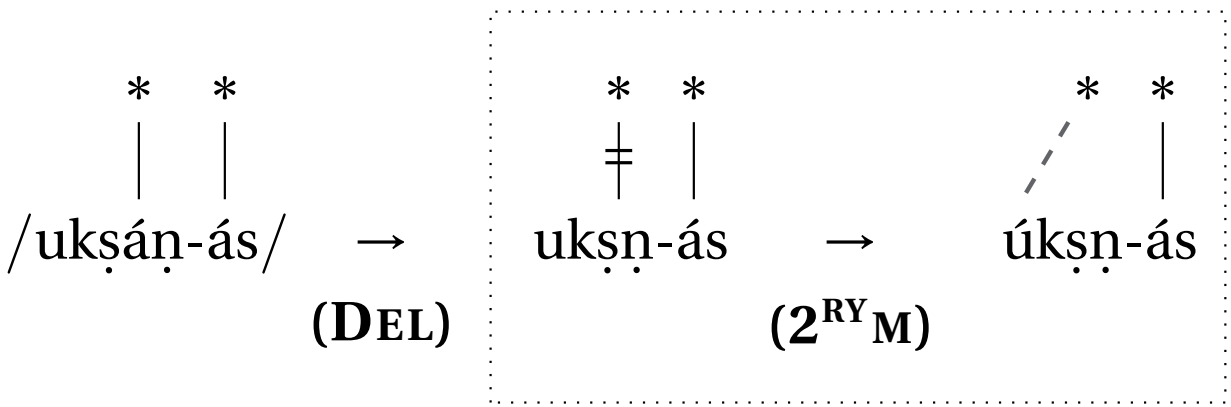

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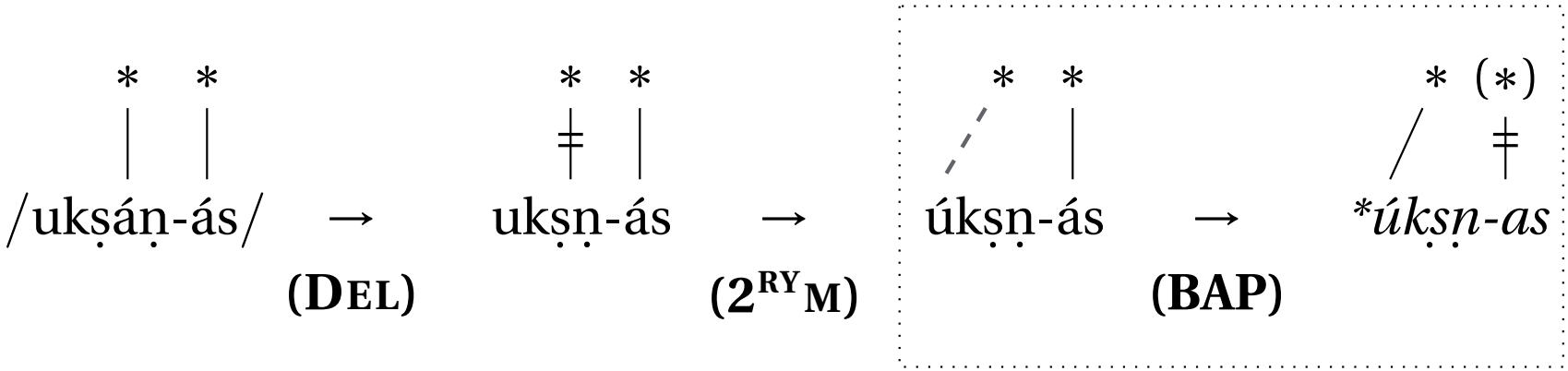


⇒ Constraint-based autosegmental analysis wrongly predicts initial stress in type 3.

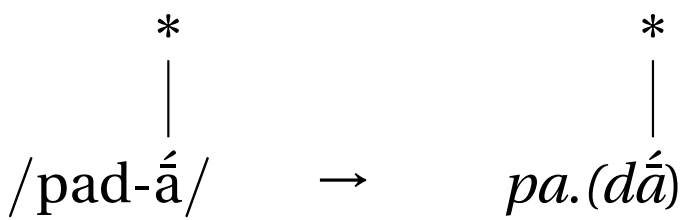
Analytic comparison — an autosegmental analysis

- Analyses that adopt an autosegmental representation of accentedness (Revithiadou 1999, 2007, Alderete 2001a, *i.a.*) standardly enforce faithfulness with constraints like:

  (40) MAX-PROM: "A prominence in the input (= accent) must have a correspondent in the output (= stress)."

  (41) DEP-PROM: "A prominence in the output (= stress) must have a correspondent in the input (= accent)."

- Consider the derivation below:



✓ no violations

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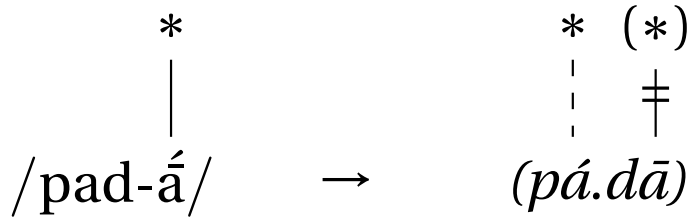

✗ violates MAX-PROM, DEP-PROM

Analytic comparison — an autosegmental analysis

- Analyses that adopt an autosegmental representation of accentedness (Revithiadou 1999, 2007, Alderete 2001a, *i.a.*) standardly enforce faithfulness with constraints like:

(42) *FLOP-PROM (Revithiadou 1999:53):
"Let χ_i be an input prominence, ζ_j be a vocalic peak, S_k phonological representations

$S_1 \mathscr{R} S_2$,
χ_1 and $\zeta_1 \in S_1$, χ_2 and $\zeta_2 \in S_2$,
$\chi_1 \mathscr{R} \chi_2$ and $\zeta_1 \mathscr{R} \zeta_2$,

if χ_1 is associated with ζ_1, then χ_2 is associated with ζ_2"

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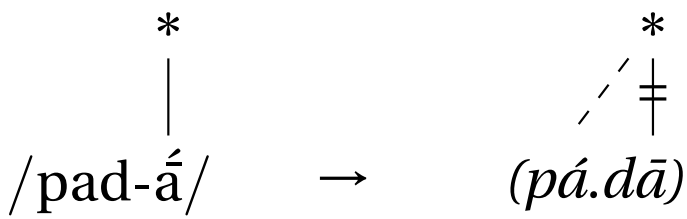

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if χ_1 is associated with ζ_1, then χ_2 is associated with ζ_2"

★ Under formulation in (42), accentual migration does not violate *FLOP-PROM when *V́* lacks a corresponding output vowel.

- Both type 1 and 2 "secondary mobility" **require** this assumption.

Analytic comparison — an autosegmental analysis

- These constraints suffice to capture core data — just substitute *FLOP-PROM ≫ MAX-PROM for ANCHOR-L in constraint ranking established in metrical analysis.

METRICAL: CULM ≫ ANCHOR-L ≫ ALL-FEET-L

↕

AUTOSEGMENTAL: CULM, { *FLOP-PROM ≫ MAX-PROM } ≫ ALL-FEET-L

Analytic comparison — an autosegmental analysis

- These constraints suffice to capture core data — just substitute *FLOP-PROM ≫ MAX-PROM for ANCHOR-L in constraint ranking established in metrical analysis — e.g., preserve underlying accents:

(43)

/pad-á/	*FLOP-PROM	MAX-PROM	ALL-FT-L
a. ☞ pa.(dá)			*
b. (pá.dā)		*!	
c. (pá.dā)	*!		

“Secondary mobility” under an autosegmental analysis

- But this ranking fails to capture type 1 “secondary mobility” in Vedic:

(44)

/arí-as/	*VV	*FLOP	MAX-PROM	ALL-FT-L
a. a.(rí.as)	*!			*
b. (ár.yas)				
c. ☹ ar.(yás)				*!
d. (ár.yas)			*!	

- *FLOP is irrelevant when input *V́* lacks corresponding *V* in output.

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/arí-as/	*VV	*FLOP	MAX-PROM	ALL-FT-L
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- Freed to migrate, the accent is predicted to shift **leftward** as in (b).

“Secondary mobility” under an autosegmental analysis

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/arí-as/	*VV	*FLOP	MAX-PROM	ALL-FT-L
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- But the attested form is (c) with **rightward** reassociation.

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★ Same problem modeling type 3 (see Appendix I for tableau).

Analytic comparison — summary

- Under a metrical representation of lexical accentedness, it is possible to account for:
  - ✓ Stress assignment in Vedic and Hittite inflection in general.
  - ✓ All three types of "secondary mobility" adduced by Kiparsky (2010).
- Under an autosegmental representation of lexical accentedness, it is possible to account for:
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Analytic comparison — summary

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⇒ Analysis of Vedic Sanskrit provides support for a metrical representation of lexical accents.

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⇒ Analysis of Vedic Sanskrit provides support for a metrical representation of lexical accents.

- **Now** — Standard Modern Greek (MG).

Word stress in Modern Greek — basic facts

- Every prosodic word in MG has a single primary stress, which in native lexicon always falls within last three syllables (e.g., Arvaniti 2000:11):

(45)	a.	πάν	[pán]	‘everything’	*σ́*
	b.	γάλα	[ɣá.la]	‘milk’	*σ́σ*
	c.	μάθημα	[má.θi.ma]	‘lesson’	*σ́σσ*
	d.	αμάρτημα	[a.már.ti.ma]	‘error’	*σσ́σσ*
	e.	μυθιστόρημα	[mi.θis.tó.ri.ma]	‘novel’	*σσσ́σσ*

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e.	μυθιστόρημα	[mi.θis.tó.ri.ma]	'novel'	*σσσ́σσ*

- Two complications (ignored here):
  - MG may (or may not) have postlexical rhythmic secondary stress (Arvaniti 1994, 2000, *i.a.*).
  - In antepenultimate-stressed words, clitics induce an additional word-final stress, which is phonetically more prominent than primary stress (Malikouti-Drachman and Drachman 1989, 1991, *i.a.*).

Word stress in Modern Greek — basic facts

- Some lexical items show paradigmatic alternations at left edge of this word-final trisyllabic window — e.g.:

(46)

	NOM.SG	NOM.PL	
a.	μάθημα [má.θi.ma]	μαθήματα [ma.θí.ma.ta]	‘lesson(s)’
b.	αμάρτημα [a.már.ti.ma]	αμαρτήματα [a.mar.tí.ma.ta]	‘error(s)’
c.	μυθιστόρημα [mi.θis.tó.ri.ma]	μυθιστορήματα [mi.θis.to.rí.ma.ta]	‘novel(s)’

Word stress in Modern Greek — basic facts

- But within the trisyllabic window, position of primary stress in MG is phonologically unpredictable — e.g.:

(47)

a.	νόμος	[nó.mos]	'law'	b.	τάξι	[ták.si]	'order'
	νομός	[no.mós]	'county'		ταξί	[tak.sí]	'taxi'
c.	τζάμι	[dzá.mi]	'glass'	d.	πότε	[pó.te]	'when'
	τζαμί	[dza.mí]	'mosque'		ποτέ	[po.té]	'ever'

Word stress in Modern Greek — basic facts

- Empirical focus — masculine and neuter nouns with theme vowel -o-.
- Trisyllabic nouns in this class exhibit four distinct stress patterns:

  (i) ULTIMATE (U): stress fixed on word-final syllable in all inflectional forms.

(48)

	TYPE	M.NOM.SG	M.NOM.PL	GEN.SG	GEN.PL	
a.	U	uran-ós	uran-í	uran-ú	uran-ón	'sky'
b.	PU	fandár-os	fandár-i	fandár-u	fandár-on	'soldier'
c.	APU	klívan-os	klívan-i	klívan-u	klívan-on	'kiln'
d.	MOB	ánθrop-os	ánθrop-i	anθróp-u	anθróp-on	'human'

Word stress in Modern Greek — basic facts

- Empirical focus — masculine and neuter nouns with theme vowel -o-.
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(ii) PENULTIMATE (PU): stress fixed on penultimate syllable in all inflectional forms.

(48)

	TYPE	M.NOM.SG	M.NOM.PL	GEN.SG	GEN.PL	
a.	U	uran-ós	uran-í	uran-ú	uran-ón	'sky'
b.	PU	fandár-os	fandár-i	fandár-u	fandár-on	'soldier'
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Word stress in Modern Greek — basic facts

- Empirical focus — masculine and neuter nouns with theme vowel -o-.
- Trisyllabic nouns in this class exhibit four distinct stress patterns:

(iv) MOBILE (MOB): stress on antepenultimate syllable in NOM.SG/PL, on penultimate syllable in GEN.SG/PL.

(48)

	TYPE	M.NOM.SG	M.NOM.PL	GEN.SG	GEN.PL	
a.	U	uran-ós	uran-í	uran-ú	uran-ón	'sky'
b.	PU	fandár-os	fandár-i	fandár-u	fandár-on	'soldier'
c.	APU	klívan-os	klívan-i	klívan-u	klívan-on	'kiln'
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Word stress in Modern Greek — basic facts

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- Trisyllabic nouns in this class exhibit four distinct stress patterns:

  (i) ULTIMATE (U): stress fixed on word-final syllable in all inflectional forms.

(49)

	TYPE	N.NOM.SG	N.NOM.PL	GEN.SG	GEN.PL	
a.	U	orfan-ó	orfan-á	orfan-ú	orfan-ón	'orphan'
b.	PU	kapél-o	kapél-a	kapél-u	kapél-on	'hat'
c.	APU	ðáxtil-o	ðáxtil-a	ðáxtil-u	ðáxtil-on	'finger'
d.	MOB	θéatr-o	θéatr-a	θeátr-u	θeátr-on	'theatre'

Word stress in Modern Greek — basic facts

- Empirical focus — masculine and neuter nouns with theme vowel -o-.
- Trisyllabic nouns in this class exhibit four distinct stress patterns:

(ii) PENULTIMATE (PU): stress fixed on penultimate syllable in all inflectional forms.

(49)

	TYPE	N.NOM.SG	N.NOM.PL	GEN.SG	GEN.PL	
a.	U	orfan-ó	orfan-á	orfan-ú	orfan-ón	'orphan'
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(iii) ANTEPENULTIMATE (APU): stress fixed on antepenultimate syllable in all inflectional forms.

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	TYPE	N.NOM.SG	N.NOM.PL	GEN.SG	GEN.PL	
a.	U	orfan-ó	orfan-á	orfan-ú	orfan-ón	'orphan'
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c.	APU	ðáxtil-o	ðáxtil-a	ðáxtil-u	ðáxtil-on	'finger'
d.	MOB	θéatr-o	θéatr-a	θeátr-u	θeátr-on	'theatre'

Word stress in MG -o-stems

- Empirical focus — masculine and neuter nouns with theme vowel -o-.
- Trisyllabic nouns in this class exhibit four distinct stress patterns:

(iv) MOBILE (MOB): stress on antepenultimate syllable in NOM/ACC.SG/PL, on penultimate syllable in GEN.SG/PL.

(49)

	TYPE	N.NOM.SG	N.NOM.PL	GEN.SG	GEN.PL	
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b.	PU	kapél-o	kapél-a	kapél-u	kapél-on	'hat'
c.	APU	ðáxtil-o	ðáxtil-a	ðáxtil-u	ðáxtil-on	'finger'
d.	MOB	θéatr-o	θéatr-a	θeátr-u	θeátr-on	'theatre'

Analyzing word stress in MG -o-stems

- Some disagreement (e.g., Protopapas et al. 2006), but general view is that antepenultimate stress is phonologically preferred.
  - Malikouti-Drachman and Drachman (1981, 1989), Ralli and Touratzidis (1992), Drachman and Malikouti-Drachman (1999), Revithiadou (1999, 2007), Burzio and Tantalou (2007), Revithiadou and Lengeris (2016), *i.a.*.

Analyzing word stress in MG -o-stems

- Some disagreement (e.g., Protopapas et al. 2006), but general view is that antepenultimate stress is phonologically preferred.
- NOM forms of MOB -o-stems receive default antepenultimate stress:

(50)	a.	/anθrop-os/	→	[án.θro.pos]	'human'	(NOM.SG)
	b.	/anθrop-i/	→	[án.θro.pi]	'humans'	(NOM.PL)
(51)	a.	/θeatr-o/	→	[θé.a.tro]	'theatre'	(NOM/ACC.SG)
	b.	/θeatr-a/	→	[θé.a.tra]	'theatres'	(NOM/ACC.PL)

Analyzing word stress in MG -o-stems — MOB/NOM

- Some disagreement (e.g., Protopapas et al. 2006), but general view is that antepenultimate stress is phonologically preferred.
- NOM forms of MOB -o-stems receive default antepenultimate stress:

(50)	a.	/anθrop-os/	→	[(án.θro).⟨pos⟩]	‘human’ (NOM.SG)
	b.	/anθrop-i/	→	[(án.θro).⟨pi⟩]	‘humans’ (NOM.PL)
(51)	a.	/θeatr-o/	→	[(θé.a).⟨tro⟩]	‘theatre’ (NOM/ACC.SG)
	b.	/θeatr-a/	→	[(θé.a).⟨tra⟩]	‘theatres’ (NOM/ACC.PL)

- Standard analysis (Malikouti-Drachman and Drachman 1981, 1989; cf. Arvaniti 2000):
  - Right-aligned syllabic trochees
  - Final syllable extrametricality

Analyzing word stress in MG -o-stems — MOB/NOM

- Implementing default antepenultimate requires constraints in (51–54):

  (51) CULMINATIVITY: A prosodic word has exactly one stressed syllable.

  (52) TROCHAIC: Feet have initial prominence.

  (53) NONFINALITY: The head foot of a prosodic word does not fall on the word-final syllable.

  (54) ALL-FEET-RIGHT: Feet must be aligned with right edge of a prosodic word. Assign one violation (*) for each intervening syllable peak.

- Antepenultimate stress emerges when ALL-FT-R is dominated by other markedness constraints:

(55)

/anθrop-os/		CULM	TROCH	NONFIN	ALL-FT-R
a.	an.θro.pos	*!			
b.	(an.θró).pos		*!		*
c. ☞	(án.θro).pos				*
d.	an.(θŕo.pos)			*!	

Analyzing word stress in MG -o-stems — PU

- Deviations from antepenultimate stress are due to the presence of lexical accent(s).
- Nouns with penultimate stress have a left foot edge preceding stem-final vowel:

(56) /fan(tar-os/ → [fan.(dá.ros)] ‘soldier’ (soldier-M.NOM.SG)

- Penultimate stress surfaces if ANCHOR-L dominates NONFINALITY:

(57)

/fan$_i$(tar-os/	CULM	TROCH	ANCH-L	NONFIN	ALL-FT-R
a. fan.$_i$(da.rós)		*!		*	
b. ☞ fan.$_i$(dár.os)				*	
c. $_i$(fán.da).ros			*!		*

Analyzing word stress in MG -o-stems — U/NOM

- Nouns with ultimate (= final) stress are based on POST-ACCENTING roots, which prefer stress to fall on immediately following syllable (cf. Revithiadou 1999, 2007, Drachman and Malikouti-Drachman 1999).
- **Proposal:** POST-ACCENTING roots contain a left foot edge following stem-final vowel:

(58)	a.	/uran(-os/	→ [u.ra.(nós)]	'sky'	(NOM.SG)
	b.	/uran(-i/	→ [u.ra.(ní)]	'skies'	(NOM.PL)
(59)	a.	/orfan(-o/	→ [or.fa.(nó)]	'theatre'	(NOM/ACC.SG)
	b.	/orfan(-a/	→ [or.fa.(ná)]	'theatres'	(NOM/ACC.PL)

Analyzing word stress in MG -o-stems — U/NOM

- Nouns derived from post-accenting roots suggest MG allows unary feet, in violation of FOOTMINIMALITY (cf. Everett 2005):

  (60) /uran$_i$(-i/ → [u.ra.$_i$(ní)] 'skies' (sky-M.NOM.PL)

  (61) FOOTMINIMALITY-σ: Feet must contain at least two syllables.

- Final stress emerges if ANCHOR-L dominates FOOTMINIMALITY:

(62)

uran$_i$(-os		ANCH-L/R	FTMIN	NONFIN	ALL-FT-R
a. ☞	u.ra.$_i$(nós)		*	*	
b.	u.$_i$(rá.nos)	*!		*	
c.	$_i$(ú.ra).nos	*!			*

Analyzing word stress in MG -o-stems — MOB/GEN

- GEN of MOB stems receive penultimate stress due to PRE-ACCENTING inflectional endings, which prefer stress to fall on immediately preceding syllable (cf. Revithiadou 1999, 2007).
- **Proposal:** PRE-ACCENTING endings contain a right foot edge following their initial vowel, preserved due to (modified) ANCHOR-L/R:

(63)	a.	/anθrop-u)/	→	[an.(θró.pu)]	'of the human' (GEN.SG)
	b.	/anθrop-on)/	→	[an.(θró.pon)]	'of humans' (GEN.PL)
(64)	a.	/θeatr-u)/	→	[θe.(á.tru)]	'of the theatre' (GEN.SG)
	b.	/θeatr-on)/	→	[θe.(á.tron)]	'of theatres' (GEN.PL)

(65) ANCHOR-L/R: The left/right edge of every head foot in the input corresponds to the left/right edge of a head foot in the output. Assign a violation (*) if a syllable peak intervenes.

Analyzing word stress in MG -o-stems — MOB/GEN

- Penultimate stress in MOB nouns with pre-accenting endings suggest MG prohibits ternary feet, in keeping with FOOTMAXIMALITY:

  (66) /anθrop-on)$_i$/ → [an.(θró.pon)$_i$] 'humans' (human-GEN.PL)

  (67) FOOTMAXIMALITY-σ: Feet contain no more than two syllables.

- Penultimate stress requires that FOOTMAXIMALITY dominates FOOTMINIMALITY.

(68)

/anθrop-on)$_i$/	FTMAX	ANCH-L/R	FTMIN	NONFIN	ALL-FT-R
a. an.θro.(pón)$_i$			*!	*	
b. ☞ an.(θró.pon)$_i$				*	
c. (án.θro)$_i$.pon		*!			*
d. (án.θro.pon)$_i$	*!			*	

Analyzing word stress in MG -o-stems — APU

- Nouns with fixed antepenultimate stress have a left foot edge preceding penultimate syllable.

  (66) $/_i(\text{klivan-on})_j/ \rightarrow [_i(\text{klí.va})_j\text{non}]$ ‘of kilns’ (kiln-GEN.PL)

- Both lexical accents cannot be satisfied (FTMAX > ANCH-L/R), thus root accent in (a) wins over ending accent in (b) because it better satisfies phonological preference for antepenultimate stress.

(69)

$_i(\text{klivan-on})_j$	FTMAX	ANCH-L/R	FTMIN	NONFIN	ALL-FT-R
a. $_i(\text{klí.va.non})_j$	*!			*	
b. ☞ $_i(\text{klí.va})_j$.non		*			*
c. kli.$_i$(vá.non)$_j$		*		*!	

Analyzing word stress in MG -o-stems — U/GEN

- Nouns based on post-accenting roots retain final stress in GEN forms:

(70) /uran$_i$(-on)$_j$/ → [u.ra.$_i$(non)$_j$] 'of skies' (sky-GEN.PL)

- This pattern emerges from same constraint ranking:

(71)

uran$_i$(-on)$_j$	FTMAX	ANCH-L/R	FTMIN	NONFIN	ALL-FT-R
a. ☞ u.ra.$_i$(nón)$_j$			*	*	
b. u.$_i$(rá.non)$_j$		*!		*	
c. $_i$(ú.ra)$_j$.non		*!*			*

- (a) wins over (b) — better to satisfy both lexical accents with unary foot than just one with a binary foot (ANCH-L/R ≫ FTMIN).

Summary: Word stress in MG -o-stems

- Analysis correctly derives four-way prosodic contrast in MG -o-stems from interplay of:
  - Accentual contrast in roots:

(72)

U	PU	APU	MOB
σσ(	σ(σ	(σσ	σσ

  - Accentual contrast in inflectional endings:

(73)

NOM.SG	NOM.PL	GEN.SG	GEN.PL
/-os, -o/	/-i, -a/	/-u)/	/-on)/

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  - Phonological preference for antepenultimate stress.

★ Also accounts for prosodic phenomena argued to be problematic by Revithiadou (2007).

Word stress in MG neuter nouns in -ί

- MG has a class of neuter nouns with NOM.SG -ί ([-í]) — e.g.:

(74)

	N.NOM.SG	N.NOM.PL	GEN.SG	GEN.PL	
a.	peð-í	peð-j-á	peð-j-ú	peð-j-ón	'child'
b.	nis-í	nis-j-á	nis-j-ú	nis-j-ón	'island'

- This class exhibits morphologically unique prosodic alternation:
  - NOM/ACC.SG has stem-final stress, surfacing on class marker [-í-].
  - In other case forms, class marker undergoes glide formation and stress shifts onto inflectional endings.

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- The puzzle:
  - NOM.PL ending must be unaccented /-a/, since it does not attract stress in MOB stems like (75) (*[θeatr-á], *[aloɣ-á]).

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  - NOM.PL ending must be unaccented /-a/, since it does not attract stress in MOB stems like (75) (*[θeatr-á], *[aloɣ-á]).
  - But it surfaces with non-default stress in (74).

Word stress in MG neuter nouns in -ί

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- Revithiadou (2007) argues alternations in (74) can't be captured under previous approaches to lexical accent (metrical or autosegmental).

  ⇒ Alternative analysis combining COLORED CONTAINMENT (van Oostendorp 2007) and TURBIDITY THEORY (Goldrick 2000).

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- But these alternations fall out straightforwardly from proposed metrical analysis.
  - NOM/ACC.SG ~ NOM/ACC.PL alternations are exactly parallel to Type 1 "secondary mobility" in Vedic (*arí-s* ~ *ary-ás* 'friend(s)').

Analyzing word stress in MG neuter nouns in -í

- Non-default stress on class suffix [-í-] in NOM.SG indicates that it bears a lexical accent:

(76) /peð-$_i$(i-∅/ → [pe.(ði)] 'child' (child-SFX-N.NOM.SG)

(77)

peð-$_i$(i-∅	FtMax	Anch-L/R	FtMin	NonFin	All-Ft-R
a. ☞ pe.$_i$(ði)			*	*	
b. $_i$(pé.ði)		*!		*	

Analyzing word stress in MG neuter nouns in -í

- When stem-final vowel is resyllabified as glide, stress shifts rightward onto unaccented ending:

  (78) /peð-$_i$(i-a/ → [pe.(ðjá)] 'children' (child-SFX-N.NOM/ACC.PL)

- Simplified assumption (see Malikouti-Drachman and Drachman 1990) — glide formation driven by:

  (79) *iV: [i] before a vowel is not permitted in the output.

(80)

peð-$_i$(i-a	*iV	FtMax	Anch-L/R	FtMin	NonFin	All-Ft-R
a. pe.$_i$(ðí.a)	*!				*	
b. ☞ pe.$_i$(ðjá)				*	*	
c. $_i$(pé.ðja)			*!		*	

- Winner (b) satisfies Anchor-L/R by resyllabifying *V́* into onset of head foot.

Discussion

- Analyses employing metrical or autosegmental representations of lexical accentedness make predictions that are broadly similar.
- But these predictions differ when an accented vocalic peak lacks an output correspondent (due to vowel deletion, glide formation, etc.).
- **In this special case, Vedic and Modern Greek support the metrical representation**, providing a principled explanation for simultaneous:
  - ✓ Phonological preference for left edge/antepenultimate stress.
  - ✓ Rightward stress shifts when accented syllable peaks are eliminated in the output.

Discussion

- Languages like MG (and, e.g., Tokyo Japanese) have a four-way synchronic contrast between UNACCENTED, ACCENTED, PRE-, and POST-ACCENTING morphemes.

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- Encoding lexical accents with a single underlying foot edge can provide a unified account of these phenomena.
  - All four types governed by same faithfulness constraint(s) (ANCHOR).
  - Foot shape/rhyme type determined by independent language-specific principles.

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- Encoding lexical accents with a single underlying foot edge can provide a unified account of these phenomena.
- This approach is economical — does not require positing:
  - Lexical feet with empty heads and/or tails (e.g., Inkelas 1999).
  - Lexical prominences autosegmentally linked to empty vowels/grid positions (e.g., Revithiadou et al. 2006; Bogomolets 2020).
  - Distinct representations for post-accenting morphemes (e.g., "unaccentable," Revithiadou 1999), subject to different constraints.
  - Additional assumptions about interface between phonology and morphology (e.g., "morphological color," Revithiadou 2007).

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- Encoding lexical accents with a single underlying foot edge can provide a unified account of these phenomena.
- This approach is economical:
  - Captures insight of Idsardi (1992) (developed in Simplified Bracketed Grid theory; Dresher 2016, *i.a*) that a single left or right boundary is sufficient to define a prosodic grouping, such as a metrical foot.

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- Encoding lexical accents with a single underlying foot edge can provide a unified account of these phenomena.
- This approach is economical.
- Future work:
  - Extending analysis within Vedic Sanskrit and Modern Greek.
  - Further empirical testing — in Indo-European and elsewhere.

Thank you!

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“Secondary mobility” under an autosegmental analysis

- Established ranking also fails to capture type 3 “secondary mobility” in Vedic:

(65)

* * | | ukṣán-ás	CULM	*FLOP	MAX-PR	ALL-FT-L
a. (úk).(ṣnás)	*!			*
b. ☹ uk.(ṣnás)			*	*!
c. 💣 (úk.ṣnas)			*	

- *FLOP is irrelevant when input *V́* lacks corresponding *V* in output.

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- Freed to migrate by deletion, accent predicted to move leftward (in accordance with phonological preference for left edge stress) as in (c).

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c. 💣 (úk.ṣnas)			*	

✗ But the real winner is (b) with stressed inflectional ending.

“Secondary mobility” in Vedic — non-mobility

- Vedic nouns that show type 3 “secondary mobility” in weak prevocalic cases have stem-final stress in weak preconsonantal cases:

(41)

		STRONG		WEAK V		WEAK C	
a.	Ved.	*pitár-as*	:	*pitr-é*	:	*pit̥ŕ-bhis*	(father-NOM.PL/DAT.SG/INS.PL)
b.	Ved.	*mātár-am*	:	*mātr-á́*	:	*māt̥ŕ-ṣu*	(mother-F.ACC.SG/INS.SG/LOC.PL)
c.	Ved.	*sto-tā́r-as*	:	*stotré*	:	*sto-t̥ŕ-bhyas*	(praise-AGT-NOM.PL/DAT.SG/DAT.PL)

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c.	Ved. *sto-tár-as*	:	*stotré*	:	*sto-t̥ŕ-bhyas*	(praise-AGT-NOM.PL/DAT.SG/DAT.PL)

- Deletion of stem-final /á/ in weak cases causes /r/ to vocalize between consonants (Ved. *r̥* = [r̩]).
- Stem-final syllabic consonant attracts stress in preference to accented ending to its right.

  ⇒ Accent associated with deleted stem vowel remains in place when syllable is not eliminated.

Analyzing “secondary mobility” — non-mobility

- Deletion of accented stem-final /á/ in weak preconsonantal cases ending fails to trigger “secondary mobility” — stem retains stress:

(48) Ved. /pi(tar-(bhis/ → *pi.(tŕ̥.bhis)* ‘with the fathers’ (father-M.INS.PL)

(49)

pi$_i$(tar-$_j$(bhis		SSP	CULM	ANCH-L	ALL-FT-L	MAX-V
a.	pi.$_i$(tŕ̥).$_j$(bhís)		*!		***	*
b. ☞	pi.$_{ij}$(tŕ̥.bhis)			*	*	*
c.	pi.tr̥.$_{ij}$(bhís)			*	**!	*
d.	pitr.$_{ij}$(bhís)	*!			*	*
e.	$_{ij}$(pí.tr̥).bhis			**!		*

- Candidate (d) — with deletion and “secondary mobility” as in prevocalic weak cases — satisfies both lexical feet.

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c.	pi.tr̥.$_{ij}$(bhís)			*	**!	*
d.	pitr.$_{ij}$(bhís)	*!			*	*
e.	$_{ij}$(pí.tr̥).bhis			**!		*

- But (d) is ruled out by Vedic requirement that syllable margins to conform to SSP in (50) (⇒ *[tr.]).

(50) SONORITY SEQUENCING PRINCIPLE (SSP): Sonority must increase between syllable margins and the nucleus.

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c.	pi.tr̥.$_{ij}$(bhís)			*	**!	*
d.	pitr.$_{ij}$(bhís)	*!			*	*
e.	$_{ij}$(pí.tr̥).bhis			**!		*

- Winner (b) with fixed stem-final stress preferred to (c) with stressed ending because it better satisfies preference for left edge stress.

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b. ☞	pi.$_{ij}$(tŕ̥.bhis)			*	*	*
c.	pi.tr̥.$_{ij}$(bhís)			*	**!	*
d.	pitr.$_{ij}$(bhís)	*!			*	*
e.	$_{ij}$(pí.tr̥).bhis			**!		*

⇒ Autosegmental analyses overgenerate mobility when deletion occurs in preconsonantal weak cases of type 3 nouns.

Historical development of IE vowel deletion

- A major question thus far unaddressed:

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- A major question thus far unaddressed:
  - **What causes vowel deletion in ancient IE languages?**
- Metrical analysis correctly accounts for stress assignment when deletion applies (and does not), but its motivation has been ignored.
- Starting point — conditions on vowel deletion differ in Hittite and Vedic:
  - In Vedic deletion is morphophonological.
  - In Hittite deletion is phonological (under metrical analysis).

Vowel deletion in Vedic

- To account for vowel deletion in Vedic Kiparsky (2010:146–7) posits:

  (66) ZERO-GRADE (ZG): "/a/ → ∅ before an accented morpheme."

- ZG is conditioned by underlying accents — not surface stress — and so applies whether or not the trigger attracts stress — e.g., (58a) vs. (58b):

(67) a. Ved. /pi(tar-é/ → *pit.(ré)* 'for the father' (father-M.DAT.SG)

b. Ved. /pi(tar-(bhis/ → *pi(tr̥.bhis)* 'with the fathers' (father-M.INSTR.PL)

- Interaction between ZG and stress assignment (i.e., BAP) is a case of COUNTERBLEEDING ON ENVIRONMENT opacity (cf. Baković 2011).
  - If stress were assigned first, it would bleed vowel deletion.

Analyzing “secondary mobility” — non-mobility

- Analysis rightly predicts that when (morphophonological) deletion of accented stem-final /á/ by weak case ending fails to eliminate stem-final σ (i.e., no “secondary mobility”), it retains stress:

(68)

pi$_i$(tar-$_j$(bhis		SSP	CULM	ANCH-L	ALL-FT-L	MAX-V
a.	pi.$_i$(tŕ̥).$_j$(bhís)		*!		***	*
b. ☞	pi.$_{ij}$(tŕ̥.bhis)			*	*	*
c.	pi.tr̥.$_{ij}$(bhís)			*	**!	*
d.	pitr.$_{ij}$(bhís)	*!			*	*
e.	$_{ij}$(pí.tr̥).bhis			**!		*

- Again, leftmost wins — winner (b) with fixed stem-final stress preferred to (c) with mobility because it better satisfies preference for left edge stress with blocked deletion).

Vowel deletion in Hittite

- But in Hittite accented morphemes trigger deletion of a preceding non-high vowel **only if** it allows them to attract stress (Yates 2019a):

(69) a. Hitt. /pi(sen-(as/ → [pis(náːs)] 'of the man' (man-ANIM.GEN.SG)
[*p*]*išnāš*

b. Hitt. /paχː(wen-(i/ → [paχ.(χʷéː.ni)] 'in the fire' (fire-N.LOC.SG)
paḫḫweni

- Expected output for (60b) in a grammar with ZG is *[paχ.(χóː.ni)].
  - If ZG applied, stem-final accented syllable nucleus would not be eliminated (/w/ → /u/ → [o] /__χ) and so would retain stress.
- Hittite evidence is thus consistent with purely phonological deletion:

(70) PRETONIC VOWEL DELETION (PVD): /e, a/ → ∅ / ___ *σ́*
"/e, a/ is deleted before a stressed syllable." (iterative)

Vowel deletion in Hittite

- "Secondary mobility" in Hittite can be captured in classical OT (via "look-ahead") using a metrical representation of accentedness.
- Deletion is driven by (Yates 2019a; cf. Yates 2014):

(71) *PRETONIC-V (*PRE-V́): Unstressed [e, a] ([+syll, −high, −round]) in a pretonic syllable is not permitted in the output.

★ Prediction — deletion occurs in Hittite where it is prosodically optimizing.

Analyzing vowel deletion in Hittite

- Deletion in Hittite predicted if output better satisfies ANCHOR-L.

(72)

$pi_i(sen\text{-}_j(as$		CULM	ANCH-L	ALL-FT-L	*PRE-V́	MAX-V
a.	pi.$_i$(sé:).$_j$(ná:s)	*!		***		
b.	pi.$_{ij}$(sé:.nas)		*!	*		
c. ☞	pis.$_{ij}$(ná:s)			*		*
d.	pi.se.$_{ij}$(ná:s)		*!	**	*	
e.	$_{ij}$(pí:.se).nas		*!*		*	
f.	$_{ij}$(pís.nas)		*!*		*	*

- Crucial comparison — candidates (b) vs. (c):
  - Deletion in (c) allows ANCHOR-L to be fully satisfied, violating only low-ranked MAX-V.

  ⇒ (c) thus preferred to (b) with non-deletion, which violates higher-ranked ANCHOR-L.

Analyzing vowel deletion in Hittite

- Deletion not predicted if output does not better satisfy ANCHOR-L.

(73)

paχːᵢ(wén-ⱼ(i	SSP	CULM	ANCH-L	ALL-FT-L	*PRE-V́	MAX-V
a. paχ.ᵢ(χʷéː).ⱼ(níː)		*!		***		
b. ☞ paχ.ᵢⱼ(χʷéː.ni)			*	*		
c. paχ.ᵢⱼ(χóː.ni)			*	*		*!
d. pax.χo.ᵢⱼ(níː)			**!	**		*
e. ᵢⱼ(pχʷːéː.ni)	*!		*			*
f. ᵢⱼ(páx.χʷe).ni			**!	**		*

- Crucial comparison — candidates (b) vs. (c):
  - Deletion in (c) **still does not allow** ANCHOR-L to be fully satisfied.

⇒ (b) with non-deletion thus preferred to (c), which gratuitously violates MAX-V.

Diachrony of vowel deletion in IE

- **Proposal:** In PIE vowel deletion was stress conditioned, occurring only where it was prosodically optimizing (cf. Yates 2019a,b)
  - Hittite preserves the inherited situation.
  - In PNIE phonological vowel deletion was reanalyzed as a morphophonological process (≈ "Zero-Grade") and extended into new environments (i.e., over-generalized).
- Much more work needed to determine:
  - Precise synchronic conditions for application of vowel deletion in Vedic and other NIE languages.
  - How this "over-generalization" may have occurred diachronically.

“Secondary mobility” in Vedic compounds

- Vedic compounds provide more evidence for metrical analysis with respect to type 1 “secondary mobility.”
- Some Vedic endocentric (“determinative”) compounds show vowel deletion and “secondary mobility” at their right edge — e.g.:

STRONG		WEAK	
vr̥tra-háṇ-am	:	*vr̥tra-ghnáˊ*	‘Vr̥tra-slayer’
			(Vr̥tra-kill-M.ACC/INSTR.SG)

“Secondary mobility” in Vedic compounds

- In such compounds, second member (2M) is regularly stressed in “strong” cases — even when it is unaccented and the first member (1M) is accented, as in (a):

  a. /vrtrá-ghan-am/ → *vr̥tra-háṇ-am* ‘Vr̥tra-killer’

- Per Sandell (2015) 2M attracts stress because it is the morphological head of the compound.
  - But when head itself cannot be stressed because its vowel is deleted — why does inflectional ending attract stress, as in (b)?

  b. /vrtrá-ghan-ā́/ → *vr̥tra-ghn-ā́* ‘with the Vr̥tra-killer’

- Metrical (but not autosegmental) analysis can account for this pattern.

“Secondary mobility” in Vedic compounds

- 2M stress in Vedic endocentric compounds is due to (cf. Sandell 2015):
  - HEADSTRESS$_{CMPD}$: The left edge of a compound’s morphological head must be aligned with the left edge of the word’s head foot. Assign a violation (*) if a syllable peak intervenes.
- For 2Ms to attract stress from accented 1Ms (e.g., /vrtrá–/) requires: HEADSTRESS$_{CMPD}$ ≫ ANCHOR-L.

vr̥t(ra-han-am		CULM	HDSTRESS$_{CMPD}$	ANCHOR-L	ALL-FT-L
a.	vr̥t.(rá).(há.n̥am)	*!			***
b.	vr̥t.(rá.ha).n̥am)		*!		*
c. ☞	vr̥t.ra.(há.n̥am)			*	**

“Secondary mobility” in Vedic compounds

- “Secondary mobility” in compounds emerges from same ranking:

vr̥t(ra-ghan-(ā		CULM	HDSTRESS$_{CMPD}$	ANCHOR-L	ALL-FT-L
a.	vr̥t.(rágh).(nā́)	*!			***
b.	vr̥t.(rá.ghnā)		*!		*
c. ☞	vr̥t.ragh.(nā́)			*	**

- In contrast, autosegmental analysis wrongly predicts that stem accent will surface when head cannot be stressed (= (b) above):