# Simplicity and Explanation in Metrical Typology

Eugene Buckley
University of Pennsylvania

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## Theoretical Desiderata

- Descriptive adequacy
  - can every language be generated?
- Formal simplicity
  - are constraints evaluated locally?
- Typological accuracy
  - are unattested languages impossible?
  - what is the right locus of explanation?



## Trends in Metrical Typology

- Directional foot construction.
  - stepwise iteration
- Gradient alignment in OT.
  - modeling of the iterative approach
- Categorical alignment and Lapse.
  - a simpler theory
  - distinct typological predictions



## Directional Trochees

Pintupi: left to right

( tʲá mu ) ( lìm pa ) ( tʲùŋ ku )
( ṭí ḷi ) ( rì ŋu ) ( làm pa ) tʲu

Warao: right to left

( yà pu ) ( rù ki ) ( tà ne ) ( há se )
e ( nà ho ) ( rò a ) ( hà ku ) ( tá i )



## Gradient Alignment

Pintupi: ALL-FT-LEFT

( ṭí ḷi ) ( rì ŋu ) ( làm pa ) tʲu
0 2 4

* ṭi ( ḷí ri ) ( ŋù lam ) ( pà tʲu )
1 3 5



## Relative Alignment Violations

| | Parse Syllable | All-Ft Left | All-Ft Right |
|---|---|---|---|
| (10)00000 | **!*** | | ***** |
| ☞ (10)(20)(20)0 | * | **,**** | *,***,***** |
| (10)0(20)(20) | * | ***,****!* | **,***** |
| 0(10)(20)(20) | * | *,***,***!** | **,**** |

## Categorical Alignment

- Gradient alignment is massively nonlocal.
  - also not finite state (Eisner, Bíró)
- Alignment has been used both gradiently and categorically.
- All OT constraints should be categorical (McCarthy).
- Produces a better stress typology.



## Previous Nongradient Work

- Eisner (1998)
  - "Primitive Optimality Theory"
  - strictly local constraints
- Kager (2001)
  - emphasis on rhythmic constraints
- McCarthy (2003)
  - all constraints are categorical



## Rhythmic wellformedness

- Categorical alignment of one foot at the left or right edge.
- Generate location of other feet from local properties of lapse and clash.
- Lapses are preferred in certain positions.
  - adjacent to main stress
  - at right edge of domain



## Constraints on Lapses

*LAPSE
No two adjacent unstressed syllables.

*INITIAL-LAPSE
No lapse at the left edge.

LAPSE-AT-PEAK
Lapse must be adjacent to the peak.

LAPSE-AT-END
Lapse must be adjacent to the right edge.



## Right-Edge Lapses

| | |
|---|---|
| Trochees, LR | (σ́ σ) (σ̀ σ) (σ̀ σ)<br>(σ́ σ) (σ̀ σ) (σ̀ σ) σ |
| Trochees, RL | (σ̀ σ) (σ̀ σ) (σ́ σ)<br>σ (σ̀ σ) (σ̀ σ) (σ́ σ) |
| Iambs, LR | (σ σ́) (σ σ̀) (σ σ̀)<br>(σ σ́) (σ σ̀) (σ σ̀) σ |
| * Iambs, RL | (σ σ̀) (σ σ̀) (σ σ́)<br>σ (σ σ̀) (σ σ̀) (σ σ́) |



## Typology: Trochees, ER-L

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| (10)(20)(20)0 | * | | | * | | * |
| (10)(20)0(20) | * | | * | *! | | |
| (10)0(20)(20) | * | | * | | | |
| 0(10)(20)(20) | | | | | * | |

## Typology: Trochees, ER-R

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(20)(20)(10) | | | | | * | |
| (20)0(20)(10) | * | | * | *! | | |
| (20)(20)0(10) | * | | * | | | |
| (20)(20)(10)0 | * | | | | | * |



## Typology: Iambs, ER-L

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| (01)(02)(02)0 | | | | | | * |
| (01)(02)0(02) | * | | * | *! | | |
| (01)0(02)(02) | * | | * | | | |
| 0(01)(02)(02) | * | *! | * | | *! | |



## Typology: Iambs, ER-R

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(02)(02)(01) | * | *! | * | *! | *! | |
| (02)0(02)(01) | * | | * | *! | | |
| (02)(02)0(01) | * | | * | | | |
| (02)(02)(01)0 | | | | | | * |



## Local *LAPSE

Kager (2001):

No two adjacent unstressed syllables. (I.e. *00)

McCarthy (2003):

*σ́ / __ σ́



## Nonlocal *INITIAL-LAPSE

Kager (2001):

No lapse at the left edge.
(I.e. *00 / [ __ )

McCarthy (2003):

*σ́ / $_{Wd}$[ __ σ́



## Replacing *INITIAL-LAPSE

Rule out: [ σ́ ( σ́

Nonlocal lapse avoidance:

*σ́ / $_{Wd}$[ __ σ́

Local foot alignment (categorical):

Align-L (Wd, Ft)

## Differences from *INITIAL-LAPSE

- Same basic force in an iambic system.
  - 0(01) violates both equally
  - if unary 0(1) then only Align-L is violated
  - issue then becomes syllable weight
- Potential difference in a trochaic system.
  - 0(10) violates Align-L but has no lapse
  - increases number of violations, but no effect to typology (as we'll see)



## Nonlocal LAPSE-AT-END

Kager (2001):

Lapse must be adjacent to the right edge. (I.e. If 00 then 00] )

McCarthy (2003):

*σ̆ / __ σ̆ α

where α is non-null



## Replacing LAPSE-AT-END

Rule out: σ̆ ) σ̆ unless __ $]_{Wd}$

Nonlocal lapse avoidance:

*σ̆ / __ σ̆ α

Local foot non-alignment:

*Align-R (Word, Foot)



## Differences from LAPSE-AT-END

- Pushes foot from right edge.
  - lapse there rather than ealier in word
  - equal to extrametricality
- Similar effect for a trochaic system.
  - (10)0 satisfies both equally
  - if unary (1)0 then only Align is violated
  - issue is again syllable weight
- Potential difference in an iambic system.
  - (01)0 satisfies *Align-R and has no lapse
  - could change violations elsewhere in word



## Nonlocal LAPSE-AT-PEAK

Kager (2001):

Lapse must be adjacent to the peak. (I.e. If 00 then 100 or 001)

McCarthy (2003):

*σ̆ / α __ σ̆ β

where α does not end and β does not begin with σ́



## Replacing LAPSE-AT-PEAK

Rule out: σ̆)σ̆(σ̀ , σ̆(σ̆σ̀) , etc.

Nonlocal lapse avoidance:

*σ̆ / α __ σ̆ β where α or β ≠ σ́

Local foot non-alignment:

*Align (Hd(Wd), R; Ft, L) *or L, R*

## Differences from LAPSE-AT-PEAK

- Symmetry not built into *Align constraint, but not needed anyway.
  - main stress foot is at left or right edge, so only the other side can abut a foot
  - potentially distinct if foot extrametricality
- Conceptually, a kind of clash avoidance.
  - foot pushed away from main stress
  - prevents the unfooted syllable — and the lapse — from being in other positions



## Kager: Trochees, ER-L

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| (10)(20)(20)0 | * | | | * | | * |
| (10)(20)0(20) | * | | * | *! | | |
| (10)0(20)(20) | * | | * | | | |
| 0(10)(20)(20) | | | | | * | |



## Local: Trochees, ER-L

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (10)(20)(20)0 | * | | | * | | * |
| (10)(20)0(20) | * | | * | *! | | |
| (10)0(20)(20) | * | | * | | | |
| 0(10)(20)(20) | | | * | * | * | |



## Kager: Trochees, ER-R

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(20)(20)(10) | | | | | * | |
| (20)0(20)(10) | * | | * | *! | | |
| (20)(20)0(10) | * | | * | | | |
| (20)(20)(10)0 | * | | | | | * |



## Local: Trochees, ER-R

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(20)(20)(10) | | | * | * | * | |
| (20)0(20)(10) | * | | * | *! | | |
| (20)(20)0(10) | * | | * | | | |
| (20)(20)(10)0 | * | | | * | | * |



## Kager: Iambs, ER-L

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| (01)(02)(02)0 | | | | | | * |
| (01)(02)0(02) | * | | * | *! | | |
| (01)0(02)(02) | * | | * | | | |
| 0(01)(02)(02) | * | *! | * | | *! | |

## Local: Iambs, ER-L

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (01)(02)(02)0 | | | | * | | * |
| (01)(02)0(02) | * | | * | *! | | |
| (01)0(02)(02) | * | | * | | | |
| 0(01)(02)(02) | * | | * | *! | *! | |



## Kager: Iambs, ER-R

| | *Lapse | *Init Lapse | At End | At Peak | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(02)(02)(01) | * | *! | * | *! | *! | |
| (02)0(02)(01) | * | | * | *! | | |
| (02)(02)0(01) | * | | * | | | |
| (02)(02)(01)0 | | | | | | * |



## Local: Iambs, ER-R

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(02)(02)(01) | * | | * | *! | *! | |
| (02)0(02)(01) | * | | * | *! | | |
| (02)(02)0(01) | * | | * | | | |
| (02)(02)(01)0 | | | | * | | * |



## Extrametricality

- Preference for final lapse is the expression of final extrametricality.
  - Kager's LAPSE-AT-END
  - Local *ALIGN-R
- Many typologies assume that initial extrametricality is impossible.
- It's rare, but not impossible.
  - Symmetrical *ALIGN-L



## Kashaya Extrametricality

li (bu tá:) du

'keep whistling'

ca ($q^h$a má:) (la wi:) (biʔ)

'start to cut downward'

pih (mo yá:) (da du)

'smile while walking around'



## Previous: Trochees, ER-L

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (10)(20)(20)0 | * | | | * | | * |
| (10)(20)0(20) | * | | * | *! | | |
| (10)0(20)(20) | * | | * | | | |
| 0(10)(20)(20) | | | * | * | * | |

## Revised: Trochees, ER-L

| | *Lapse | *Align L | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (10)(20)(20)0 | * | * | | * | | * |
| (10)(20)0(20) | * | * | * | *! | | |
| (10)0(20)(20) | * | * | * | | | |
| 0(10)(20)(20) | | | * | * | * | |

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## Previous: Trochees, ER-R

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(20)(20)(10) | | | * | * | * | |
| (20)0(20)(10) | * | | * | *! | | |
| (20)(20)0(10) | * | | * | | | |
| (20)(20)(10)0 | * | | | * | | * |

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## Revised: Trochees, ER-R

| | *Lapse | *Align L | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(20)(20)(10) | | | * | * | * | |
| (20)0(20)(10) | * | * | * | *! | | |
| (20)(20)0(10) | * | * | * | | | |
| (20)(20)(10)0 | * | * | | * | | * |

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## Previous: Iambs, ER-L

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (01)(02)(02)0 | | | | * | | * |
| (01)(02)0(02) | * | | * | *! | | |
| (01)0(02)(02) | * | | * | | | |
| 0(01)(02)(02) | * | | * | *! | *! | |

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## Revised: Iambs, ER-L

| | *Lapse | *Align L | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| (01)(02)(02)0 | | * | | * | | * |
| (01)(02)0(02) | * | * | * | *! | | |
| (01)0(02)(02) | * | * | * | | | |
| 0(01)(02)(02) | * | | * | * | * | |

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## Previous: Iambs, ER-R

| | *Lapse | | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(02)(02)(01) | * | | * | *! | *! | |
| (02)0(02)(01) | * | | * | *! | | |
| (02)(02)0(01) | * | | * | | | |
| (02)(02)(01)0 | | | | * | | * |

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## Revised: Iambs, ER-R

| | *Lapse | *Align L | *Align R | *Align Hd | Align L | Align R |
|---|---|---|---|---|---|---|
| 0(02)(02)(01) | * | | * | * | * | |
| (02)0(02)(01) | * | * | * | *! | | |
| (02)(02)0(01) | * | * | * | | | |
| (02)(02)(01)0 | | * | | * | | * |



## Changes to Typology

- Two new iambic systems are predicted.
  - 0(01)(02)(02) is Kashaya
  - 0(02)(02)(01) yet to be found?
- Resemble R to L iambs.
  - suggested as rare or impossible
  - just rhythmically disfavored



## Exhaustive Parsing

- So far, strictly binary feet.
- Different predictions if unary feet are present.
  - PARSE-SYL >> FTBIN
- In particular, R to L iambs.
  - 0(02)(02)(01) ruled out by Kager
  - (2)(02)(02)(01) is permitted



## Rhythmic Unary Feet

- Trochees, unary at right edge:
  - no lapse in (10)(20)(20)(2)
  - cf. (10)(20)(20)0
- Iambs, unary at left edge:
  - no lapse in (1)(02)(02)(02)
  - cf. 0(01)(02)(02)
- Asymmetric prediction for Kager with LAPSE-AT-END, symmetric with *ALIGN



## Dual Stress Systems

- Many languages have fixed stress in one position.
  - initial, penultimate, etc.
- A handful have fixed stress in two positions.
  - initial AND penultimate, etc.
  - one primary, the other secondary



## Four Patterns

| | | |
|---|---|---|
| Initial & Final | 2020201<br>22020201 | *Tauya* |
| Initial & Penult | 2202010<br>20202010 | *Biangai* |
| Initial & Final | 1020202<br>10202022 | *Shoshone* |
| Second & Final | 0101012<br>01010102 | *Yupik* |

# Kager: Positions of Clashes

| | Attested | Unattested |
|---|---|---|
| Iambs, RL | (2)(2)(02)(01) | (2)(02)(2)(01) |
| Trochees, RL | (2)(20)(20)(10) | (20)(2)(20)(10) |
| Trochees, LR | (10)(20)(2)(2) | (1)(20)(20)(2) |
| Iambs, LR | (01)(01)(01)(2) | (01)(1)(01)(02) |



# Constraints on Clashes

*CLASH
No two adjacent stressed syllables
= *σ́ / __ σ́

*CLASH-AT-PEAK
No clash involves a stress peak.
= *σ́ / __ Hd( Hd(Wd) ) *(symmetrical)*

CLASH-AT-EDGE
Clash must be adjacent to the left edge.
= *σ́ / α __ σ́ where α is non-null



# Kager's Analysis of Tauya

| | *Clash | *Clash-at-Peak | Clash-at-Edge |
|---|---|---|---|
| (2)(2)(02)(01) | * | | |
| (2)(02)(2)(01) | * | | *! |
| (2)(02)(02)(1) | * | *! | (*) |



# Replacing CLASH-AT-EDGE

CLASH-AT-EDGE
*σ́ / α __ σ́ where α is non-null

- This is nonlocal again.
- So would be "Align-Clash".
- Rethink footing and restrict unary feet to edge position.



# Positions of Unary Feet

| | Attested | Unattested |
|---|---|---|
| now trochaic | (2)(20)(20)(1) | (20)(2)(20)(1) |
| still trochaic | (2)(20)(20)(10) | (20)(2)(20)(10) |
| now iambic | (1)(02)(02)(2) | (1)(2)(02)(02) |
| still iambic | (01)(01)(01)(2) | (01)(1)(01)(02) |



# Local Analysis of Tauya

| | *Clash | Unary-at-Edge |
|---|---|---|
| (2)(20)(20)(1) | * | |
| (20)(2)(20)(1) | * | *! |
| (20)(20)(2)(1) | * | *! |

*Thanks to Lucas Champollion*

# Unary-Foot Analysis

- Don't need CLASH-AT-EDGE.
- Replace *CLASH-AT-PEAK, partly.
- Alignment of unary foot with edge of word.
  - local: refers to adjacent elements
  - or license marked structure at edge
  - unary/binary distinction is crucial in metrical phonology



# Gradient Alignment

Can generate difference between these parsings by re-ranking, but not supported by attested systems.

| | All-Ft Left | All-Ft Right |
|---|---|---|
| ☞ (2)(20)(20)(1) | *,***,***** | *,***,***** |
| (20)(2)(20)(1) | **,***,*****! | *,***,**** |



# Dual-Stress Typology

(Gordon 2002)

| | [σ́ | [σσ́ | σ́σσ] | σ́σ] | σ́] |
|---|---|---|---|---|---|
| [σ̀ | — | 0 | 1 | 6 | 3 |
| [σσ̀ | 0 | — | 0 | 0 | 0 |
| σ̀σσ] | 1 | 0 | — | 0 | 0 |
| σ̀σ] | 3 | 0 | 0 | — | 0 |
| σ̀] | 0 | 0 | 0 | 0 | — |



# Accidental Gaps

- Rarity of dual stress systems in general.
- Avoidance of stress clash.
- Rarity of peninitial and antepenultimate stress.



# Single-Stress Typology

| | [σ́ | [σσ́ | σ́σσ] | σ́σ] | σ́] |
|---|---|---|---|---|---|
| Hyman (1977) | 114 | 12 | 6 | 77 | 97 |
| | 37.3% | 3.9% | 2.0% | 25.2% | 31.7% |
| Gordon (2002) | 57 | 10 | 7 | 53.5 | 59.5 |
| | 30.2% | 5.3% | 3.7% | 28.8% | 32.0% |



# Typological Penumbras

- Example like Kashaya, roughly [σσσ́ , is absent.
- If proportion of [σσ́ : [σσσ́ is similar to σ́σ] : σ́σσ] then expect < 1.
- Anything that occurs **must** be formally possible.
- Something that hasn't been encountered **might** be formally impossible.

## Inside the grammar

- Local constraints
  - no gradient evaluation
- Formal categories
  - foot, (non)head, edge, etc.
- Degrees of freedom
  - left or right headed
  - left or right (non)alignment



## Outside the grammar

- Rhythmic Laws (Kager)
  - Rarefy near peaks
  - Rarefy at the right edge
  - Stress-mark edges
- Iambic/Trochaic Law (Hayes)
  - Uneven iambs, even trochees
- Phonetic
  - Peak followed by trough for HL intonation
- Processing favors left edge



## Conclusions

- Descriptive adequacy
  - coverage of rare cases
- Formal simplicity
  - local constraints
- Typological explanation
  - some patterns formally excluded
  - others just unlikely to arise



## Thanks!

Gene Buckley
Dept of Linguistics
619 Williams Hall
University of Pennsylvania
Philadelphia, PA 19104-6305

gene@ling.upenn.edu