Simplicity and Explanation in Metrical Typology

Eugene Buckley
University of Pennsylvania

NAPhC4 — 13 May 2006

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) (σ́ σ) (σ̀ σ) (σ̀ σ) σ
Trochees, RL	(σ̀ σ) (σ̀ σ) (σ́ σ) σ (σ̀ σ) (σ̀ σ) (σ́ σ)
Iambs, LR	(σ σ́) (σ σ̀) (σ σ̀) (σ σ́) (σ σ̀) (σ σ̀) σ
* Iambs, RL	(σ σ̀) (σ σ̀) (σ σ́) 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):

*σ̆ / __ σ̆

Nonlocal *INITIAL-LAPSE

Kager (2001):

No lapse at the left edge.

(I.e. *00 / [__)

McCarthy (2003):

*σ̆ / $_{Wd}$[__ σ̆

Replacing *INITIAL-LAPSE

Rule out: [σ̆ (σ̆

Nonlocal lapse avoidance:

*σ̆ / $_{Wd}$[__ σ̆

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)			*	*	*	

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	*			*		*

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	*	*		*		*

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)	*		*	*!	*!	

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)	*		*	*	*	

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				*		*

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 22020201	*Tauya*
Initial & Penult	2202010 20202010	*Biangai*
Initial & Final	1020202 10202022	*Shoshone*
Second & Final	0101012 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)(0 2)(0 1)	*		
(2)(0 2)(2)(0 1)	*		*!
(2)(0 2)(0 2)(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)

	[ό	[σό	όσσ]	όσ]	ό]
[ὸ	—	0	1	6	3
[σὸ	0	—	0	0	0
ὸσσ]	1	0	—	0	0
ὸσ]	3	0	0	—	0
ὸ]	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

	[ό	[σό	όσσ]	όσ]	ό]
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 [σσό , is absent.
- If proportion of [σό : [σσό is similar to όσ] : όσσ] 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