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Syntax-Prosody Faithfulness

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1. Introduction: Match as SP:MAX/DEP

Goals:

- On the empirical side, we take up the question why phrase-final prosodic enclisis of function words is impossible in English.

a. **I don't know where Tom's.* (*I don't know where Tom is.*)
b. *Tom's not here.* (*Tom is not here.*)
c. *This book is Tom's.*

1. Introduction: Match as SP:MAX/DEP

- (*Tom's*)$_{\omega}$ is a *bona fide* prosodic word, as shown by (b,c).
- As such, it should be wellformed in any position, including phrase-final, as is the homophonous possessive in (c).

a. **I don't know where Tom's.* (*I don't know where Tom is.*)
b. *Tom's not here.* (*Tom is not here.*)
c. *This book is Tom's.*

Explanation to be pursued here

- Because of wh-movement, [*'s*] in (a)—but not in (b,c)—constitutes an entire syntactic phrase.
- **Non-vacuity**: Every syntactic phrase with overt material is required to have a (non-vacuous) phonological correspondent, which is not the case in (a):

a. **I don't know where Tom's.* (*I don't know where Tom is.*)
b. *Tom's not here.* (*Tom is not here.*)
c. *This book is Tom's.*

1. Introduction: Match as SP:MAX/DEP

's is not a phonological phrase, not even a word or a syllable, and $_{\omega}$(*Tom's*) corresponds to the subject noun phrase, not to the verb phrase.

a. **I don't know where Tom's.* (*I don't know where Tom is.*)
b. *Tom's not here.* (*Tom is not here.*)
c. *This book is Tom's.*

Second goal

The impossibility of phrase-final enclisis needs to be seen in the context of the whole system of cliticization of English, and here a point of theory comes into play:

- The simple non-vacuity explanation informally sketched above has important consequences for the formal theory of Syntax-Prosody (SP) mapping, in particular, for Match Theory (Selkirk 2011; Elfner 2012; Ito and Mester 2013).
- In order for it to go through, it requires a conception of SP-Match constraints that is rather different from the generally accepted one.

SP:MAX and PS:DEP

- The new conception insists merely on the existence of some corresponding (syntactic or prosodic) constituent on the other side, not on exact correspondence.
- It literally belongs to Faithfulness Theory (McCarthy and Prince 1996): Syntax-Prosody-Match is SP:MAX, Prosody-Syntax-Match is PS:DEP.
- As all MAX- and DEP-constraints, these are purely existential and non-gradient.

SP:MAX and PS:DEP

- Details of correspondence, on the other hand, are enforced by other families of constraints that are also already part of the theory, such as classical SP:ALIGN and standard faithfulness (including IDENT, evaluated gradiently).

Outline

- Introducing the theory of Match as SP:MAX/DEP
- Background: Prosodic requirements on left edges
- Right edges: lack of weak phrase-final function words
- Prosodic enclitics: characteristics and basic analysis, and the full explanation for the lack of phrase-final enclisis

Traditional constraints on the syntax-prosody mapping relation

Given in two forms, following

- Alignment Theory (McCarthy and Prince 1993; Selkirk 1996)
- and Match Theory (Selkirk 2011), with a syntactic phrase, XP, corresponding to a prosodic phrase, ϕ.

Traditional constraints on the syntax-prosody mapping relation

Interface constraints	Alignment of E(dge) = Left, Right	Matching
Syntax-to-Prosody Mapping	ALIGN-XP-E: Align (XP, E, ϕ, E)	MATCH-XP: Match (XP, ϕ)
Prosody-to-Syntax-Mapping	ALIGN-ϕ-E: Align (ϕ, E, XP, E)	MATCH- ϕ: Match (ϕ, XP)

- There are equivalent Alignment and Match constraints at the word level, e.g., ALIGN-LEFT-E(LexWd, PrWd) and MATCH(LexWd, PrWd).

Selkirk's Match Theory

Selkirk's (2011, 451) MATCH is actually not a new type of constraint, but simply two-sided ALIGNMENT:

a. Match(α,π) [= SP faithfulness]

The left and right edges of a constituent of type α in the input syntactic representation must correspond to the left and right edges of a constituent of type π in the output phonological representation.

b. Match(π,α) [= PS faithfulness]

The left and right edges of a constituent of type π in the output phonological representation must correspond to the left and right edges of a constituent of type α in the input syntactic representation.

Selkirk's Match Theory

- This alignment-based conception of MATCH seems to call for gradient evaluation, but this has hardly ever been made use of in an essential way, to our knowledge.
- The intention has always gone beyond alignment, and has aimed for prosodic replication of the whole constituent, not just preservation of its edges (see Ishihara 2014).
- But checking on whole-scale correspondence requires the whole set of faithfulness constraints, and is in any case not easily, or profitably, expressed in a single constraint that can be evaluated gradiently.

Moving away from gradience?

Elfner (2012, 28), in a move away from gradience, proposes an all-or-nothing categorical version of MATCH-PHRASE which we might refer to as "exact Match".

MATCH-PHRASE$_T$:

Suppose there is a syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α. Assign one violation mark if there is no phonological phrase (φ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α.

The trouble with MATCH constraints

- As a categorical constraint, MATCH_T is easy to evaluate, but it is unlikely to be workable in real life where standard phonology (such as the Onset requirement) routinely leads to small deviations from perfect correspondence.

The trouble with MATCH constraints

- Any Match constraint, whether in the original formulation or in the revised form, creates a serious redundancy within OT-phonology:
- The theory already contains not only the (semi-)equivalent edge Alignment constraints,
- but also a fully-worked-out subsystem of faithfulness constraints that militates against all conceivable kinds of input-output discrepancies, and syntax-prosody correspondence is just one kind of correspondence relation.

The trouble with MATCH constraints

- There is no need for MATCH constraints to duplicate their work.
- A more radical, and more interesting, theory therefore suggests itself:
- To replace the current conception of MATCH by a purely existential conception.
- Surprise (?): Such existential MATCH constraints turn out to be equivalent to the familiar MAX/DEP constraints of General Correspondence Theory, as applied to the syntax-prosody relation: SP:MAX/DEP.

SP:MAX/DEP

- SP:MAX/DEP constraints require nothing but the existence of a correspondent in the output, which can be utterly different from the input element.
- They are separate from IDENT and other faithfulness constraints, which deal with detailed aspects of correspondence, and from the usual one-sided Alignment constraints.
- We propose to replace the traditional interface constraints by the following.

SP:MAX/DEP

Interface constraints	Alignment of E(dge)=Left, Right	SP-Faithfulness (="existential Matching")
SP-Mapping	ALIGN-XP-E: Align (XP, E, ϕ, E)	SP:MAX-XP MAX (XP, ϕ)
PS-Mapping	ALIGN-ϕ-E: Align (ϕ, E, XP, E)	PS:DEP-ϕ DEP (ϕ, XP)

General scheme of SP-Correspondence constraints

Let *S* be an input syntactic representation and *P* its corresponding output phonological representation.

- SP:MAX A constituent of type α with phonological content in *S* corresponds to some constituent of type π in *P*.
- PS:DEP A constituent of type π in *P* corresponds to some constituent of type α in *S*.

α	π
clause	ι (international phrase)
XP (syntactic phrase)	φ (phonological phrase)
lex(lexical word)	ω (prosodic word)

General scheme of SP-Correspondence constraints

Let *S* be an input syntactic representation and *P* its corresponding output phonological representation.

PS-MAX	A constituent of type **α** with phonological content in *S* corresponds to some constituent of type **π** in *P*.
PS-DEP	A constituent of type **π** in *P* corresponds to some constituent of type **α** in *S*.

α	**π**
clause	ι (international phrase)
XP (syntactic phrase)	φ (phonological phrase)
lex (lexical word)	ω (prosodic word)

General scheme of SP-Correspondence constraints

- The label "*lex*" refers to the broadly shared assumption that in general only lexical words, not function words, project prosodic words.
- This kind of restriction does not hold at the phrasal and clausal levels, where projections of functional heads need to be mapped to prosody just like projections of lexical heads (Elfner 2012).
- For a number of issues that need to be settled regarding the meaning of "clause", see Selkirk 2009 for discussion. The clausal level will not play a role in our analysis here.

Illustration: Word-level correspondence constraints

- Here lexical and functional status are the determining factor.

SP:MAX-*lex*: MAX (*lex*, ω)

A constituent of type *lex* (lexical word) with phonological content in *S* corresponds to some constituent of type ω (prosodic word) in *P*.

PS:DEP-ω: DEP (ω, *lex*)

A constituent of type ω (prosodic word) in *P* corresponds to some constituent of type *lex* (lexical word) in *S*.

(cf. WDCON and PRWDCON of Selkirk 1996)

2. Requirements on left edges: StrongStart

- Since the beginnings of metrical phonology it has been known that left edges of prosodic constituents are subject to more stringent requirements than right edges.
- An example is the initial dactyl requirement in English (Prince 1983, 49): feet/stresses are right-aligned, but words beginning with unfooted/unstressed syllables are avoided: (*Tàta*)*ma*(*góuche*), not **Ta*(*tàma*)(*góuche*).
- Recently, Selkirk (2011, 470) has proposed STRONGSTART, a generalized version of this kind of left edge requirement (informally, "beginnings of prosodic units are strong").

"StrongStart" (informally): "Beginnings of prosodic units are strong."

- STRONGSTART is responsible for a wide variety of prosodically motivated effects, requiring prosodic constituents to start with a bang and not with a whimper:
- **Promotion of initial constituents:** In Xitsonga preposed constituents which would normally be parsed as phonological phrases are boosted into full intonational phrases (see Kisseberth 1994 for the original empirical generalizations; Selkirk 2011, 442–445).

StrongStart effects

Postposing of initial weak elements:

- Clitics are often banned from first position
- and appear in peninitial second position (Wackernagel 1892),
- or are moved to a position later in the sentence, as in Bulgarian (Harizanov 2014) and Irish (Bennett, Elfner, and McCloskey 2016:171).

Deletion of initial weak elements

- In English, initial weak syllables can be deleted (Weir 2012):

  ~~*Have*~~ ~~*you*~~ *got milk?*

  ~~*It's*~~ ~~*a*~~ *nice day today*

- German so-called pronoun zap (Ross 1982; Haider 1986) deletes initial weak elements:

  ~~*Ich*~~ *hab das schon gelesen* '(I) have already read it'

  ~~*Das*~~ *hab ich schon gelesen*. '(that) have I already read'

Modes of resolution deeply embedded in the morphosyntactic system

- For example, the morphosyntactically unmotivated doubling of agreement clitics on unary initial constituents in a dialect of Mixtec (Ostrove 2016)
- in order to create a branching first constituent (cf. also Elordieta 2007).

Versions of STRONGSTART

A number of different versions of STRONGSTART have been proposed. The approach most in line with classical OT derives STRONGSTART effects from downward P-to-P-alignment (see Ito and Mester 1992, 56; McCarthy and Prince 1993, 83):

ALIGN-L (π_n, π_{n-1})

- This is a well-known family of constraints requiring strict succession in the prosodic hierarchy at the beginnings of prosodic units (ϕ to ω, ω to f, etc.).
- This is the approach taken in Werle (2009), who develops an extensive analysis of peninitial clitics in Bosnian, Serbian, and Croatian along these lines.

Requirements on right edges: No weak phrase-final *fnc*—"StrongEnd"?

- There is thus ample crosslinguistic evidence that prosodic constituents optimally start with a strong prominent unit.
- Are similar requirements found at right edges of prosodic constituents?
- Is the ungrammaticality of final enclisis in English (**I don't know where Tom's,* etc.) an effect of a STRONGEND requirement?

3. Requirements on right edges: No weak phrase-final *fnc*—"StrongEnd"?

- A closely related additional fact: the ungrammaticality of reduced *fnc* in phrase-final position (examples after Selkirk 1996, 200).

a. I can eat more than Ray can.	[kæn]	*[kən]	*[kn̩]
b. If you think you can, go ahead and do it.	[kæn]	*[kən]	*[kn̩]
c. I don't know where Ray is.	[ɪz]	*[əz]	*[z]
d. Wherever Ray is, he's having a good time.	[ɪz]	*[əz]	*[z]
e. What did you look at yesterday?	[æt]	*[ət]	
f. Who did you do it for that time?	[fɔr]	*[fr̩]	

No weak phrase-final *fnc*

- Selkirk (1996, 202) captures the data directly by a P-to-P alignment constraint, requiring every phonological phrase to end in a full prosodic word.

ALIGN-RIGHT-ϕ: ALIGN (ϕ, R, ω, R)

S: [*Who did Mary* [$_{VP}$ *look* [$_{PP}$ *at* _]$_{PP}$]$_{VP}$ *last time*]

P: ($_{ϕ}$ *Who did Mary* *look* **(**$_{ω}$ *æt*)$_{\boldsymbol{ω}}$ **)** $_{ϕ}$ ($_{ϕ}$ *last time*)$_{ϕ}$

ALIGN-RIGHT-ϕ

- ALIGN-RIGHT-ϕ crucially dominates PS:DEP-ω, which requires every prosodic word to be grounded in a lexical word.
- The tableau shows that the preposition *at* appears in its (stressed) strong form $_{\omega}[_{f}[_{\sigma}\acute{æ}t]]]$ phrase-finally (a), violating PS:DEP-ω, but in its weak (unstressed) form $[_{\sigma}ət]$ if not phrase-final (d).

ALIGN-RIGHT-ϕ

Who did Mary	[look	at __]	Align-R-ϕ	PS:Dep-ω
►a.	($_{\omega}$look	$_{\omega}$æt)$_{\phi}$		*
b.	($_{\omega}$look	$_{\sigma}$ət)$_{\phi}$	*	
Mary	[looked	at Jim]		
c.	($_{\omega}$looked	$_{\omega}$æt $_{\omega}$Jim) $_{\phi}$		*
►d.	($_{\omega}$looked	$_{\sigma}$ət $_{\omega}$Jim) $_{\phi}$		

ALIGN-RIGHT-ϕ

	Tony [can eat] more than [Ray can__]	ALIGN-R-ϕ	PS:DEP-ω
►a.	Tony $(_{\sigma}$kən $_{\omega}$eat$)_{\phi}$ more than $(_{\omega}$Ray $_{\omega}$kǽn$)_{\phi}$		*
b.	Tony $(_{\omega}$kǽn $_{\omega}$eat$)_{\phi}$ more than $(_{\omega}$Ray $_{\omega}$kǽn$)_{\phi}$		**
c.	Tony $(_{\sigma}$kən $_{\omega}$eat$)_{\phi}$ more than $(_{\omega}$Ray $_{\sigma}$kən$)_{\phi}$	*	
d.	Tony $(_{\omega}$kǽn $_{\omega}$eat$)_{\phi}$ more than $(_{\omega}$Ray $_{\sigma}$kən$)_{\phi}$	*	*

- Candidates (ab) both fulfill higher-ranking alignment, but (a) has fewer violations of PS:DEP-ω (only one prosodic word not rooted in a lexical word), and emerges as the winner.

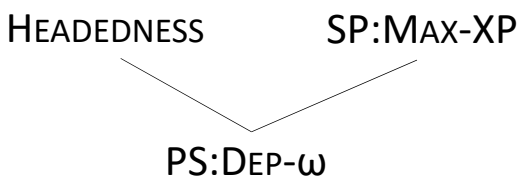
Problems with ALIGN-RIGHT-ϕ

- Although the right-alignment analysis demanding full prosodification at constituent ends can produce the correct outputs, the ALIGN-R-ϕ constraint strikes a strangely discordant "StrongEnd" note.
- The problem is that it sits uneasily not with STRONGSTART in any of its versions, but with NONFINALITY and other constraints (such as Spaelti's (1994) FINALWEAKEDGE) that favor prosodically weak ends of constituents.

Problems with ALIGN-RIGHT-ϕ

- Can we do better than resorting to a constraint directly strengthening the end of prosodic units, by alignment or other means that run afoul of the evidence from phonetics and psycholinguistics that has accumulated over the years since Beckman (1997), Smith (2002), etc.?
- No reference to ends of prosodic units is necessary in SP-Correspondence Theory. MAX-XP and HEADEDNESS (Ito and Mester 1992, 37; see also Selkirk 1996, 190) requiring a prosodic unit π_n to contain a head π_{n-1}, can simply take over what the alignment constraint did but without any reference to edges of prosodic constituents.

No reference to ends of prosodic units necessary in SP-Correspondence Theory



No reference to ends of prosodic units necessary in SP-Correspondence Theory

What did Mary	$_{VP}$[look	$_{PP}$[at ___]]	HEADED-NESS	SP: MAX-XP	PS: DEP-ω
▶	$_{\phi}$($_{\omega}$look	$_{\phi}$($_{\omega}$æt))			*
	$_{\phi}$($_{\omega}$look	$_{\phi}$($_{\sigma}$ət))	*		
	$_{\phi}$($_{\omega}$look	$_{\omega}$æt)		*	*
	$_{\phi}$($_{\omega}$look	$_{\sigma}$ət)		*	

No reference to ends of prosodic units necessary in SP-Correspondence Theory

- MAX-XP requires $_{PP}$[*at* __], as well as $_{VP}$[*look at*], to correspond to a ϕ, with the result that recursive ϕ-structure emerges as the winner.
- HEADEDNESS requires the lone *at* in a ϕ to be a full prosodic word, violating PS:DEP-ω; the choice of the strong allomorph of the function word therefore follows from SP-Correspondence Theory itself.

So what about the "Strong End" effect?

- No recourse is needed to any "StrongEnd" (right-alignment) constraint, which, in hindsight, was merely a descriptive observation in the guise of a good-looking (but misguided) formal alignment constraint.
- The SP-constraint, on the other hand, has no edge reference, and only cares about the existence of the appropriate correspondent.

Assumptions about phrase structure

- In conformity with the Inclusiveness Condition of Bare Phrase Structure (Chomsky 2007; 2008; 2013), we assume that there are no bar levels distinctions in syntactic representations, hence no T'/T'' distinction.

  I can eat more than [$_{T}$ *Michelle* [$_{T\ T}$*can* __]].

- In order to stay with familiar terminology, we refer to all projections of X as "XP", making no distinctions in bar level.

Assumptions about phrase structure

- The most natural interpretation of SP:MAX-constraints then is one that applies them to all projections, including auxiliary-verb structures such as *can eat* that are "intermediate pro-jections" of T in traditional understanding.

I can eat more than...	$_{TP}$[$_{DP}$ [Michelle]	$_{TP}$[can__]]	HEADED-NESS	SP: MAX-XP	PS: DEP-ω
▶a.	$_{\phi}$($_{\phi}$($_{\omega}$Michelle)	$_{\phi}$($_{\omega}$kæn))			*
b.	$_{\phi}$($_{\omega}$Michelle)	$_{\phi}$($_{\omega}$kæn)		*	*
c.	$_{\phi}$($_{\phi}$($_{\omega}$Michelle)	$_{\phi}$($_{\sigma}$kən))	*		
d.	$_{\phi}$($_{\omega}$Michelle	$_{\omega}$kæn)		**	*
e.	$_{\phi}$($_{\omega}$Michelle	$_{\sigma}$kən)		**	

- The recursive structure (a) wins over the flat structure (b) because the higher TP has a correspondent ϕ.
- Since the domain of the rhythm rule is usually taken to be φ, the phonological phrase (Hayes 1984), one might argue that its nonapplication in this case (*Michèlle cán*, not **Mìchelle cán*) favors the flat structure.
- But this is not probative if the domain of the rhythm rule is in fact ϕ_{min} (see Elordieta 2015; Selkirk and Lee 2015 for recent overviews of recursive category structure in phonology).

I don't know where...	$_{TP}[_{DP}$[Ray]	$_{TP}$[is__]]	HEADED-NESS	SP: MAX-XP	PS: DEP-ω
▶	$_{\phi}($ $_{\phi}($ $_{\omega}$Ray)	$_{\phi}($ $_{\omega}$íz))			*
	$_{\phi}($ $_{\omega}$Ray)	$_{\phi}($ $_{\omega}$íz)		*	*
	$_{\phi}($ $_{\phi}($ $_{\omega}$Ray)	$_{\phi}($ $_{\sigma}$əz))	*		
	$_{\phi}($ $_{\omega}$Ray	$_{\omega}$íz)		*	*
	$_{\phi}($ $_{\omega}$Ray	$_{\sigma}$əz)		*	
Compare:	**$_{TP}[_{DP}$[Tim]**	**$_{TP}$[is leaving]]**			
▶	$_{\phi}($$_{\phi}($$_{\omega}$Tim)	$_{\phi}($ $_{\sigma}$əz $_{\omega}$leaving))			
	$_{\phi}($$_{\phi}($$_{\omega}$Tim)	$_{\phi}($ $_{\omega}$íz $_{\omega}$leaving))			*

Remaining question here

- Are there other cases where ALIGN-R(ϕ,ω) ("StrongEnd") is actually needed in English and elsewhere—because the function word does not constitute a syntactic XP all by itself?
- Or can we here also affirm the validity of ANCHOR-AWAY (Nelson 1998)?

Interim summary

- Summarizing so far, English has a large number of prosodic proclitics (*fnc* lex): *to* go, *the* student, *can* meet, etc.
- In phrase-final position, function words cannot appear in their weak form
- because they are the only representative of a whole syntactic phrase, and Headness requires them to be full prosodic words.
- Elements that are prosodic enclitics are not possible.

Interim summary

- Not dealt with here: There is a small number of (lex *fnc*) structures like *see ya* (V-obj pro, enclitic to verb) which can occur in any position, including phrase-finally.
- This exception is only apparent because these are specific morphosyntactic enclitics (see Selkirk 1996) that are restricted as to their host, which has to be verbal.
- What remains to be explained is prosodic enclisis, which is not morphosyntactically restricted to hosts of a specific category, but which cannot occur in phrase-final position (**Tell me where Tom's*).

4. Prosodic enclisis

English has half a dozen special forms of auxiliaries that show enclisis:

Ted's right.	*Ted is right.*
Ted's already left.	*Ted has already left.*
Ted'll help us.	*Ted will help us.*

Prosodic enclisis

Enclitic auxiliaries are single consonants and hence subsyllabic, and they do not have a morphosyntactic subcategorization frame.

is **'s**	am **'m**	have **'ve**	will **'ll**
has **'s**	are **'re**	had **'d**	would **'d**

Characteristics of prosodic enclitics

- The substantial work on the clitic system of English done in the 1970's by Zwicky, Selkirk, Kaisse, and others uncovered most of the characteristics.
- They are subsyllabic in size (single consonants)
- There is a proper subset relation (wherever reduced auxiliaries can occur, corresponding full verbs can occur as well, but there are contexts where only the full form is possible)

Characteristics of prosodic enclitics

- This is allomorphy, not productive phonology: Enclitic auxiliaries are lexically listed allomorphs, not the results of general phonological reduction (Kaisse 1983, 94–95);
  - For example, while *would, could,* and *should* all have reduced forms ([wəd, kəd, ʃəd]), only *would* has the idiosyncratic monoconsonantal form ['d]: *I'd rather be home.*

Characteristics of prosodic enclitics

- In terms of their position, enclitic auxiliaries are adjoined to the final syllable of the preceding word, just like the exponent of the plural/3sg/possessive morphemes:

is/has	*Matt'*[s] *gone, but Tom*'[z] *here, and Bruce*'[əz] *on his way*
plural	*cat*[s], *home*[z], *buss*[əz]
3sg	*fit*[s], *come*[z], *miss*[əz]
poss	*Matt'*[s], *Tom'*[z], *Bruce'*[əz] *car*

Characteristics of prosodic enclitics

- Enclitic auxiliaries are prosodic, not morphosyntactic, enclitics because there is no restriction on the host (i.e., it can attach to any preceding word irrespective of category):

has *The man you met's just arrived.*
is *The man you met's making an awful fuss.*

Characteristics of prosodic enclitics

- This holds in full generality only for *is* and *has* and their monoconsonantal form *'s*, and we restrict ourselves to these here.
- The most important feature of enclitic auxiliaries is that they are prosodically deficient variants of full forms, consisting of a single consonant.
- A single consonant, especially an obstruent, cannot constitute a syllable in English, hence also cannot be a foot, or a prosodic word on its own.

Characteristics of prosodic enclitics

- Disregarding their syntactic affiliation, prosodic enclitics go with the word on their left, even if they are syntactically more closely related to the material on their right.
- Note the mismatch of the syntactic and the prosodic parse of ***'s*:**

S: [$_{NP}$[*Tim*] $_{TP}$[***'s*** *leaving*]]

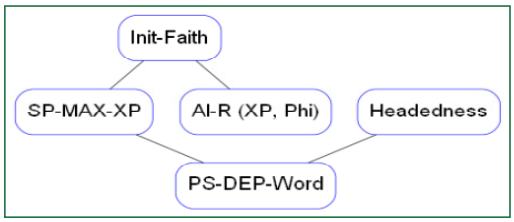
P: $_{\iota}$($_{\phi}$($_{\omega}$($_{f}$ ($_{\sigma}$(*Tim****'s***))))) ($_{\phi}$($_{\omega}$($_{f}$($_{\sigma}$(*lea*)$_{\sigma}$(*ving*)))))

Constraints

INIT-FAITH	The beginning of a prosodic word is faithful to the beginning of the corresponding lexical word.
SP: MAX-XP	A syntactic phrase corresponds to a phonological phrase.
AL-R (XP, Φ)	The right edge of a syntactic phrase corresponds to the right edge of a phonological phrase

Constraints

HEADED-NESS	A prosodic category at level i immediately dominates a head at level i-1 or i.
PS: DEP-ω	A prosodic word corresponds to a lexical word.



Correspondence Analysis

		NP[Tim]	TP['s leaving]	INIT-FAITH	SP: MAX-XP	AL-R(XP,Φ)	HEADEDNESS	PS: DEP-ω
a.	▶	ϕ(ω Tim's)	ϕ(ω leaving)			*		
b.		ϕ(ω Tim)	ϕ(ω 'sleaving)	*				

- The winning candidate (a) parses the TP-initial *'s* with the subject, but fulfills SP:Max-XP for both NP and TP, just as (b).
- It beats the more faithful candidate (b) that preserves *'s* in ϕ-initial position by parsing it at the beginning of a prosodic word, violating standard positional faithfulness INITIAL-FAITH.

(To save space, we will from now on suppress the outermost phrase corresponding to the whole sentence in all candidates).

CorrespondenceAnalysis

- Compare the analysis of enclitic monoconsonantal *'s* (a), which cannot be parsed ω-initially, with that of proclitic reduced *əs* in (c), which receives a faithful ϕ-initial parse by the same constraint hierarchy:

		NP[Tim]	TP['s leaving]	INIT-FAITH	SP: MAX-XP	AL-R (XP,Φ)	HEADED-NESS	PS: DEP-ω
a.	▶	ϕ(ω Tim's)	ϕ(ω leaving)			*		
b.		ϕ(ω Tim)	ϕ(ω 'sleaving)	*				
		NP[Tim]	**TP[is leaving]]**					
c.	▶	ϕ(ω Tim)	ϕ (σəs ω leaving)					
d.		ϕ(ω Tim)	ϕ (ωìs ω leaving)					*

5. The argument for the Correspondence Theory with SP:MAX-XP

- So far, SP:MAX-XP and the traditional MATCH select the same winners.
- We now turn to the phrase-final enclitics where the difference emerges, pointing to the advantages of SP:MAX-XP.

No phrase-final enclisis

Some examples (after Anderson 2008) of the phenomenon:

Tim's happier than Kim is/'s __. John is taller than Harry is/*'s __.*

John has known Mary longer than Fred has/'s __Martha.*

Who do you think you are/'r __?*

Fred's an Independent: he'd no more campaign for a Democrat than he would/'d __ for a Republican*

John is happier with their marriage than his wife ìs/'s __.*

No phrase-final enclisis

- Selkirk (1996, 198, footnote 5) observes that

> "[i]t is an interesting fact that these contracted forms are only possible if they are *not* phrase-final […]. The atypical prosodic encliticization that they display must somehow reflect this fact. For now, this remains a puzzle."

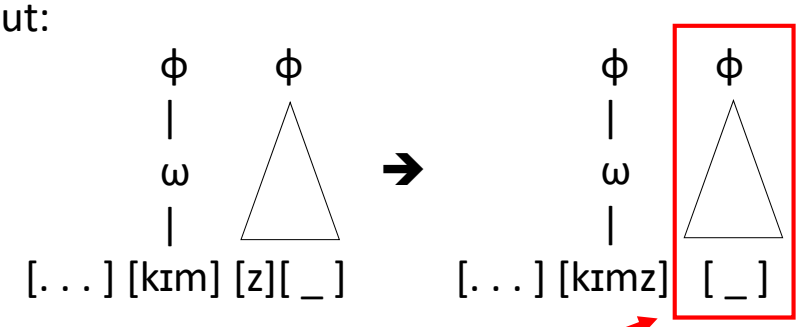
No phrase-final enclisis

a. $[_{TP}$ is happier]
b. $[_{TP}$'s happier]
c. $[_{TP}$ is __]
d. *$[_{TP}$'s __]

- Anderson (2008) observes that the TP's in (a-c) are wellformed, but not the TP consisting just of the monoconsonantal (d).
- This is in itself unremarkable since it holds for basic syllabic reasons.

No phrase-final enclisis

The real question is why the simple phonological adjustment of reassigning the lone *'s* to the preceding phrase is also not a way out:



Anderson's idea: The problem lies here.

No phrase-final enclisis

- Taking up an idea first raised by Selkirk (1984, 366), Anderson's (2008, 11) insight is to interpret the impossibility of final enclisis of *'s* not as an idiosyncratic quirk of Modern English that could easily be changed, but rather as a reflection of a fundamental principle:
- The result of the phonological adjustment would be that the ϕ originally built over the phonetic material corresponding to the TP would now be left with no phonetic content at all.
- This is impossible.

No phrase-final enclisis

- We state the ban on prosodic vacuity in a preliminary form as a principle:

  *[$_{\phi}$ Ø]: Phonetically empty PPhrases are disallowed.

- and will then derive it from Syntax-Prosody Correspondence Theory.

Ban on prosodic vacuity

- The ban on prosodic vacuity has been argued by Kandybowicz (2015) to motivate a kind of *do*-support (*ye* 'do, make') in Asante Twi.
- Our question now is how to derive the ban on prosodic vacuity in our analysis.

Ban on prosodic vacuity

As things stand, the candidate with enclisis of *'s* is the winner in (b) since SP:MAX-XP is ranked too low to prevent this.

a. Tim's leaving if	$_{NP}$[Kim]	$_{TP}$[is__]	HEADED -NESS	SP: MAX-XP	Align-R (XP,ϕ)	PS: DEP-ω
correct ►	$_{\phi}$(Kim)	$_{\phi}$($_{\omega}$ìs)				*
	$_{\phi}$(Kim)	$_{\phi}$ ($_{\sigma}$əs)	*			
	$_{\phi}$($_{\omega}$ Kim	$_{\omega}$ìs)		*$_{TP}$	*$_{NP}$	*
	$_{\phi}$($_{\omega}$Kim	$_{\sigma}$əs)		*$_{TP}$	*$_{NP}$	
b. Tim's leaving if	**$_{NP}$[Kim]**	**$_{TP}$['s __]**				
wrong winner ►!!!	$_{\phi}$(Kim's)	Ø		*$_{TP}$	*$_{NP}$	
	$_{\phi}$(Kim)	$_{\phi}$('s)	*			

6. The solution: Allomorph priority

- In *allomorph priority*, all allomorphs enter the same competition, so /is/ and /'s/ are allomorphs of one morpheme that compete with each other in the same derivation, and ceteris paribus the second beats the first.
- PRIORITY (Mascaró 1996) (or some economy constraint), preferring /'s/ to /is/, is fulfilled by candidates with enclitic *'s* (e.g., *Kim's*) but violated by candidates with reduced and nonreduced vowels.
- For an alternative approach using M-PARSE, see Ito and Mester (2018).

The solution: Allomorph priority

- Optionality arises through lack of ranking between two constraints, here by ALIGN-R >> PRIORITY in (a), and PRIORITY >> ALIGN-R in (b).

a.	$_{NP}$[Kim]	$_{TP}$[is/'s leaving]	HEADED-NESS	SP: MAX-XP	ALIGN-R (XP,ϕ)	PRIORITY: 's > is	PS: DEP-ω
▶	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\sigma}$əs $_{\omega}$leaving)				*	
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\omega}$ìs $_{\omega}$leaving)				*	*
	$_{\phi}(_{\omega}$Kim's)	$_{\phi}(\ _{\omega}$leaving)			*$_{NP}$		

b.	$_{NP}$[Kim]	$_{TP}$[is/'s leaving]	HEADED-NESS	SP: MAX-XP	PRIORITY: 's > is	ALIGN-R (XP,ϕ)	PS: DEP-ω
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\sigma}$əs $_{\omega}$leaving)			*		
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\omega}$ìs $_{\omega}$leaving)			*		*
▶	$_{\phi}(_{\omega}$Kim's)	$_{\phi}(\ _{\omega}$leaving)				*$_{NP}$	

Sentences with gaps

- Sentences with gaps, however, incur SP:MAX violations.
- So for an input such as

  Tim's leaving if Kim [*is/'s* __]

  the competition is over before allomorph variation arises, and the outcome [...] *Kim ìs* wins with either ranking.

Sentences with gaps

a.	… $_{NP}$[Kim]	$_{TP}$[is/'s _]	HEADED-NESS	SP: MAX-XP	ALIGN-R (XP,ϕ)	PRIORITY: 's > IS	PS: DEP-ω
▶	$_{\phi}$($_{\omega}$Kim)	$_{\phi}$($_{\omega}$ìs)				*	*
	$_{\phi}$($_{\omega}$Kim)	$_{\phi}$($_{\sigma}$əs)	*				
	$_{\phi}$($_{\omega}$Kim's)			*$_{TP}$	*$_{NP}$		
b.	**… $_{NP}$[Kim]**	**$_{TP}$[is/'s _]**	**HEADED-NESS**	**SP: MAX-XP**	**PRIORITY: 's > IS**	**ALIGN-R (XP,ϕ)**	**PS: DEP-ω**
▶	$_{\phi}$($_{\omega}$Kim)	$_{\phi}$($_{\omega}$ìs)			*		*
	$_{\phi}$($_{\omega}$Kim)	$_{\phi}$($_{\sigma}$əs)	*				
	$_{\phi}$($_{\omega}$Kim's)			*$_{TP}$		*$_{NP}$	

How does traditional MATCH fare?

- High-ranked SP:MAX-XP correctly predicts the sole winning candidate, and phrase-final *Kim's* is not a possible outcome.
- Since allomorph priority is crucial in this explanation of the impossibility of phrase-final enclisis, it is reasonable to ask how traditional Match Theory would fare with *Allomorph Priority.*
- In order to derive the *is/'s* variation for sentences like *Kim is/'s leaving*, MATCH-PHRASE (preferring *is*) and PRIORITY (preferring *'s*) must be unranked, so that both outputs are admitted as winning candidates, just as the correspondence-theoretic SP:MAX-XP analysis.

How does traditional MATCH fare?

- Here is the result. Everything work fine for sentences without gaps.

a.	$_{NP}$[Kim]	$_{TP}$[is/'s leaving]	HEADED-NESS	MATCH-PHRASE	PRIORITY: 's > IS	MATCH-ω
▶	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\sigma}$əs $_{\omega}$leaving)			*	
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\omega}$ìs $_{\omega}$leaving)			*	*
	$_{\phi}(_{\omega}$Kim's)	$_{\phi}(\ \ _{\omega}$leaving)		*$_{NP}$ *$_{TP}$		
b.	$_{NP}$[Kim]	$_{TP}$[is/'s leaving]	HEADED-NESS	PRIORITY: 's > IS	MATCH-PHRASE	MATCH-ω
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\sigma}$əs $_{\omega}$leaving)		*		
	$_{\phi}(_{\omega}$Kim)	$_{\phi}(_{\omega}$ìs $_{\omega}$leaving)		*		*
▶	$_{\phi}(_{\omega}$Kim's)	$_{\phi}(\ \ _{\omega}$leaving)			*$_{NP}$ *$_{TP}$	

How does traditional MATCH fare?

- The problem is that with the same unranked constraints, phrase-final *'s* again emerges as the wrong winner with the ranking in (b).

a.	… $_{NP}$[Kim]	$_{TP}$[is/'s _]	HEADED-NESS	MATCH-PHRASE	PRIORITY: 's > IS	MATCH-ω
▶	$_{\phi}(_{\omega}$Kim)	$_{\phi}(\ _{\omega}$ìs)			*	*
	$_{\phi}(\ _{\omega}$Kim)	$_{\phi}(_{\sigma}$əs)	*			
	$_{\phi}(_{\omega}$Kim's)			*$_{NP}$ *$_{TP}$		
b.	… $_{NP}$[Kim]	$_{TP}$[is/'s _]	HEADED-NESS	PRIORITY: 's > IS	MATCH-PHRASE	MATCH-ω
	$_{\phi}(\ _{\omega}$Kim)	$_{\phi}(\ _{\omega}$ìs)		*		*
	$_{\phi}(\ _{\omega}$Kim)	$_{\phi}(_{\sigma}$əs)	*	*		
wrong winner ▶ !!!	$_{\phi}(\ _{\omega}$Kim's)				*$_{NP}$ *$_{TP}$	

How does traditional MATCH fare?

- Different from the correspondence SP:MAX-XP analysis, the unintended variation continues with the MATCH-PHRASE analysis.
- One might surmise that the situation would improve by adding ALIGN-R unranked with PRIORITY (just as in the successful MAX-XP analysis), and indeed it does, with Match-Phrase blocking phrase-final enclisis in (b) <*Tim's leaving. I wonder if*> *if Kim*'s.*

How does traditional MATCH fare?

a.	… $_{NP}$[Kim]	$_{TP}$[is/'s _]	HEADED-NESS	MATCH-PHRASE	ALIGN-R (XP,ϕ)	PRIORITY: 'S > IS	MATCH-ω
▶	$_{ϕ}$($_{ω}$Kim)	$_{ϕ}$($_{ω}$ìs)				*	*
	$_{ϕ}$($_{ω}$Kim)	$_{ϕ}$($_{σ}$əs)	*				
	$_{ϕ}$($_{ω}$Kim's)			*$_{NP}$ *$_{TP}$	*$_{NP}$		
b.	… $_{NP}$[Kim]	$_{TP}$[is/'s _]	HEADED-NESS	MATCH-PHRASE	PRIORITY: 'S > IS	ALIGN-R (XP,ϕ)	MATCH-ω
▶	$_{ϕ}$($_{ω}$Kim)	$_{ϕ}$($_{ω}$ìs)			*		*
	$_{ϕ}$($_{ω}$Kim)	$_{ϕ}$($_{σ}$əs)	*		*		
	$_{ϕ}$($_{ω}$Kim's)			*$_{NP}$ *$_{TP}$		*$_{NP}$	

How does traditional MATCH fare?

- But now there is no variation in the winner for

  <I wonder if> Kim is/'s leaving.

  either, even when the enclitic *is* not phrase-final.

How does traditional MATCH fare?

a.	NP[Kim]	TP[is/'s leaving]	HEADED-NESS	MATCH-PHRASE	ALIGN-R (XP,ϕ)	PRIORITY: 's > IS	MATCH-ω
▶	ϕ(ω Kim)	ϕ(σəs ω leaving)				*	
	ϕ(ω Kim)	ϕ(ωɨs ω leaving)				*	*
	ϕ(ω Kim's)	ϕ(ω leaving)		*NP *TP	*NP		

wrong winner

b.	NP[Kim]	TP[is/'s leaving]	HEADED-NESS	MATCH-PHRASE	PRIORITY: 's > IS	ALIGN-R (XP,ϕ)	MATCH-ω
▶ !!!	ϕ(ω Kim)	ϕ(σəs ω leaving)			*		
	ϕ(ω Kim)	ϕ(ωɨs ω leaving)			*		*
	ϕ(ω Kim's)	ϕ(ω leaving)		*NP *TP		*NP	

How does traditional MATCH fare?

- The reason: The desired winner still violates MATCH-PHRASE, which is violated both by $_{\phi}(\ _{\omega}$*Kim's*), which does not exactly match $_{NP}$[*Kim*], and by $_{\phi}(_{\omega}$*leaving*), which does not exactly match $_{TP}$[*'s leaving*].
- If MATCH-PHRASE was defined as purely existential, then there would be no violation of MATCH- PHRASE, and we would get variation—
- but that is exactly what correspondence theoretic SP:MAX-XP already does.

7. Conclusion

- By insisting that syntactic constituents must in some form be matched in prosody, the theory developed here provides very simple explanations
  - for positions where weak elements must appear in their strong form—because otherwise a phonological phrase would have no head—, and
  - for positions where a functional element cannot undergo enclisis—because if it did, a whole syntactic constituent would go unmatched.

Conclusion

- In order for this explanation to go through, MATCH constraints must literally be part of Correspondence Theory and have a purely existential force, and merely insist on the existence of a prosodic correspondent to a syntactic phrase.
- They are part of Faithfulness Theory: SP-Faithfulness (MAX and DEP).
- Detailed correspondence falls to other faithfulness constraints and standard alignment constraints.

Conclusion

- In separating Match itself from the details of syntax-prosody correspondence, the theory argued for here has some similarities to the two-stage view of prosodic structure formation couched in Minimalism developed in Selkirk and Lee (2015), Selkirk (2017), and Kratzer and Selkirk (2018).
- It distinguishes a phase-based "Spell-Out-by-Match" from the phonology proper, which incorporates prosodic structure faithfulness constraints, in a division of labor reminiscent of the proposal made here.

Conclusion

- We couch our proposal within classical parallel OT for three reasons.
- First, we have not encountered any evidence for the need for a serial theory, and the parallelism of classical OT appears to be the simplest and therefore best choice.
- Secondly, Cheng and Downing (2012) have raised grave doubts about the sheer feasibility of a phase-based "spell-out" conception of the syntax-prosody mapping (on the basis of data from Bantu), whereas a standard alignment-based mapping accounts for all the data straightforwardly.

Conclusion

- Thirdly, a feed-forward phase-based "Spell-Out-by-Match" does not have the means to perform the kind of two-directional simultaneous optimization that we have seen at work in our proposal, where SP:MAX constraints directly compete with PS-DEP constraints.

8. Appendix: Factorial typology

We assess the predictions of the core of the analysis by studying the factorial typology of the system consisting of representative inputs and five constraints, as produced in OTWorkplace (Prince, Tesar, and Merchant, https://sites.google.com/ site/otworkplace/).

Inputs

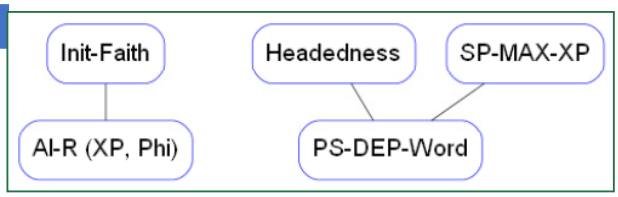
	Inputs:
a.	[[Ray] [can]] / *I can eat more than* __
b.	[[Ray] [is]] / *I don't know where* __
c.	[[Tim] [is leaving]]
d.	[[Tim] ['s leaving]]
e.	[look [at __]] / *What did Mary* __

Constraints

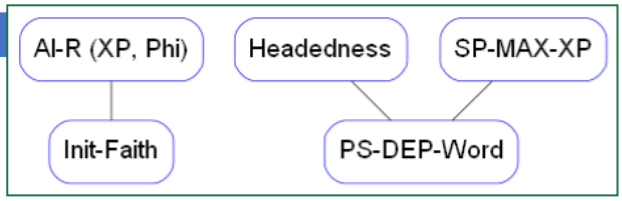
INIT-FAITH	The beginning of a prosodic word is faithful to the beginning of the corresponding lexical word.
SP:MAX-XP	A syntactic phrase is matched by a corresponding phonological phrase.
AL-R (XP, Φ)	The right edge of a syntactic phrase corresponds to the right edge of a phonological phrase.
HEADEDNESS	A prosodic category at level i immediately dominates a head at level i-1 or i.
PS:DEP-ω	A prosodic word corresponds to a lexical word.

The typology contains six languages

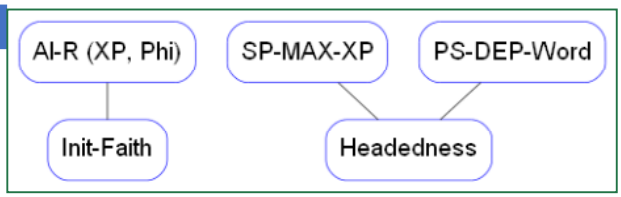
	Lg#1 (English)
a.	ϕ(ϕ(ω Ray) ϕ(ω càn))
b.	ϕ(ϕ(ω Ray) ϕ(ω ìs))
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim's) ω leaving)
e.	ϕ(ω look ϕ(ω àt))



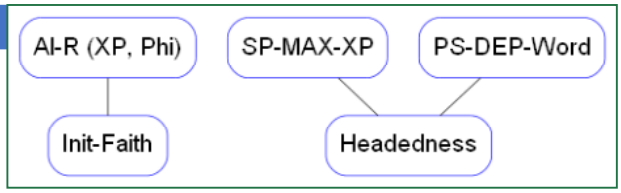
	Lg#2
a.	ϕ(ϕ(ω Ray) ϕ(ω càn))
b.	ϕ(ϕ(ω Ray) ϕ(ω ìs))
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim) ϕ(ω 'sleaving))
e.	ϕ(ω look ϕ(ω àt))



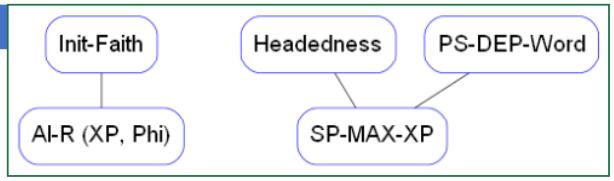
	Lg#3
a.	ϕ(ϕ(ω Ray) ϕ(σ cən))
b.	ϕ(ϕ(ω Ray) ϕ(σ əs))
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim's) ϕ(ω leaving))
e.	ϕ(ω look ϕ(σ ət))



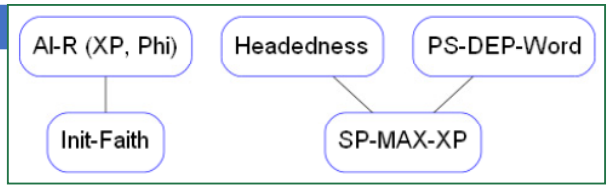
	Lg#4
a.	ϕ(ϕ(ω Ray) ϕ(σ cən))
b.	ϕ(ϕ(ω Ray) ϕ(σ əs))
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim) ϕ (ω 'sleaving))
e.	ϕ(ω look ϕ(σ ət))



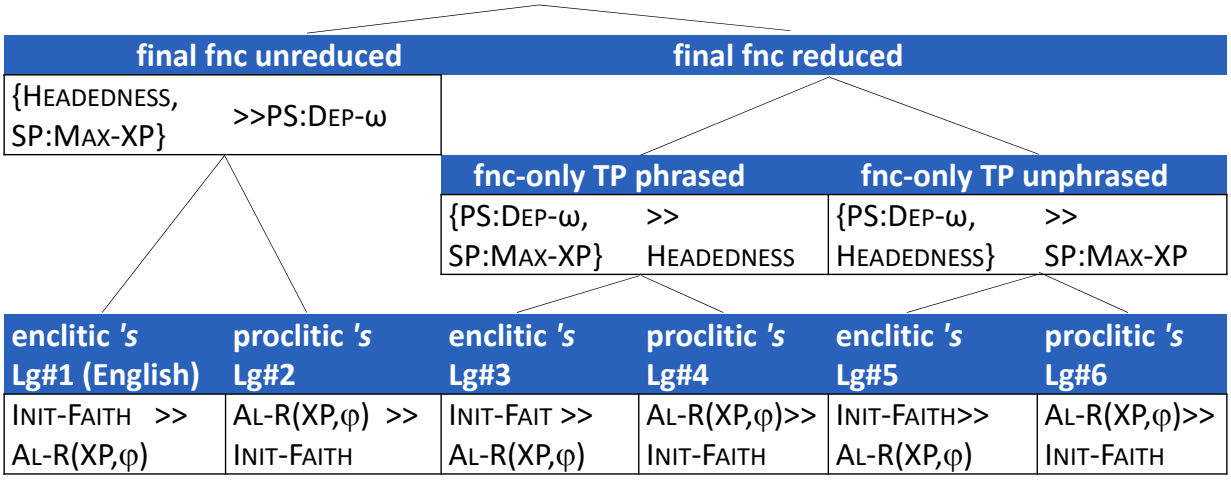
	Lg#5
a.	ϕ(ϕ(ω Ray) σ cən)
b.	ϕ(ϕ(ω Ray) σ əs)
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim's) ϕ(ω leaving))
e.	ϕ(ω look σ ət)



	Lg#6
a.	ϕ(ϕ(ω Ray) σ cən)
b.	ϕ(ϕ(ω Ray) σ əs)
c.	ϕ(ϕ(ω Tim) ϕ(σ əs ω leaving))
d.	ϕ(ϕ(ω Tim) ϕ(ω 'sleaving))
e.	ϕ(ω look σ ət)



The typology has a rather simple structure



Discussion

- The first two languages leave phrase-final *fnc* unreduced: Lg#1 is English, and Lg#2 differs in showing a faithful phrase-initial parse of *'s* in (d), violating word-initial positional faithfulness, which ranks below MAX-XP. Lg#3-Lg#6 all allow phrase-final *fnc* to reduce.
- This happens in two ways:
- In Lg#3 and Lg#4, *fnc* is its own phrase while being reduced, violating HEADEDNESS (MAX-XP, DEP-ω >> HEADEDNESS).
- Monoconsonantal *'s* is either enclitic (Lg#3) or proclitic (Lg#4), depending on the relative ranking of INIT-FAITH and ALIGN-R(XP,φ).

Discussion

- Lg#5 and Lg#6 show reduced final *fnc* by leaving the *fnc*-only TP unphrased (HEADEDNESS, DEP-ω >> MAX-XP).
- Again, monoconsonantal *'s* is either enclitic (Lg#5) or proclitic (Lg#6), depending on the ranking of INIT-FAITH and ALIGN-R(XP,φ).
- This typology seems to reasonably reflect the crosslinguistic options. It can easily be expanded by including additional possibilities, such as allowing *'s* to delete, or to remain unsyllabified at the word level, which are of little interest to our current concerns.

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