

An interface approach to prosodic recursivity

Bariş Kabak and Anthi Revithiadou
University of Konstanz and University of the Aegean

Baris.Kabak@uni-konstanz.de

revithiadou@rhodes.aegean.gr

1. Statement of the problem

- ✓ In recent phonological theories, the constraint NONRECURSIVITY has been employed to account – mainly via its violation – for the emergence of recursive prosodic structures.
- ✓ It is not clear, however, under which conditions and why recursive structures arise in prosodic systems. For instance, it is an open question whether there is recursivity below the level of the Phonological Word (PW).
- ☒ **BASIC CLAIMS:**
- ✓ REC arises from the morphosyntax-phonology interface:
The grammar requires recursive morphosyntactic (e.g., complex predicates, adjuncts, etc.) structures to be *mirrored* in phonology in the most parsimonious way possible.
- ✓ Main prosodic constituents that mediate the morphosyntax-phonology interface are the *Phonological Word* (PW) and the *Phonological Phrase* (PPh), and hence REC is restricted to these levels.
- ✓ NONRECURSIVITY as a constraint is problematic:
 - It does not define – due to the negative way it is formulated – what a well-formed recursive structure is.
 - It does not do the job that it is supposed to do because recursive structures do not emerge from violation of this constraint but through the interaction of different constraint sets (e.g., ALIGNMENT >> EXHAUSTIVITY) (see section 4).
- ☒ **PROPOSAL:**
- Derivation of recursivity in phonology:
- ✓ Recursive structures are generated through the high-ranking of the constraint MIRROR (inspired by van Oostendorp’s (2003, 2006) *Integrity*, see also Kaye’s (1974) *Morphological Recoverability*), which requires “recursive” morphosyntactic structures to be realized as such in the phonological component.
- Properties of recursive prosodic categories:
- ✓ Recursive structures are created by the extension of an already existing prosodic constituent, yielding a two-segment prosodic category.
- ✓ This “extended” constituent exhibits an ambiguous behavior because (a) it inherits the properties of its mother (head category), and (b) being an additional layer of structure,

it may develop properties of its own (especially in the context of rhythmic re-adjustment rules).

☒ **OUTCOME:**

- It constraints REC in a principled way.
- Explains why REC in the levels below the PW and above the PPh is less motivated.
- Accounts for why the majority of rules that have been observed to apply within recursive domains often tend to be optional rules, and very frequently rules related to rhythmic re-adjustment.

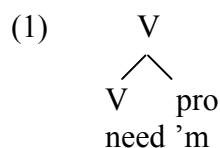
2. Recursivity in phonology

2.1. REC at the PW level

QUESTION: What sort of arguments have been put forward to motivate REC at the PW level?

✓ Selkirk (1995): Two lines of argumentation

#1 *The morphosyntactic argument* (Selkirk 1995: 205): English weak pronouns form a nested structure like the following:



which is basically translated into phonology as a REC structure:

(2) $\text{PW}[\text{PW}[\text{need}] 'm]$ (cf. Needham [nid m])

In this case, phonology mirrors the nested morphosyntactic structure by respecting the prosodic boundaries of the lexical word, i.e., the verb. How exactly this is done remains an open question.

Unfortunately, the morphosyntactic argument was not really pursued fervently in the prosodic phonology literature and, as a result, it gradually lost strength and, eventually, it was silenced.

#2 *The phonological argument* (Booij 1995, 1996). Proclitics in Dutch are parsed into a REC structure with their host because *prevocalic ə-deletion*, which normally applies within PW but not across PWs, as shown in (3a-b), is not enforced in proclitic + host strings, (4).¹

(3)

a.	/romə-ein/	[romɛin]	‘Roman’
b.	/haldə ɪk/	[haldɪk]	‘fetched I’

¹ Dutch clitics have been the topic of investigation of many researchers (Berendsen 1983, Gussenhoven 1985, among others). Recently, Grijzenhout and Krämer (2000) proposed an analysis where clitics are parsed by the PPh.

(4) /də avɔnd/ [də avɔnt]/*[davɔnt] ‘the afternoon’

☞ Here, rule blocking signals a REC structure.

☞ PROBLEM: Inconsistency

For Selkirk, the absence of a rule application (aspiration) suggests that the clitic is parsed at the level of the PPh (*free clitic*), e.g. ([t]_σ (London)_{PW})_{PPh} (Selkirk 1995: 197-198). On the contrary, for Booij, the same suggests that the clitic forms a REC structure with its host (affixal clitic).

QUESTION: When does a rule safely indicate that a specific element is outside the PW of its host but still in the PW domain?

To conclude, the majority of the prosodic phonology literature relies on phonological arguments in order to substantiate REC structures at the phonological level. However, it is often the case that the phonological argumentation is characterized by circularity and is often surrounded by a veil of vagueness. In this paper, we attempt to revive the interest for the morphosyntactic motivation of REC.²

2.2. REC at the PPh level

REC is commonly found at the PPh level. Some illustrative examples are provided below:

✓ Itô & Mester (2007), Dutch (based on Schreuder and Gilbers 2004, Schreuder 2006): Multiple instances of the *Rhythm Rule* (signaling the left boundary of a PPh) in complex phrases created by iterative adjunction indicates recursive phonological phrasing.

(5) _{PPh}[_σonafhankelijk _{PPh}[_σAmsterdams _{PPh}[_σaardrijkskundig genootschap]]]
‘Independent Amsterdam Geographical Society’

cf.: onafhankelijk, Amsterdám, aardrijkskundig

✓ Gussenhoven (2005), English: Gussenhoven independently proposes recursive structures for English prenominal modifier constructions:

(6) _{PPh}[_σTwènty-six _{PPh}[_σvèry nice _{PPh}[_σJàpanese CDs]]]

☒ The reverse situation is witnessed here; it is broadly accepted that REC at the PPh level results from morphosyntactic recursivity

✓ See also Ladd (1986), who employs Major Phrases and Tone Groups, for arguments and evidence in favor of recursivity in intonational structure.

² Recently, Itô & Mester (2007) revive the interest for the prosodic hierarchy and propose a radical simplification by introducing minimal and maximal projection of heads. The restrictiveness of their model is achieved by assuming that there can only be one maximal and one minimal instantiation of every category.

3. An interface perspective on REC

3.1. Fundamental assumptions

- ✓ Recursion is not an inherent property of phonology, but rather the by-product of its interface with morphosyntax. More specifically, it arises from the following structures:

- Inherently “recursive” morphosyntactic structures such as nominal and verbal compounds as well as complex predicates

↓

$[Y X] X \rightarrow PW_{REC}$

- Function words that are adjoined to syntactic heads such as clitics

↓

ADJUNCTION to an $X \rightarrow PW_{REC}$

- Pieces of structure such as adjunct modifiers (i.e., elements that are assembled parallel to the main derivation at their own derivational workspace) that have to merge with the rest of the derivation at a later stage³

↓

ADJUNCTION to an $XP \rightarrow PPh_{REC}$

In short, morphosyntactically “recursive” structures and those created outside the main lexical or syntactic cycle.

- ☞ **IMPORTANT CONSEQUENCE:** The interface gives us primarily two main sites: the *PW* and the *PPh*. One cannot possibly have recursion at the level of the *Foot* or the *Syllable*, because these are not possible interface sites. Hence recursion of these constituents is not an available option.

3.2. Constructions generating REC in phonology

In this paper, we focus on these two types of constructions. Specifically, we look at:

(7) COMPOUNDING:

- nominal compounds $([N N]_N)$
- complex predicates $([N V]_V)$ or $([V V]_V)$

(8) ADJUNCTION:

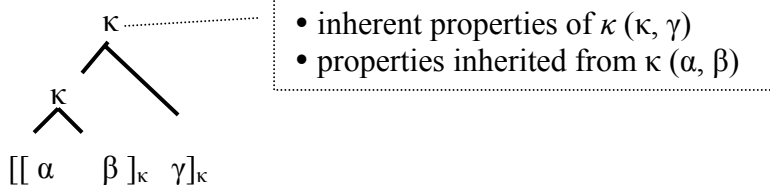
- preverbal pronominal object clitics $(cl V)_{TP}$
- adjunct modifiers $(YP XP)_{XP}$

³ See Revithiadou & Spyropoulos (2005) and the references cited therein.

Below we will illustrate each of these structures using data primarily from Greek and Turkish and show that:

- a. Adjunction at the level of PPh and PW creates a two-segment category that corresponds to an innermost and an outermost phonological layer at the PF.
- b. The outermost layer inherits properties of the mother constituent. Those properties may reiteratively or optionally apply within that layer of structure.
- c. As a separate layer, however, it is likely to be interpreted as triggering unique phonological properties, though this is not mandatory. We argue that such properties are quite often related to rhythmic structure building/ re-adjustment.

(9)



4. MIRROR vs. NONRECURSIVITY and typological consequences

The constraint MIRROR (inspired by van Oostendorp's 2003, 2006 *Integrity* and Kaye's 1974 *Morphological Recoverability*) is taken to be an interface constraint that maps recursive morphosyntactic heads to recursive phonological heads and vice versa.

- (10) MIRROR: Recursive morphosyntactic structures should correspond to recursive phonological structures and vice versa.

We propose this constraint in place of Selkirk's (1995) NONRECURSIVITY (NONREC), which we believe to create problems in the following ways:

- a. It does not really endorse the propagation of REC outputs via its violation. Actually, the interaction between other constraints does the job. See, for example, Peperkamp's FAITHFULNESS ("Do not modify lexically built structure"), the constraint invoked for the analysis of Neapolitan (Peperkamp 1997: 189). See also discussion below in section 8.
- b. It is crucially needed for rendering internal clitics ($_{PW}[fnc \text{ word}]$) as more optimal outputs than affixal clitics ($_{PW}[fnc \text{ }_{PW}[\text{word}]]$) (based on Peperkamp's analysis of Lucanian (1997: 193)):

(11)

	T1 /fnc, word/	NONREC	EXH	FAITH
☞	a. $_{PW}[fnc \text{ word}]$			*
	b. $_{PW}[fnc \text{ }_{PW}[\text{word}]]$	*!		
	c. $_{PPh}[fnc \text{ }_{PW}[\text{word}]]$		*!	

- c. Because it is formulated as a negative statement, it is unclear what qualifies as well-formed REC, e.g. is a multiply nested structure such as $[[[\text{word}] \text{ fnc}] \text{ fnc}]$ better than a flat structure such as $[[\text{word}] \text{ fnc} \text{ fnc}]$? Other constraints (e.g., *STRUC) must be employed in order to decide in favor of one or the other candidate.
- d. At the conceptual level, it implies that avoidance of REC is natural for PHONOLOGY but, at the same time, as a *universal constraint*, is inconsistent with the very premise

of linguistic theory, namely that recursion is one of the most fundamental characteristics of human communication.

MIRROR guarantees that the clitic typology, as advocated by Selkirk (1995), can be maintained but, crucially, it imposes a more intimate link between phonological REC and morphosyntactic REC. In other words, it predicts the following clitic typology cross-linguistically:

(12)	<i>Clitic type</i>	<i>ranking</i>
L1	<ul style="list-style-type: none"> ▪ internal clitics ▪ affixal clitics with REC morphosyntax 	EXH >> MIRROR >>> ALIGN
L2	<ul style="list-style-type: none"> ▪ free clitics ▪ affixal clitics with REC morphosyntax 	MIRROR, ALIGN >> EXH
L3	<ul style="list-style-type: none"> ▪ affixal clitics 	ALIGN >> EXH >> MIRROR

RESULTS:

- ✓ Differences in morphosyntactic structure are responsible for the surfacing of different clitic types. In other words, the *same grammar* (ranking of constraints) gives rise to different prosodic patterns. It should be noted that this line of reasoning is in accordance with basic premises of OT, and also in total alignment with Selkirk's assumptions about the different patterns of prosodization of function words in English:

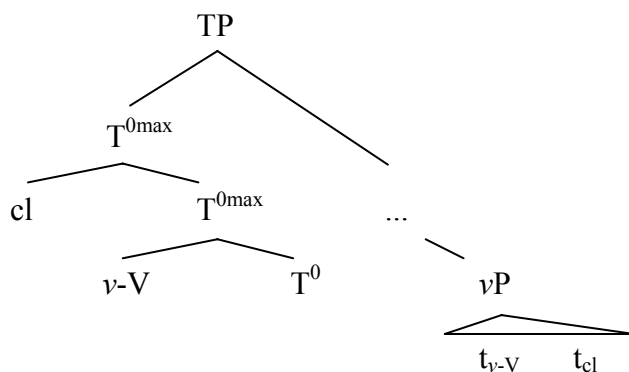
“...the variety in prosodization of function words, can come about in just two different ways, given an optimality theoretical perspective: through differences in the in the morphosyntactic input structure in which the Fnc is located and/or differences in the ranking of the relevant constraint.” (Selkirk 1995: 209).

5. REC at the level of PW: Empirical substantiation

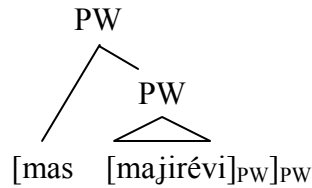
5.1. Clitics forming REC structures with their host: [cl [host]_{PW}]_{PW}

- ☒ Standard Greek pronominal clitics (Revithiadou & Spyropoulos 2006)

(13) *Syntactic structure*⁴



⁴ Philippaki-Warbuton & Spyropoulos (1999), Spyropoulos (1999), Philippaki-Warbuton et al. (2004) offer a cliticization analysis as adjunction to the T head.

(14) *prosodic structure*

- (15) a. /mas maʝirévi/ [maz.majirévi] ‘(s/he) cooks for us’
 b. /mas ðjavázi/ [maz.ðjavázi] ‘(s/he) reads for us’

RULE #1: *s-voicing*

$$s \rightarrow z / _m, v, \delta, \gamma$$

- *s-voicing* is a PW-rule, e.g. /pros-méno/ → [pro.zméno] ‘anticipate’, /ʝeras-ménos/ → [ʝe.ra.zmé.nos] ‘aged’. Notice that the cluster syllabifies together.
- *s-voicing* applies in the recursive PW but re-syllabification does not: [maz.majirévi]/ *[ma.zma.ji.ré.vi] suggesting that the consonants are not really ‘adjacent’

- (16) a. /me aʝini/ [meaʝini] ~ [maʝini] ‘(s/he) leaves me’
 b. /me onomázi/ [meonomázi] ~ [monomázi] ‘(s/he) names me’
 c. /me elénxi/ [meelénç̣i] ~ [melénç̣i] ‘(s/he) controls me’

RULE #2: *e-deletion in hiatus*

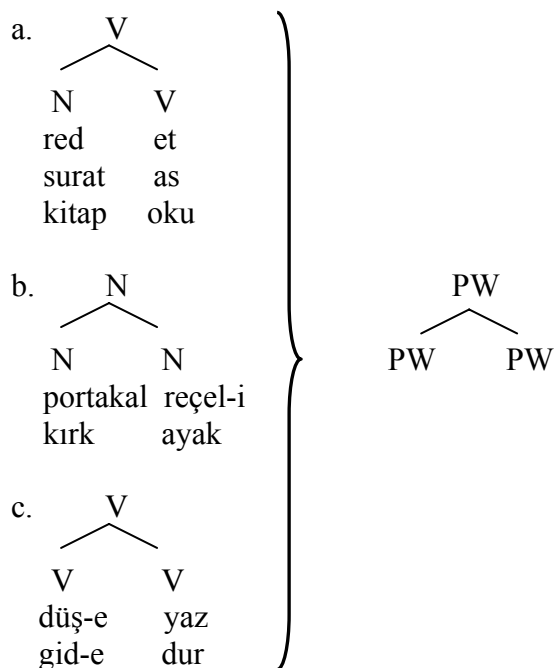
$$e \rightarrow \emptyset / _ \{a, o, e\}$$

- *e-deletion* applies obligatorily within the PW-domain, e.g. /kse-alázo/ [ksalázo] ‘change (clothes)’, /kse-onomázo/ [ksonomázo] ‘un-name s.o.’ but optionally within the recursive-PW.
- ✓ **MERIT OF THE ANALYSIS:** The interface approach developed here has an interesting repercussion for the ‘left-right asymmetry’ problem. In Greek, for instance, proclitics are adjoined syntactically to their verbal host (see (15)), and thus prosodify into a REC structure. Enclitics, on the other hand, form internal clitics, that is, they prosodically incorporate into the PW of their verbal host. Importantly, it is not accidental under our analysis that they also *do not syntactically adjoin to the verb* (the verb moves to the ModP).

5.2. Compounds and complex predicates forming REC structures: [[noun]_{PW} [light verb]_{PW}]_{PW}

CASE STUDY #1: Noun-head incorporation for Turkish (e.g., Knecht 1986; Kornfilt 1995, 2003; Aydemir 2004; see Öztürk 2005 for a pseudo-incorporation analysis)⁵

⁵ Based on standard assumptions on incorporation (Baker 1988, 1996), one can claim that the moved element adjoins to the V. Thus, the analysis proposed here correctly predicts that this element will be parsed recursively to the head category.

(17) *syntactic structure* *prosodic structure*

Glosses: *red et.* (reject do) ‘to reject’; *surat as:* (face hang) ‘get upset’; *kitap oku* (book read) ‘read a book’; *portakal reçel-i* (orange jam-CPMRK) ‘orange jam’; *kırk ayak* (fourty feet) ‘caterpillar’; *düş-e yaz* (fall-CVM fall) ‘to almost fall down’; *gid-e dur* (go-CVM stop) ‘continue to go’

CASE STUDY #2: Light verbs (LV) in Complex Predicates in Turkish

(18) LVS ARE PWS THEMSELVES	(19) LVS FORM PWS WITH THEIR HOSTS
<p>a. They do not harmonize with the preceding vowels; rather they initiate their own harmony domain (20)</p> <p>b. All are at least bimoraic and have final stress just like a word (e.g., <i>et-mék</i> ‘Aux-Inf’)</p> <p>c. They can be reduplicated just like any other words (21).</p> <p>d. All can occur in isolation (22) and can get inflected (21, 22).</p>	<p>They are syllabified with their hosts unlike syntactic phrases:</p> <p>a. Consonant cluster resolution (23)</p> <p>b. Degemination (24)</p> <p>c. Long vowel shortening (25)</p>

- (20) a. telefon et-mek ‘to phone’
 telephone do-INF
- b. tıraş ol-mak ‘to shave’
 shave be-INF

- (21) a. hasta ol-du-m **mol-du-m** ‘I was sick and such’
 b. kahvaltı et-ti **met-ti** ‘(s)he had breakfast and such’

- (22) A: telefon et-ti-n-mi? ‘Did you phone?’
 telephone do-PAST-2P-INTER

- B: et-ti-m ‘I did’
 do-PAST-1S

- (23) Consonant cluster resolution:

Compound Verbs:

- a. /haps ol-mEk/ **haps** olmak ‘to be imprisoned’
 prison be-INF

Syntactic Phrases:

- b. /haps iste-mEk/ **hapis** istemek ‘to ask for imprisonment’
 prison want-INF (*haps)

- (24) Degemination:

Compound Verbs:

- a. /redd et-mEk/ **redd** etmek ‘to reject’
 rejection do-INF

Syntactic Phrases:

- b. /redd al-mEk/ red almak ‘to receive rejection’
 increase want-INF (*redd)

- (25) Long vowel shortening:

Compound Verbs:

- a. /hara:m et-mEk/ **hara:m** etmek ‘to take the pleasure out of s.th.’
 forbidden Aux-INF

Syntactic Phrases:

- b. /hara:m et/ haram et ‘religiously forbidden meat’
 forbidden meat (*hara:m)

- (26) Absence of CC-resolution and degemination can also be observed in certain compounds: (e.g., *kayn+ana* ‘mother-in-law’; *kayn+ata* ‘father-in-law’; see Kabak & Vogel 2001: 350-352)

☞ CONCLUSION: PW-rules are observed in the outermost domain.

6. Unique PW_{REC} processes: Rhythmic structure-building and re-adjustment rules

- ✓ Unique segmental rules are hard to attest in this domain, which, in turn, makes it difficult to substantiate the *Clitic Group* (Nespor & Vogel 1986, Hayes 1989). It seems, however, that special rhythm-related phenomena could be developed in such a domain since the extended structure would be interpreted as an extra layer by Metrical Phonology.

CASE STUDY #1: Sequence of clitics plus host ($[(cl\ cl)_F [host]_{PW}]_{PW}$)

In varieties spoken in the northern part of Greece, clitic clusters form a (post-lexical) Foot and adjoin to PW.⁶ As a result, a rhythmic/secondary stress is developed:

- (27) a. /mas tus maɣirévi/ [màstuz. majirévi] ‘(s/he) cooks them for us’
 b. /mas tus ðjavázi/ [màstuz. ðjavázi] ‘(s/he) reads them for us’

CASE STUDY #2: Compound formations ($[[[modifier]_{PW} [head]_{PW}]_{PW}]_{PW}$)

- ☒ Compounds have different prosodic properties compared to phrases:

Turkish (Kabak & Vogel 2001):

- (28) a. kárk ayak ‘caterpillar’ b. kárk ayak ‘fourty feet’
- | | | | | |
|-----|------|------|------|------|
| PPh | * | | * | |
| CG | * | | * | * |
| PW | * | * | * | * |
| | kárk | ayak | kárk | ayak |

Greek:

- (29) *Adj+N compounds (rightmost stress prominence)*
 a. pirinikòs pólemos ‘nuclear war’
 b. ðiplomatikò sóma ‘diplomatic delegation’
- (30) *Adj+N phrases (leftmost stress prominence)*
 a. irakinós pòlemos ‘Iraqi war’
 b. ðiplomatikó àsilo ‘diplomatic asylum’

Turkish:

- (31) *Complex predicate (no secondary stress)*
 a. koş-úþ dur-du ‘he continued to run’
 run-CNV Aux-PAST
- b. at-ı ver-di ‘(s)he suddenly threw it’
 throw-CNV Aux-PAST

⁶ The same phenomenon is also observed in dialects of German (see Kabak & Schiering 2006).

- (32) *Phrase (secondary stress)*
- a. koş-úp dur-dù ‘(s)he ran and stopped’
run-CONJ stop-PAST
- b. at-ı ver-di ‘(s)he gave the horse’
horse-ACC give-PAST

☞ **CONCLUSION:** Metrical Phonology interprets the outermost domain (i.e. PW_{Rec}) as an independent layer. Directionality of stress prominence is decided on a language-specific basis.

7. Other sources of REC

- ✓ MIRROR might be the most natural but, definitely, not the only source for the emergence of REC. As mentioned above, in a standard function word prosodization analysis, REC structures typically result not from crucial violation of NONREC but from a ranking which requires top-ranking of some form of lexical faithfulness constraint, e.g. ALIGN (LexW, PW-L/R) >> EXHAUSTIVITY, as shown by the following tableau:

(33)

T2 /fnc, V/	ALIGN	EXH
☞ a. $PW[fnc_{PW}[V]]$		
b. $PW[fnc V]$	*!	
c. $PPh[fnc_{PW}[V]]$		* _{PPh} * _{PW} * _F

- ✓ In other words, REC structures may arise when the language imposes a strict distinction between the *lexical* and the *post-lexical* level (as naturally predicted by all *Lexical Phonology* models (Kiparsky 1982, Mohanan 1986, Kaisse and Shaw 1985)).
- ✓ Finally, besides the purely morphosyntax-driven account of recursivity, we also argue that recursion can also be lexically encoded. That is, morphosyntactic elements can have a templatic specification as to where they adjoin. We argue that such elements have developed from independent compound-like constructions similar to the ones discussed above (see Kabak & Revithiadou 2006).

EXAMPLES:

- ✓ PW-adjoiners (Kabak & Vogel 2001: 328):
- mE negative
 - y/0 copula
 - yken ‘while’
 - ylE instrumental/commutative
- (34) a. [biçák]-la_(PWA) ‘with a knife’
b. [yáz]_(PWA)-ma-dı-nız ‘you did not write’

See Lahiri & Fitzpatrick-Cole (1999) for =o in Bengali, which only attaches to P-words.

- ✓ PPh-adjoiners (Revithiadou & Spyropoulos 2005): In Greek, fill-words such as *re*, *re si*, and so on, are placed after the first PPh: {[...]PPh ____ [...]PPh ...}IP.

(35) *fill-words after a PPh*

- a. [to éfayan]_{PPh} *re* [to axláði]_{PPh}
 it eat-PAST.3PL *re* the pear-SG.ACC
 ‘They ate, hey, the pear.’
- b. [o jánis]_{PPh} *re* [kérðise to laçío]_{PPh}
 the John-SG.NOM *re* win-PAST.3SG.PAST the lottery-SG.ACC
 ‘John, hey, won the lottery’

That these elements fall outside the PPh is supported by several segmental and metrical rules. For instance, blocking of s-voicing, (35b).

8. Conclusions

- REC is not an inherent property of phonology but the result of its interface with morphosyntax.
- REC arises primarily from a requirement to mirror recursive morphosyntactic (e.g., complex predicates, adjuncts, etc.) structures.
- An important consequence is that different morphosyntactic structures give rise to different clitic types but, crucially, the *grammar remains the same*.
- The interface analysis proposed here may also account for several instances of the ‘left-right asymmetry’ problem (e.g., proclitics vs. enclitics in Greek).
- The non-morphosyntactic sources of REC are limited to lexical specification and the distinction between the lexical and the post-lexical level.
- NONRECURSIVITY goes against the fundamental premises of linguistic theory and should be modified or abandoned.
- REC at *Phonological Word* (PW) and the *Phonological Phrase* (PPh) is principled since these are the main prosodic categories that participate in the morphosyntax-phonology interface.

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