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# ANCIENT GREEK PITCH ACCENT: EXTENDING TONAL ANTEPENULTIMACY TO ENCLITICS AND THE ΣΩΤΗΡΑ WORDS\*

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This article extends Itô & Mester’s (2016) tone-based analysis of the recessive pattern in Ancient Greek to enclitic constructions and the so-called *σωτήρα* (sotera) words. The hub of Itô & Mester’s proposal is that recessive accentuation results from a tonal constellation that includes the basic word melody, i.e. HL, and a word-final boundary tone L<sub>%</sub> that is strictly confined to the last mora of the word, e.g.  $\sigma^H t^L k\sigma^L$  ‘house’. This analysis, however, cannot straightforwardly account for the accentual behavior of enclitic structures, especially those in which the final syllable of the host – presumably reserved for the L<sub>%</sub> – surfaces with a H tone, e.g.  $\sigma^H t^L k\sigma^H$  ‘someone’s house’. Furthermore, it cannot explain the dubious accentual behavior of word-final consonant clusters, especially in relation to the retraction of H in *σωτήρα*-type words like *κεῖρυκς* ‘orator’, instead of the expected  $ke^H ry^L k_\mu^L$ , without postulating an additional stratum. In this article, we claim that Itô & Mester’s analysis can be easily sustained provided it is amended, first, with the notion of *phonological adjunction* (Itô & Mester 2007, 2009) that provides a more refined layering of phonological structure necessary for the prosodification of certain enclitic patterns and, second, the premise that phonological representations are built of symbols (e.g. segments, moras) that are numerically *gradient* (Smolensky & Goldrick 2016). Gradient representations allow us to distinguish between moras with different degrees of strength and hence make various tonal processes sensitive to such strength differences.

**Keywords:** activity level, Ancient Greek, enclitics, gradient symbolic representation, phonological adjunction, tonal antepenultimacy

## 1 Introduction

The status of pitch accent systems as a typologically independent category, next to stress and tone systems, has been called into question, most notably by Hyman (2009: 213–215) who argues against the existence of a pitch-accent prototype. In particular, he claims that the so-called pitch accent languages simply pick-and-choose properties from both tone and stress systems often giving rise to hybrid and analytically indeterminate systems that are tough to typologically categorize. A typical example is Tokyo Japanese, which has been analyzed both accentually and tonally (McCawley 1968, 1977, 1978, Haraguchi 1977, 1999, Poser 1984, Pierrehumbert & Beckman 1988, and so on) with no consensus whatsoever on the exact role, if any, of the foot structure in the tonal/accentual grammar (see Poppe 2015 for extensive argumentation based on cross-dialectal research). Ancient Greek<sup>1</sup> is another pitch accent system which has been analyzed – within the generative framework at least<sup>2</sup> – by means of both metrical structure and

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\* I wish to thank two anonymous reviewers for their valuable comments and suggestions. All errors and infelicities remain my own.

<sup>1</sup> In this article Ancient Greek refers strictly to the Attic dialect (7th c. BC – 3rd c. BC), which has been described as a pitch accent language (see Probert 2006: 55, and references cited therein). Other dialects, such as Thessalian, for example, are believed to have replaced pitch accent with stress (Probert 2006: 73–74).

<sup>2</sup> Ancient Greek accentuation has been a favorite topic of investigation both in generative phonology (Kiparsky 1967, 1973, 2003, Kiparsky & Halle 1977, Sommerstein 1973, Steriade 1982, 1988, Sauzet 1989, Golston 1990, Noyer 1997, Halle 1997,

contrastive relative pitch. More specifically, both syllabic and moraic trochees have been proposed (e.g. Steriade 1988, Sauzet 1989, Golston 1990) to account for the positioning of the H tone either on the antepenultimate syllable, e.g. *pélekys* ‘axe-NOM.SG’<sup>3</sup> or on the antepenultimate mora, e.g. *dáimōn* ‘god-NOM.SG’, commonly known as the *recessive* pattern. Under Sauzet’s (1989) and Golston’s (1990) analysis, for instance, moraic trochees are built from right to left, e.g.  $pe(leky)[s]$ <sup>4</sup> ‘axe-NOM.SG’,  $(dai)(mō)[n]$  ‘god-NOM.SG’, whereas tones are aligned with specific positions within these feet. More specifically, the L component of Allen’s (1973) HL ‘contonation’ is aligned with the head mora of the rightmost foot, whereas the H surfaces on the immediately preceding vocalic mora:  $pe^H(\underline{le}^Lky)[s]$ ,  $(dai^H)(mō^L)[n]$ .

Itô & Mester (2016) argue that some features of particular pitch accent systems, such as Ancient Greek, are basically tonal in nature and pursue a non-metrical approach in order to capture the antepenultimacy bias exhibited by the recessive pattern. More specifically, they argue that recessive accentuation results from a tonal constellation that includes the basic word melody, i.e. HL, and a boundary Low tone, symbolized as  $L_{\%}$ ,<sup>5</sup> that indicates the end of the *phonological word* ( $\omega$ , Selkirk 1981, Nespor & Vogel 1986), e.g.  $pe^Hle^Lky^{L_{\%}}[s]$ ,  $dai^Hmō^L_{\%}[n]$ . An integral role in their analysis has a tonal anti-lapse constraint, which is at play in other pitch accent systems such as Japanese. This constraint militates against the presence of more than one low-toned vocalic mora at the right edge of the word and, therefore, ensures that the boundary tone (i.e.  $L_{\%}$ ) and the tonal fall that yields will be confined to the very end of the word.

In this article, we will claim that Itô & Mester’s proposal – as it stands – faces some empirical challenges and, therefore, needs to be modified. More specifically, we will show that their analysis encounters some serious problems in deriving the correct tonal patterns in certain host+clitic constructions and, in particular, those in which the last mora of the host is either extrametrical or linked with a lexically-specified tone. We propose, therefore, a revised analysis that incorporates two key elements: first, the notion of *gradience*, that is, the premise that phonological representations are built of symbols (i.e. segments, moras) that have a different degree of strength or presence in the structure (Smolensky & Goldrick 2016, see also Inkelas 2015); and, second, the concept of *phonological adjunction* (Itô & Mester 2007, 2009 et seq.), which provides the appropriate platform for deriving a more refined layering of prosodic structure, needed for the prosodification of certain enclitic patterns. Gradient representations will be shown to be pivotal in determining the moraicity of the last syllable and hence the ability of a boundary tone to associate to the target position (i.e. the final mora of the  $\omega$ ). The presence or not of  $L_{\%}$  at the final mora will turn out to have important repercussions on the overall tonal pattern of the word in isolation and in enclitic contexts. On the other hand, adjunction enriches the set of structural relations within the  $\omega$ , thus enabling us to treat enclitics in specific accentual contexts as occupying positions within extended  $\omega$ ’s.

The remainder of this article is organized as follows: In Section 2 we present Itô & Mester’s tonal antepenultimacy account of the recessive pattern in Ancient Greek and discuss some problems it encounters at the empirical level. The solution to these problems is offered in Section 3 where we develop an analysis that makes crucial use of gradient phonological representations and extended word structures. Section 4 offers a brief overview of alternative analyses that employ both metrical and tonal constraints and discusses their shortcomings compared to the analysis proposed here; it also concludes this article.

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Blumenveld 2004, among others) as well as in the non-generative grammatical tradition (Lejeune 1945, Vendryes 1945, Allen 1966, 1973, 1987, Devine & Stephens 1985, 1994, Probert 2000, 2006, among others).

<sup>3</sup> The following abbreviations are used in this article: acc: accusative, dat: dative, gen: genitive, masc: masculine, nom: nominative, pl: plural, sg: singular, TBU: tone bearing unit,  $\emptyset$ : null suffix.

<sup>4</sup> Final consonants are extrametrical [C] and, consequently, do not contribute to the moraicity of the syllable.

<sup>5</sup> An anonymous reviewer points out that the % symbol is commonly used to indicate the boundary of an *Intonation Phrase* and proposes instead to codify the boundary tone with a diacritic that refers to its domain of association, namely  $L_{\omega}$  (see Hayes & Lahiri 1991). However, we decided to remain faithful to Itô & Mester’s original notation for reasons that will become clear in Sections 3.2-3.3, where enclitic constructions are discussed.

## 2 Antepenultimacy as the result of a L%, and some problems

In this section, we present Itô & Mester’s proposal on how the recessive pattern is computed in Ancient Greek (Section 2.1) and then move on to discussing some challenging data (Section 2.2) from enclitic constructions which pose a threat to their account. The discussion also extends to a second group of problematic data that involve the traditional *σωτήρα* (sotera) law (from *σωτήερα* ‘savior-ACC.SG’). This law prohibits a H to fall on the second mora of the penultimate syllable, if the final contains a single *vocalic* mora: \*V<sup>˘</sup>V.V. Under Itô & Mester’s account, such cases cannot be handled unless one posits a retraction rule that triggers leftward shift of the H at a later stage/different stratum of the phonological computation (see also Kiparsky 2003).

### 2.1 Itô & Mester’s tonal antepenultimacy and the recessive pattern

In Ancient Greek recessive word accent may fall within one of the last three syllables but not further than the antepenultimate mora when the final is (at least) bimoraic (‘Law of Limitation’). The weight of the final syllable is causally related to the surfacing of the antepenultimacy effect that typically characterizes recessive accentuation, and has been subject to many different interpretations, as will be discussed in Sections 3 and 4. More precisely, words ending in a light (i.e. CV, CVC) syllable have a H tone (known as *acute* ‘V<sup>˘</sup>’) either on the antepenultimate syllable (1a–d) or on the antepenultimate mora (1e–g). Shorter words that end in a HEAVY-LIGHT sequence, like the ones in (1f–g), reveal the full HL tonal melody (traditionally called *circumflex* ‘V<sup>˘</sup>V<sup>˘</sup>’). If, on the other hand, the final syllable is heavy (i.e. CVV, CVCC), the H is restricted to the penult, as demonstrated by the examples in (2). Antepenult accent is therefore permitted in a word like *ἀντήρως* (1c) with short /o/ in the last syllable, but not in *αντήρως* (2a) (\**ἀντήρως*) with long final /o/.

- (1) *Recessive accent in words ending in a light (CV, CVC) syllable*
- |    |         |                           |  |                  |
|----|---------|---------------------------|--|------------------|
| a. | πέλεκys | /peleky-s/                | CV <sup>H</sup> .CV <sup>L</sup> .CVC  | ‘axe-NOM.SG’     |
| b. | ἡέλενος | /heleɛn-os/               | CV <sup>H</sup> .CV <sup>L</sup> V.CVC | ‘Hellene-GEN.SG’ |
| c. | ἀντήρως | /ant <sup>h</sup> rɔws-s/ | V <sup>H</sup> C.CV <sup>L</sup> V.CVC | ‘man-NOM.SG’     |
| d. | ἡέρωα   | /heerɔ-a/                 | CVV <sup>H</sup> .CV <sup>L</sup> V.CV | ‘hero-ACC.SG’    |
| e. | σώματα  | /sɔmat-a/                 | CVV <sup>H</sup> .CV <sup>L</sup> .CV  | ‘body-NOM.PL’    |
| f. | σώμα    | /sɔmat/                   | CV <sup>H</sup> V <sup>L</sup> .CV     | ‘body-NOM.SG’    |
| g. | οἶκος   | /oiko-s/                  | V <sup>H</sup> V <sup>L</sup> .CVC     | ‘house-NOM.SG’   |
- (2) *Recessive accent in words ending in a heavy (CVV, CVCC) syllable*
- |    |            |  |  |                      |
|----|------------|--|--|----------------------|
| a. | αντήρως    | /ant <sup>h</sup> rɔp-oo/                  | VC.CVV <sup>H</sup> .CV <sup>L</sup> V | ‘man-GEN.SG’         |
| b. | δαίμων     | /daímɔn/                                   | CVV <sup>H</sup> .CV <sup>L</sup> VC   | ‘god-NOM.SG’         |
| c. | καπάδοκs   | /kapadok-s/                                | CV.CV <sup>H</sup> .CV <sup>L</sup> CC | ‘Cappadocian-NOM.SG’ |
| d. | λίπότηρiks | /lip-o-t <sup>h</sup> rik <sup>h</sup> -s/ | CV.CV <sup>H</sup> .CV <sup>L</sup> CC | ‘hairless-NOM.SG’    |

The above examples illustrate that there are certain phonologically defined positions where the tonal melody may fall and others where it may not. Ancient Greek is a morphology-controlled system at heart in the sense that the position of accent/tone is not always predictable from the phonological shape of the word; rather, it is a lexical property of individual morphemes (e.g. Kiparsky 1973, Steriade 1988). That is to say, many (un)derived words have a lexically pre-linked accent/tone on positions other than those defined by recessive accentuation, as demonstrated by the examples in (3).<sup>6</sup>

<sup>6</sup> Non-recessive accentuation is peripheral to Itô & Mester’s analysis and, consequently, to the subject matter of the present section. It will be briefly addressed in Section 2.2 in relation to the accentual patterns of enclitic constructions.

(3) *Lexically accented words*

a.	isk <sup>h</sup> yyrós	/isk <sup>h</sup> yy-ro <sup>HL</sup> -s/	‘strong-MASC.NOM.SG’
b.	psyyk <sup>h</sup> ikoós	/psyyk <sup>h</sup> -iko <sup>HL</sup> -s/	‘spiritual-MASC.NOM.SG’
c.	patéér	/patε <sup>HL</sup> r/	‘father-NOM.SG’
d.	psyyk <sup>h</sup> ikóōn	/psyyk <sup>h</sup> -iko-ō <sup>H</sup> ō <sup>L</sup> n/	‘spiritual-MASC.GEN.PL’
e.	patrída	/patr-i <sup>H</sup> d-a <sup>L</sup> /	‘fatherland-ACC.SG’

Itô & Mester treat Ancient Greek as a pitch accent system, where recessive (i.e. non-lexical) word accent is interpreted as the combination of a tonal HL complex (see Allen 1966) followed by boundary tone L<sub>%</sub> that demarcates the end of the ω.<sup>7</sup> Their approach builds on Misteli’s (1868) insight that the word-final mora is reserved for this L<sub>%</sub> boundary tone, whereas the preceding ones host the HL contonation. A significant component of their analysis is that it dispenses with a foot-controlled conditioning in the distribution of accent/tones. All that is needed is the constraint NOLAPSE-L<sub>%</sub>/μ (‘L<sub>%</sub> occupies no more than one mora’, Itô & Mester 2016: 5), which essentially prohibits L<sub>%</sub> to span over more than one mora. Ranked high enough in the Ancient Greek tonal grammar, this constraint penalizes prospective outputs like ant<sup>h</sup>rōōpo<sup>L<sub>%</sub></sup>o<sup>L<sub>%</sub></sup>, for instance, in which the L<sub>%</sub> is associated to two consecutive moras. With L<sub>%</sub> occupying the final mora, the L element of the HL contonation will then associate to the immediately preceding mora(s) (depending on the length of the penultimate), whereas the H will dock on the mora of the preceding syllable:

(4) *The tonal melody of recessive accentuation* (Itô & Mester 2016)

	H	L	L <sub>%</sub>	
	μ.	μ (μ.)	μ.	pélekys (1a), héléenos (1b)
	μ	μ.	μ.	sóōma (1f), óikos (1g)
	μμ.	μ μ.	μ.	ánt <sup>h</sup> rōōpos (1c), heérōa (1d)
	μμ.μμ.	μ	μ.	ant <sup>h</sup> rōōpoō (2a)

Furthermore, words ending in a consonant cluster like li.pó.t<sup>h</sup>rik<sub>μ</sub>s (2d) are taken to place the H tone of the contonation on the penultimate syllable because the pre-final coda consonant, being intrametrical, projects a mora,<sup>8</sup> as opposed to the final one (see fn 4). Evidently, this is the mora that hosts the L<sub>%</sub>, as portrayed in (5a). Had the consonant at issue lacked a mora, the H tone would have been located on the antepenultimate syllable, which is not the case, as evinced by the ungrammaticality of (5b).

(5) *Recessive accentuation in words ending in CC#*

a.	H	LL <sub>%</sub>	b.	H	L	L <sub>%</sub>
	μ.	μμ.		μ.	μ.	μ.
	li.pó.t <sup>h</sup> rik <sub>μ</sub> s	(2b)		*lí.po.t <sup>h</sup> riks		

According to Itô & Mester, the H tone is compelled to appear as close to the left edge of the word (ALIGNLEFT-H/ω<sub>i</sub>) as permitted by the constraints that regulate the alignment of L and L<sub>%</sub>. CONTIGUITY-T ensures that there will not be a gap, i.e. a tone-less mora, between adjacent tones, whereas CRISPEDGE-σ/T penalizes a tone that spreads over two syllables. Finally, ALIGNRIGHT-L<sub>%</sub>/ω specifies the ω as the domain at the right of which L<sub>%</sub> occurs. These constraints are stated in (6):

<sup>7</sup> From Hyman’s (2009) perspective, Ancient Greek could be approached as a *restricted tone system* (see also Voorhoeve 1973), which is the view we adopt in our analysis (Sections 3 and 4).

<sup>8</sup> Steriade (1988: 273–275) discusses several compound words of this pattern, e.g. polyánt<sup>h</sup>ranks ‘with much coal’ (\*polyánt<sup>h</sup>ranks).

- (6) *Itô & Mester's constraints for recessive accent*
- ALIGNRIGHT-L<sub>%</sub>/ω: L<sub>%</sub> is a word-final boundary tone.
  - CONTIGUITY-T: Tone domains are contiguous.
  - CRISPEGE-σ/T: Multiple linking of tones between syllables is prohibited.
  - ALIGNLEFT-H/ω<sub>i</sub>:<sup>9</sup> H is leftmost in ω.

The ranking of the constraints presented in tableau (7) generates all permissible recessive patterns. Inputs with a final light syllable will yield a H tone on the antepenultimate syllable (7i-a) and not on the penultimate one (7i-b), because ALIGNLEFT-H/ω<sub>i</sub> keeps the H as far from the right edge as permitted by the higher ranked constraints. Notice also that this constraint, being strategically ranked above CONTIGUITY-T, rules out the form \*an<sup>H</sup>thrō<sup>L</sup>σ<sup>L</sup>po<sup>L%</sup>s, where the H is located on the consonantal mora of the initial syllable in compliance with the demands of CONTIGUITY-T. That is, ALIGNLEFT-H/ω<sub>i</sub>, from the ranking it occupies, masks the moraicity of word-medial consonantal moras.

Moreover, words with a bimoraic final syllable will have their H tone placed on the second mora of the penult (7ii-a). This is ensured by the workings of the constraints that regulate the alignment of L<sub>%</sub>, which render ungrammatical candidate outputs such as (7ii-b, c) and (7ii-d). The alignment of the second leg of the HL contonation is determined by CONTIGUITY and CRISPEGE; the former eliminates candidate (7ii-f), while the latter rules out candidate (7ii-e).

		AR-L <sub>%</sub>	CONTIGUITY-T	CRISPEGE-σ/T	NOLAPSE-L <sub>%</sub> /μ	AL-H/ω <sub>i</sub>
(7) i.	/ant <sup>h</sup> rōpo-s/ <sub>i</sub> HLL <sub>%</sub>	☞ a. H L L <sub>%</sub>   N   ánt <sup>h</sup> rōpos				
	b. HL L <sub>%</sub>       ant <sup>h</sup> rōpos					*!
ii.	/ant <sup>h</sup> rōp-oo/ <sub>i</sub> HLL <sub>%</sub>	☞ a. HLL <sub>%</sub>       ant <sup>h</sup> rōpoo				**
	b. H L L <sub>%</sub>   N   ánt <sup>h</sup> rōpoo	*!				
	c. HL L <sub>%</sub>     N ant <sup>h</sup> rōpoo				*!	*
	d. H L L <sub>%</sub>   N N ánt <sup>h</sup> rōpoo				*!	
	e. HL L <sub>%</sub>   N   ant <sup>h</sup> rōpoo			*!		*

<sup>9</sup> Itô & Mester index this constraint to apply to an *i* class of lexical words, that is, those that are lexically specified to be accented recessively. However, indexing can be dispensed with if word-final H(L) (see the examples in (3)) is treated as the result of lexical pre-specification (i.e. pre-association of HL to the final short or long TBU of a particular exponent).

	f.	H	L	L%		*!			
			Λ						
		ánt <sup>h</sup> rṓpoo							

## 2.2 Empirical problems with the tonal antepenultimacy account

When a clitic is attached to the right edge of a word, the accentual pattern within the host+clitic construction alters dramatically.<sup>10</sup> Some representative examples are listed in (8). The host in (8a) has a recessively assigned H on the non-head mora of the penultimate syllable because the final long syllable can foster both the L of the HL contonation and the L% that demarcates the right edge of the ω. Disyllabic enclitics appear either with a H on their final syllable or with a HL when inflected with the inherently accented gen.pl suffix /-ṓñ/. Strangely enough, the exact same set of enclitics surface with no H(L) tone(s) after a host that displays another pattern of recessive accentuation (8b) or a host that has a lexically pre-specified tonal melody on its final syllable, e.g. *hodós*, *pylṓñ* (8c):

- (8) a.  $\mu\mu^H \cdot \mu^L \mu^{L\%}$  *host + accented disyllabic clitic*  
 daímṓñ tinós ‘someone’s god’  
 elpídṓñ tinṓñ ‘of some (GEN.PL) hopes (GEN.PL)’  
 (cf. daímṓñ tis ‘some god’)
- b. *host V(C)# + accentless clitic*  
 ánt<sup>h</sup>rṓpós tis ‘some man’  
 ánt<sup>h</sup>rṓpós tinos ‘someone’s man’  
 éékoosá tinṓñ ‘I heard them (GEN.PL)’  
 óikós tis ‘some house’  
 óikós tinos ‘someone’s house’
- c. *host V̇C/V̇VC# + accentless clitic*  
 hodós tis ‘some street’  
 hodós tinos ‘someone’s street’  
 p<sup>h</sup>ṓñs ti ‘some light’  
 p<sup>h</sup>ṓñs tinos ‘someone’s light’  
 pylṓñ tinṓñ ‘of some (GEN.PL) gates (GEN.PL)’

Obviously, the examples in (8b) are problematic under Itô & Mester’s tonal antepenultimacy analysis. If the final mora of the host is reserved for the L%, then the insertion of the H in this exact position is unexpected to say the least. Moreover, the presence of the H in the final syllable seems to affect the tonal pattern of the following enclitic, which surfaces with no tone whatsoever, (8b–c), as opposed to the tonal behavior of the same clitic in the context of a VV(C)-final host.

By general acknowledgement, Ancient Greek enclitics are extremely resilient to analyses that do not resort to some kind of special stipulation in order to tackle their various accentual peculiarities (see Warburton 1970, Sommerstein 1973, Steriade 1988, Golston 1990, Halle 1997, Blumenfeld 2004, and also the discussion in Section 4). In the next section, we will show that Itô & Mester’s account can be easily preserved provided it is amended with a richer representational apparatus and a more fine-grained layering of the ω.

<sup>10</sup> The Ancient Greek enclitic stock includes: (a) the indefinite *tis*, *ti* ‘someone, something’ in all its inflected forms; (b) the oblique cases of the personal pronouns, e.g., *me* (1ACC.SG), *moi* (1DAT.SG); (c) the present indicative of the verbs *p<sup>h</sup>emí* ‘I say’ and *eimí* ‘I am’ (except for 2sg forms); (d) several indefinite adverbs, e.g., *poú* ‘somewhere’; (e) several postpositive conjunctions and particles, e.g., *dé* ‘but’, *te* ‘and’, *gár* ‘for, namely’. For a complete list, see Probert (2003) and Revithiadou (2013).

A second set of problematic data includes the so-called *σωτήρα*-words and, particularly, those that end in a consonant cluster (9). In such words, the H must retract to the first mora of a heavy penultimate, if the final is light. Retraction affects both lexically specified and recessively assigned H tones but, crucially, only vocalic moras count as light. More specifically, roots that have a lexically pre-specified HL melody at their final syllable, e.g. /sɔtɛɛ<sup>HL</sup>r-Ø/ *σωτήέρ* ‘savior-NOM.SG’, /g<sup>h</sup>yy<sup>HL</sup>p-s/ *g<sup>h</sup>ýyps* ‘vulture-NOM.SG’, shift their H to the head mora when combined with a light inflection, e.g. *σωτήέρα* ‘savior-ACC.SG’ (cf. *σωτήέρων* ‘savior-GEN.PL’), *g<sup>h</sup>ýypes* /g<sup>h</sup>yy<sup>HL</sup>p-es/ ‘vulture-NOM.PL’. Furthermore, H retraction affects VC-final roots like /kɛɛryk-/ ‘orator’ which surface as *kéeryks* ‘orator-NOM.SG’, and not as *keéryks* (kɛɛ<sup>H</sup>ry<sup>L</sup>k<sub>μ</sub><sup>L%</sup>s), as predicted by the tonal antepenultimacy account. Itô & Mester address words like the ones in (9) in a footnote and consider them to result from a retraction that applies at a later stage, intimating that more than one stratum may be required for the analysis of Ancient Greek accentuation (see Kiparsky 2003, also Noyer 1997).<sup>11</sup>

- (9) *σωτήρα*-VCC# words
- |    |           |              |                  |
|----|-----------|--------------|------------------|
| a. | kéeryks   | /kɛɛryk-s/   | ‘orator-NOM.SG’  |
| b. | katéelips | /katɛɛlip-s/ | ‘terrace-NOM.SG’ |
- (cf. *kapádoks* ‘Cappadocian-NOM.SG’ (2c); *lipó<sup>th</sup>riks* ‘hairless-NOM.SG’ (2d))

Puzzlingly, enclitic constructions with *σωτήρα*-VCC words (10a), which is the focus of our discussion in this article, pattern accentually with words that end either in a long vowel (10b) or in a consonant cluster (10c) but, significantly, not with *σωτήρα*-words of the former type (i.e. V-final) (10d–e). The fact that *kéeryks* and *daímων* pattern alike in encliticization leads us to conclude that the mora contributed by the intrametrical consonant and the vocalic one are equivalent, at least for the purposes of accent assignment in enclitics, but certainly not for the *σωτήρα*-type of H retraction.

- (10)
- |    |                            |                               |
|----|----------------------------|-------------------------------|
| a. | kéeryks tinós              | ‘someone’s orator’            |
| b. | daímων tinós               | ‘someone’s god’               |
| c. | kapádoks tinós             | ‘someone’s Cappadocian’       |
| d. | σωτήέρα tinos              | ‘someone’s savior (ACC.SG)’   |
| e. | g <sup>h</sup> ýypés tinos | ‘someone’s vultures (NOM.PL)’ |

The aforementioned issues will be addressed and offered an explanation in the ensuing section on the basis of an analysis that implements gradient phonological representations (Smolensky & Goldrick 2016) and a prosodic structure that contains enough layers to accommodate all attested enclitic patterns.

### 3 Preserving Tonal Antepenultimacy

#### 3.1 Gradient symbolic representations and moraic strength

As mentioned in Section 2.1, word-prefinal consonantal moras as well as final vocalic moras are treated alike by Itô & Mester because they can equally foster the L<sub>%</sub>:

- (11)
- |    |          |             |  |                      |
|----|----------|-------------|--|----------------------|
| a. | daímων   | /daímων/    | CVV <sup>H</sup> .CV <sup>L</sup> V <sup>L%</sup> C                              | ‘god-NOM.SG’         |
| b. | kapádoks | /kapádok-s/ | CV.CV <sup>H</sup> .CV <sup>L</sup> C <sub>μ</sub> <sup>L%</sup> C <sup>12</sup> | ‘Cappadocian-NOM.SG’ |

<sup>11</sup> Itô & Mester point out that they are not aware of an alternative to a stratal analysis of the *σωτήρα* Law, e.g. by means of OO-constraints (2016: 10, fn 11).

<sup>12</sup> There is an interaction between voicing and tone to the extent that it has been claimed that Low tone and [voice] are the same feature (e.g. Halle & Stevens 1971, Duanmu 1990, Bradshaw 1999, among others). For example, the spreading of a Low tone may be blocked by an intervening voiceless obstruent and, vice versa, the spreading of a High tone may be blocked by an intervening voiced obstruent (see Hyman & Schuh 1974, Tang 2008, Lee 2008, and many others for case studies). However, even



The equivalence of consonantal and vocalic moras is further substantiated by the tonal patterns of host+clitic constructions (see 10b–c), where both *daímōn* and *kapádoks* are followed by a clitic that bears a H tone, as opposed to words ending in a light syllable (e.g. 8b) or words with a lexically specified tone (e.g. 8c). However, the discussion on *σωτήρα* words has revealed that H retraction is sensitive to weight projected by vocalic elements only, as illustrated in (12), and not by consonants, regardless of how many they appear word finally.

- |      |    |  |  |                           |      |
|------|----|--|--|---------------------------|------|
| (12) | a. | κέ <sub>μ</sub> ε <sub>μ</sub> ρυ <sub>μ</sub> ks                      | *κεέ <sub>μ</sub> ρυks                     | ‘orator-NOM.SG’           | CC#  |
|      | b. | p <sup>h</sup> ilospeέ <sub>μ</sub> ε <sub>μ</sub> λυ <sub>μ</sub> ηks | *p <sup>h</sup> ilospeέ <sub>μ</sub> λυηks | ‘fond of grottoes-NOM.SG’ | CCC# |

According to Smolensky & Goldrick’s (2016) *Gradient Symbolic Representations* (GSR) model, the underlying phonological representations of morphemes (i.e. roots, affixes) consist of elements (i.e. segments, moras, tones, etc.), each of which has a specific numerical value – ranging from 0 to 1.0 – that reflects its differential degree of robustness. This value defines for each, say, segment token its *activation level* (AL).<sup>13</sup> Segments with an activity strength of 1.0 are strong enough to be pronounced and are impervious to change, as opposed to segments with an AL below 1.0, which remain silent. Interestingly, the realization of elements with a lower than 1 AL is subject to the satisfaction of certain conditions. For instance, a segment may acquire the extra strength it needs via fusion with a neighboring segment; alternatively, it may also get it from the Grammar, namely *Gen*, in the form of strength insertion/epenthesis (Smolensky & Goldrick 2016: 17–18).

Building on the premises of GSR, we propose that an intrametrical (i.e. non-final) consonant in a coda position in Ancient Greek can indeed project a mora but, alas, a weaker one compared to vowels. This is because the consonant itself is not strong enough to project a mora with AL 1. Let us randomly assign to this consonant and its projected mora the AL value 0.5 (<1.0). The moraic make-up of words like the one in (11b) is therefore shaped as follows:

- |      |  |                |                |                |                    |
|------|--|----------------|----------------|----------------|--------------------|
| (13) |  | μ <sub>1</sub> | μ <sub>1</sub> | μ <sub>1</sub> | μ <sub>0.5</sub>   |
|      |  |                |                |                |                    |
|      |  | ka             | pá             | do             | k <sub>0.5</sub> s |

As mentioned above, in order for a consonantal μ<sub>0.5</sub> to be pronounced and, consequently, host the L<sub>%</sub>, the consonant must get the extra strength it needs from *Gen*. Activity insertion registers as a violation of DEP. More specifically, for a candidate in which the consonant /k<sub>0.5</sub>/ surfaces as [k<sub>1</sub>], *Gen* must add 1.0 – 0.5 = 0.5AL to the inherent strength of the consonant. This is exactly the degree of DEP violation that must be indicated in the tableau for the strength enhancement of /k<sub>0.5</sub>/. The same DEP violation should be indicated for the increase of /k<sub>0.5</sub>/’s mora strength, raising the total of AL insertion to 1.0. The representation in (14a) depicts the weak input consonant which projects an equally weak and thus unpronounceable mora (14a), whereas (14b) illustrates the output form where the corresponding consonant and mora have been added supplementary activity strength.

---

in languages where such interactions do occur, the association of a Low tone with an obstruent is not uncommon. Lee (2008: 179–182), for instance, shows that CVO(obstruent) syllables in Thai surface with L and HL tones (contra to the dictates of \*VOICELESSOBSTRUENT/L). Although tone cannot be phonetically realized on a coda stop, Gordon (2001) has shown on the basis of a phonetic experiment that in certain tone systems (e.g. Hausa) a CVO syllable can even support a HL tone through the lengthening of the preceding vowel. Based on this information, therefore, the association of L<sub>%</sub> with the mora of a voiceless consonant, although marked, is cross-linguistically attested.

<sup>13</sup> Smolensky & Goldrick (2016) do not address the source of an element’s activity strength but Inkelas (2015), who proposes a similar representational model of strength scales, maintains that strength reflects the robustness of a phonological element’s storage in memory. Here we take a more conservative view and consider AL values to be simply lexically specified.

(14)	a. <i>Input with weak C &amp; μ</i>	b. <i>Output with strength enhanced C &amp; μ</i>	<i>DEP violation</i>
	$\begin{array}{cccc} \mu_1 & \mu_1 & \mu_1 & \mu_{0.5} \\   &   &   &   \\ k a_1 p a_1 d o_1 k_{0.5} s \end{array}$	$\begin{array}{cccc} \mu_1 & \mu_1 & \mu_1 & \mu_1 \\   &   &   & \vdots \\ k a_1 p a_1 d o_1 k_1 s \end{array}$	0.5 for final $\mu_{0.5}$
			0.5 for /k <sub>0.5</sub> /

Activity increased moras projected by also activity increased consonants are associated to their sponsors via dotted association lines, as opposed to vocalic moras, which are linked with the vowels via straight lines. This difference in the type of association in essence reflects a distinction in the relation that is established between elements that share a morphological affiliation and those that do not. For instance, inherent properties of segments that are automatically projected during phonological computation (e.g. features, moras, pre-linked tones, etc.) are part of the same morphological exponent as their sponsors.<sup>14</sup> In reference to our example, vocalic moras share the same affiliation as the vowels they are projected from, an underling relation that is signaled here with the use of straight lines. Consonantal moras, on the other hand, contain – besides their inherent strength – epenthetic AL inserted during phonological computation. More precisely, they include segmental and moraic activity that is not part of the exponent a particular morpheme materializes with, hence the use of dotted association lines. Dotted associations will also be used to represent recessively assigned tones, as opposed to inherent, lexically-specified ones (see examples in 3), which are associated to their sponsors by means of straight lines.

Finally, in this article, instead of ranked constraints, we employ a *Harmonic Grammar* (Legendre et al. 1990, Legendre et al. 2006, Pater 2008/2016, among others) where Itô & Mester’s constraints, stated in (6), are assigned a specific *weight* (*w*).<sup>15</sup> The tableau in (15) illustrates the computation of two candidate outputs, one with enhanced strength on its final consonant and mora (15a) and a more faithful one (15b).

		AR-L <sub>%</sub>	CONTIGUITY-T	CRISPEDGE-σ/T	NOLAPSE-L <sub>%</sub> /μ	DEP	H
		w:5	w:4	w:3	w:2	w:1	
(15)	/ka <sub>1</sub> pa <sub>1</sub> do <sub>1</sub> k <sub>0.5</sub> -s/ HLL <sub>%</sub>	a. H LL <sub>%</sub> ⋮ ⋮ μ <sub>1</sub> μ <sub>1</sub> μ <sub>1</sub> μ <sub>1</sub> k a p á d o k <sub>1</sub> s				-1	-1
	b. H L L <sub>%</sub> ⋮ ⋮ μ <sub>1</sub> μ <sub>1</sub> μ <sub>1</sub> μ <sub>0.5</sub> k á p a d o k <sub>0.5</sub> s	-1					-5

Candidate (15b) ends in a weak mora which forces the boundary L<sub>%</sub> to be aligned to the pre-final μ<sub>1</sub> in violation of ALIGNRIGHT-L<sub>%</sub>. Clearly, this candidate is less harmonic than (15a) which solves the problem by inserting a total AL of 1.0, i.e. 0.5 AL to /k<sub>0.5</sub>/ and 0.5 AL to its mora. The epenthetic activity strikes a -1 penalty to DEP but still the *H* of (15a) is better than the *H* of (15b).

<sup>14</sup> The theoretical framework this distinction is based on is *Colored Containment* (van Oostendorp 2006, Revithiadou 2007, Zimmermann 2017), which postulates that, first, the whole input (e.g. segments, features, prosodic nodes *and* their association relations) must be reconstructable from the output at any time and, second, elements and relations that are part of a morpheme’s exponent share the same morphological affiliation or, else, *color*, in contrast to those inserted during phonological processing, which are considered epenthetic.

<sup>15</sup> Following Legendre et al. (2006) and Coetzee & Pater (2008) we convert violation marks to negative integer scores.

The major gain for implementing gradient representations is that at the surface both consonantal and vocalic moras appear to be equally strong word-finally, which explains their common tonal behavior as far as enclitic constructions are concerned. Another welcome result of this analysis is that it captures the inertness of word-medial consonantal moras with respect to tone assignment in words like, for example,  $a^H n^H t^H r^L \sigma^L p o^L s$  ( $*a n^H t^H r^L \sigma^L p o^L s$ ). Such coda consonants are enhanced enough to be pronounced but their moras remain weak ( $\mu_{0.5}$ ) because in this particular environment they need not be strengthened, as opposed to final moras which are activated due to the pressure exercised by NOLAPSE- $L\%/\mu$ .

To get back to  $\sigma\omega\tau\eta\rho\alpha$  words, gradient representations give us the means to formulate the law at hand by making direct reference to the inherent strength of moras. In particular, we propose that H retraction is enforced by a constraint that prohibits a H tone to be associated to the non-head mora of a heavy syllable if followed by the last strong mora ( $\mu_1$ ) of the  $\omega$ :

(16) *The Σωτῆρα Law*

\*H

⋮

$\mu\mu_1 \mu_1 (\mu_{0.5})$

∨ | |

$X_{:1} X_1(X_{0.5})]_\omega$

‘Do not associate the H to the non-head mora if followed by the last  $\mu_1$  of the  $\omega$ .’

This parochial constraint is made sensitive to the AL of elements that project moras of equal strength. In Ancient Greek, only vowels and diphthongs are strong enough to automatically project  $\mu_1$ 's. In other words, the constraint in (16) requires the HL melody to be realized as a contour when the final syllable is light with the proviso, however, that the relevant moraic material is projected by inherently strong elements. A consequence of this assumption is that consonantal moras, which are not automatically projected by an element with inherent AL 1, fall outside the purview of the  $\Sigma$ -law.

The following tableau indicates that the  $\Sigma$ -Law weighs more than all other constraints discussed so far, including \*CONTOUR-T/ $\sigma$  (‘No contour tone in the same syllable’).<sup>16</sup> Candidate (17a) is the winner despite the violation of CRISPEGE- $\sigma$ /T. Violation of CONTIGUITY-T also generates a less harmonic output, namely (17b). Finally, candidate (17c) is also expelled because, by having the H associated to the non-head mora, it disobeys the  $\Sigma$ -LAW. All candidates included in the tableau enhance the AL of /k<sub>0.5</sub>/ and its mora so that AR- $L\%$  can be satisfied. However, the increase of activity strength has no bearing on the satisfaction of the  $\Sigma$ -LAW, because this constraint is sensitive to input strength only.

<sup>16</sup> That \*CONTOUR-T/ $\sigma$  (‘No contour tone in the same syllable’) has a relative high weight in the language is also evidenced by the fact that contour tones, although attested in Ancient Greek, arise only in certain environments, namely, in short words that consist of a HEAVY <(LIGHT)> syllable(s) like, for instance, (H)  $p^H\acute{\sigma}\acute{\sigma}s$  ‘light’, H<L>  $\acute{o}ikos$  ‘house’, and in tonally pre-specified suffixes, e.g. gen.pl /-ῶν/.

		$\Sigma$ -LAW	AR-L <sub>%</sub>	*CONTOUR-T/ $\sigma$	CONTIGUITY-T	CRISPEGE- $\sigma$ /T	NOLAPSE-L <sub>%</sub> / $\mu$	DEP	H
		w:9	w:5	w:5	w:4	w:3	w:2	w:1	
(17)	/kɛ:₁ry₁k₁s-/ HLL <sub>%</sub>								
	a. H L L <sub>%</sub> 		-1		-1		-1	-9	
	b. HL L <sub>%</sub> 			-1	-1			-1	-10
c. H L L <sub>%</sub> 	-1						-1	-10	

To sum up, in this section we maintained that consonantal and vocalic moras are integrally different because they are projected by segments with a different degree of strength. On the surface, such disparities in the level of a segment’s activity are evened out due to the supplementary strength added by the Grammar to pre-final coda consonants. Nonetheless, the intrinsic difference between the two types of moraic material is pertinent to tonal processes that are sensitive to the source of a mora’s strength, such as the  $\sigma\omega\tau\eta\rho\alpha$  retraction.

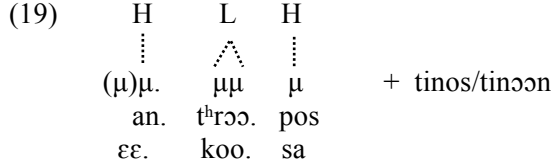
### 3.2 A re-analysis of *ánt<sup>h</sup>rōpos*-type words: Evidence from enclitic constructions

So far, we have established that on the surface VV- and VCC-final words end in a string of at least two strong moras. Interestingly, it is exactly this group of words that are followed by enclitics that surface with a tone (H or HL), as shown in (18). Here we will argue that an enclitic can surface with a tone only if the preceding word ends in a L<sub>%</sub>, that is, realizes the full HL+L<sub>%</sub> tonal melody within its domain. It remains an open question for now whether the H in *tinós* is inherent or not (although a dotted association line is used in the representation below). The tonal melody of the gen.pl form *tinṓn* is lexically-assigned by virtue of the inflectional suffix /-ṓn/. Enclitic tonal patterns will be discussed in detail in Section 3.3.

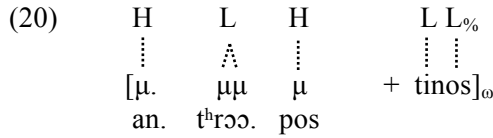
(18)

H	L	L <sub>%</sub>	H	HL
⋮	⋮	⋮	⋮	
⋮	↗	⋮		
[μ(μ). μ μ] <sub>ω</sub>			+ tinos/tinṓn	
ka.pa.	doks			
dai.	mṓn			
kεε.	ryks			

Contra to the data in (18), words that end in a light syllable are always followed by toneless clitics, even if the specific clitic form has a lexically pre-specified HL tone itself (e.g. *tinóōn*). Curiously, in this setting the final syllable of the host surfaces with a H, which is totally unanticipated under Itô & Mester’s analysis.



The solution we put forward here is quite straightforward: The lexical words in (19), as opposed to the ones in (18), have final syllable extrametricality (see, e.g., Steriade 1988). As a result, the final mora is not available to  $L_{\%}$ , therefore the boundary tone is forced to land on material added post-lexically at the right side of the string, i.e. the clitic. In this case, lexical word extrametricality is revoked and the tonal melody re-applies to the extended string, as shown below:



In short, we argue that the major difference between the structures in (18) and (19) is that in the latter the enclitic incorporates into the  $\omega$  of the host, whereas in the former it prosodifies in a different fashion, to be discussed in Section 3.3. In the ensuing paragraphs, we present the technical details of the analysis for the data in (19).

We commence by recasting Itô & Mester’s analysis of recessive accent in *ánt<sup>h</sup>róōpos*-like words (see examples in 1) according to the course of action outlined above. Within a GSR framework, extrametricality can be viewed as a positional reduction of a mora’s strength. In a way, our perspective resembles Hyde’s (2001) conception of extrametricality as gridless moras, that is, moras that fail to project a mora-level gridmark. More specifically, the mora projected by the short final vowel becomes unavailable because it loses a critical portion of its strength in violation of MAX (Smolensky & Goldrick 2016: 18) under the pressure exercised by the constraint NONFIN- $\mu_{1LEX}$ . This constraint forbids final light moras to be strong, i.e.  $\mu_1$ , and is indexed to refer strictly to lexical words. It should be noted that the degree of MAX violation is the sum of the violation of the relevant ‘gradient’ symbols a representation is built of. Assuming somewhat arbitrarily that 0.1 is just the bare minimum required for NONFIN- $\mu_{1LEX}$  to be satisfied, we calculate the deletion of the positional loss of activity of the final  $\mu_1$  as a 0.1 violation of MAX and the total loss of the activity of  $L_{\%}$  as a 1.0 violation. The total violation of MAX is therefore 1.1. This leads us to the conclusion that, in the present grammar, where NONFIN- $\mu_{LEX}$  weighs more than the other constraints, including MAX, it is more important to not realize  $L_{\%}$  at all (21a) than to have it linked to a non-final mora (21c). Of course, candidate output (21b) is the least harmonic one because it defies the constraint that compels moras to become weak word-finally. An output that satisfies NONFIN- $\mu_{LEX}$  but surfaces with a contour tone like (21d) is also less harmonic than the winning candidate.

Ancient Greek Pitch Accent

		NONFIN- $\mu_{LEX}$	AR-L $_{\%}$	*CONTOUR-T/ $\sigma$	CONTIGUITY-T	CRISPEGE- $\sigma$ /T	NOLAPSE-L $_{\%}$ / $\mu$	MAX	H
		w:7	w:5	w:5	w:4	w:3	w:2	w:2	
(21) /a <sub>1</sub> n <sub>0.5</sub> t <sup>h</sup> rɔː <sub>1</sub> pɔ <sub>1</sub> s/ H <sub>1</sub> L <sub>1</sub> L <sub>1%</sub>	a. H            L    L <sub>0%</sub> ∧ μ <sub>1</sub> μ <sub>0.5</sub> μμ <sub>1</sub> μ <sub>0.9</sub> a <sub>1</sub> n <sub>0.5</sub> t <sup>h</sup> rɔː <sub>1</sub> pɔ <sub>1</sub> s [ánt <sup>h</sup> rɔːpos]				-1			-1.1	<b>-6.2</b>
	b. H            L    L <sub>1%</sub> ∧      μ <sub>1</sub> μ <sub>0.5</sub> μμ <sub>1</sub> μ <sub>1</sub> a <sub>1</sub> n <sub>0.5</sub> t <sup>h</sup> rɔː <sub>1</sub> pɔ <sub>1</sub> s [ánt <sup>h</sup> rɔːpos]	-1			-1				<b>-13</b>
	c. H            LL <sub>1%</sub>   μ <sub>1</sub> μ <sub>0.5</sub> μμ <sub>1</sub> μ <sub>0.9</sub> a <sub>1</sub> n <sub>0.5</sub> t <sup>h</sup> rɔː <sub>1</sub> pɔ <sub>1</sub> s [ánt <sup>h</sup> rɔːpos]		-1		-1			-0.1	<b>-9.2</b>
	d.                    HL    L <sub>0%</sub>   μ <sub>1</sub> μ <sub>0.5</sub> μμ <sub>1</sub> μ <sub>0.9</sub> a <sub>1</sub> n <sub>0.5</sub> t <sup>h</sup> rɔː <sub>1</sub> pɔ <sub>1</sub> s [ant <sup>h</sup> rɔ́ðpos]			-1				-1.1	<b>-7.2</b>

The tableau in (22) exemplifies the tonal pattern of the same word when an enclitic is added postlexically (Taylor 1990, 1996, Condoravdi & Kiparsky 2001, Goldstein 2010, among others). Evidently, L $_{\%}$  does not have to be silenced here because the positional restriction on final moras is lifted; the original strength of the mora can no longer be affected by the positional subtraction of its AL triggered by NONFIN- $\mu_{LEX}$ . Moreover, the new target of L $_{\%}$  is not liable to the demands of NONFIN- $\mu_{LEX}$  because it is a function word.

		NONFIN- $\mu_{LEX}$	AR-L <sub>%</sub>	CONTIGUITY-T	CRISPEGE- $\sigma/T$	NOLAPSE-L <sub>%</sub> / $\mu$	MAX	H
		w:7	w:5	w:4	w:3	w:2	w:2	
(22)	$[a^{Hnt}r\acute{o}^L\acute{o}Lpos]_{\omega}$ tinos <sup>17</sup> $H_1L_1L_{1\%}$	a. H L L <sub>1%</sub> ∴ ∴ ∴ $\mu_1 \mu_1 \mu_1$ ánthrṓ:pos tinos $[a^{Hnt}r\acute{o}^L\acute{o}Lpo^Hs\acute{t}i^Lno^L\%s]_{\omega}$						0
	b. H L L <sub>0%</sub> ∴ ∴ $\mu_1 \mu_1 \mu_1$ ánthrṓ:pos tinos $[a^{Hnt}r\acute{o}^L\acute{o}Lpo^Hs\acute{t}i^Lnos]_{\omega}$						-1	-2

To sum up, we have offered a re-analysis of the problematic, under the tonal antepenultimacy account, pattern of *ánthrṓpos*-like words, rendered both in isolation and in enclitic contexts. The hub of our proposal is that the moraic and, by extension, the tonal make-up of the word end plays a pivotal role in the type of prosodic structure the host will form with its enclitic. More specifically, *ánthrṓpos*-type words were shown to have moras of diminished strength at their right side, so that the target TBU of L<sub>%</sub> is no longer tangible.<sup>18</sup> The immediate consequence of this situation is that such words form a plain  $\omega$  with no boundary tone. In the context of an enclitic, however, the extrametricality condition is lifted and the clitic amalgamates with the host into a unified  $\omega$ , which now provides the appropriate setting for L<sub>%</sub> to be realized. The discussion so far leads us to the somewhat tentative conclusion that there exist two types of  $\omega$ 's in Ancient Greek: those that have a weak, toneless right edge and those that end in a L<sub>%</sub>. The latter are constructed post-lexically, whereas the former lexically. In the ensuing section, we take a closer look at the prosodic pattern of enclitic constructions with words like *daímōn* and *kapádoks* as their host, and provide our interpretation of the relevant data.

### 3.3 Enclitic structures with *VV/VCC-final* hosts and prosodic adjunction

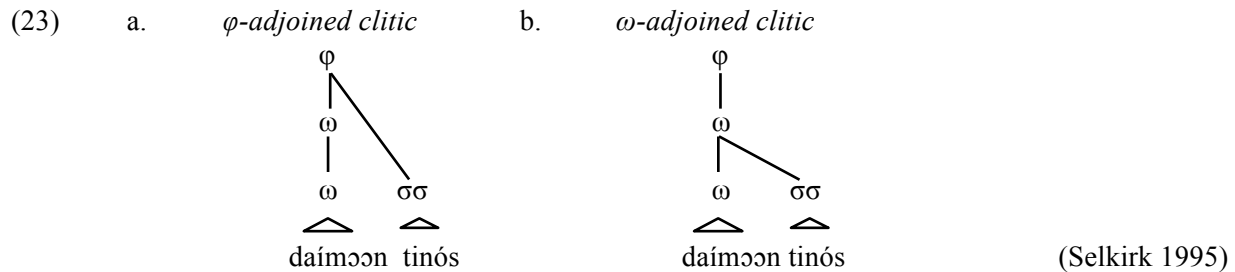
Recessive tone assignment in words like *daímōn* and *kapádoks* applies as anticipated: the HL+L<sub>%</sub> constellation is realized at the last three moras of the word with the H residing on the antepenultimate mora. Interestingly, when a clitic is added post-lexically, it surfaces with a tone either on its final syllable,

<sup>17</sup> Incorporation of the clitic intimates that ALIGNRIGHT(LexW, R;  $\omega$ , R) (McCarthy & Prince 1993) has a low weight in this grammar compared to PARSE-INTO- $\omega$  (Itô & Mester 2009: 139), which requires both the host and the clitic to be parsed into a single  $\omega$ . Since the focus of our discussion is on the tonal pattern of the respective structures, the constraints that determine their prosodic organization are omitted from the tableau.

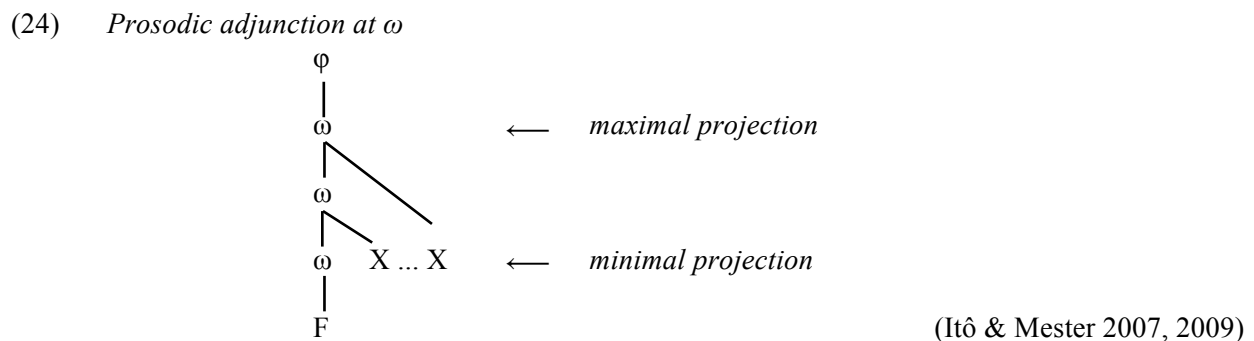
<sup>18</sup> Words with a pre-specified tone, e.g. *hodós tinos* ‘some street’ (8c), pattern with *ánthrṓpos*-like words. In such words the final mora is lexically pre-linked to the H of the HL tonal contonation, *hodo*<sup>H(L)</sup>s, leaving the L component floating. Post-lexically, though, a disyllabic clitic offers a suitable host for both the L and the L<sub>%</sub>, i.e. *hodo*<sup>H</sup>s *tí*<sup>L</sup>*no*<sup>L%</sup>s. The suppression of pre-associated HL in clitics like *tinṓdn*, e.g. *pylṓdn tinṓdn* ‘of some (GEN.PL) gates (GEN.PL)’ (8c), has been difficult to explain in previous accounts. Here we adhere to the following interpretation: Accented inflections are cross-linguistically more prone to be suppressed (Alderete 1999, Revithiadou 1999), which in the present framework is interpreted as having a low AL. However, the presence of L<sub>%</sub> as a boundary tone provides, via some sort of fusion, the extra boost to the L component of the HL melody – but, crucially, not to H – to reach an AL of 1.0. The end result is therefore an output clitic with a L, and not an HL, tone.

e.g. *kapádoks tinós*, *daímων tinós* or with a HL pre-specified tone on its inflection, e.g. *elpídων tinós*. On the basis of these data, one is led to ask: Why do clitics appear with a H(L) in this specific environment and, moreover, what kind of prosodic constituent do they form with their host?

We start by addressing the presence of a H on the last syllable of the function word. In contrast to lexical words, clitics do not display a recessive tone pattern, a rather peculiar property that has impelled researchers to propose that they are subject to a different accentual rule than lexical words (see Steriade 1988, Golston 1990, Blumenfeld 2004, among others, and Section 4 for a brief overview). Here we put forward the claim that clitics are toneless (unless they are inflected with the gen.pl suffix /-όν/) but in the environments in question surface with a boundary tone, namely H%. This hypothesis naturally raises a question on the type of prosodic boundary H% signifies and, more specifically, whether it is a *phonological phrase* ( $\varphi$ ) boundary (23a) or the boundary of an extended  $\omega$  (23b). We will argue in favor of the representation in (23b) and thus for  $\omega$ -adjunction.



The rationale behind the appeal to  $\omega$ -adjunction is twofold: First, in the Ancient Greek literature evidence from segmental processes and the metrics supports the view that clitics are not  $\varphi$ -attached (see Goldstein 2010 and references cited therein). Second, having the same clitic prosodify at the level of the  $\omega$  or the  $\varphi$ , depending on the tonal configuration of the host, finds – to my knowledge – no empirical support from cross-linguistic evidence. For one thing, a major gain of employing adjunction is that it allows us to accommodate differences in the accentual phonology of enclitic constructions by simply enforcing additional layers of structure. This line of thinking is in accord with Itô & Mester’s (2007, 2009) sparse version of the *Prosodic Hierarchy* (Selkirk 1981, Nespôr & Vogel 1986, among others) which includes fewer prosodic categories but, importantly, makes a crucial use of adjunction and relational notions such as *maximal* and *minimal* projections of categories. As depicted in (24), by including prosodic adjunction in our parsing apparatus, we can get the largest projection of  $\omega$ , namely the ‘maximal  $\omega$ ’ ( $\omega^{\max}$ , ‘ $\omega$  not dominated by  $\omega$ ’) and the smallest projection of  $\omega$ , that is, the ‘minimal  $\omega$ ’ ( $\omega^{\min}$ , ‘ $\omega$  not dominating  $\omega$ ’).



All these layers represent the different ways material can be prosodified at the level of the  $\omega$ . So far, we have shown that *ánthrōpos*-type words incorporate the enclitic in a single  $\omega$ , the right edge of which is signaled by a L%. Here, we will argue that *daímων*- and *kapádoks*-type words are prosodically organized into an extended  $\omega$  together with the clitic, namely a  $\omega^{\max}$ , which is demarcated by a H%. The tableau in (25) explicates post-lexical tone assignment in the input string /[dai<sup>H</sup>mō<sup>L</sup>ón]ω tinós/. The



focal point here is obviously the tonal behavior of the clitic. The constraint ALIGNRIGHT-H<sub>%</sub>/ω<sup>max</sup> compels the alignment of H<sub>%</sub> to the rightmost mora within the ω<sup>max</sup> domain. Needless to say, realization of H<sub>%</sub> in the pre-final mora (25b) or annihilation of its strength (25c), which is tantamount to deletion, results in less harmonic outputs.

		AR-H <sub>%</sub>	MAX	H	
		w:5	w:2		
(25) [dai <sup>H</sup> mɔ <sup>L</sup> ɔ <sup>L%</sup> n] <sub>ω</sub> tinos H <sub>%</sub>	☞ a.	$  \begin{array}{c}  H_{1\%} \\  \vdots \\  \mu_1 \mu_1 \\  [dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tinos} \\  [[dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tino}^{H\%} s]_{\omega}^{\max}  \end{array}  $			<b>0</b>
	b.	$  \begin{array}{c}  H_{1\%} \\  \vdots \\  \mu_1 \mu_1 \\  [dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tinos} \\  [[dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ ti}^{H\%} nos]_{\omega}^{\max}  \end{array}  $	-1		<b>-5</b>
	c.	$  \begin{array}{c}  H_{0\%} \\  \mu_1 \mu_0 \\  [dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tinos} \\  [[dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tinos}]_{\omega}^{\max}  \end{array}  $		-1	<b>-2</b>

The lack of tone in monomoraic/monosyllabic clitics in the same environment is attributable to an OCP constraint which prevents adjacent T%'s:

		AR-H <sub>%</sub>	OCP-T%	MAX	H	
		w:5	w:3	w:2		
(26) [dai <sup>H</sup> mɔ <sup>L</sup> ɔ <sup>L%</sup> n] <sub>ω</sub> tis H <sub>%</sub>	☞ a.	$  \begin{array}{c}  L \ L\% \ H_{0\%} \\  \vdots \\  \mu \mu_1 \ \mu_1 \\  [dai^H m\alpha \text{ } \alpha \text{ } n] \text{ tis} \\  [[dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ tis}]_{\omega}^{\max}  \end{array}  $			-1	<b>-2</b>
	b.	$  \begin{array}{c}  L \ L\% \ H_{1\%} \\  \vdots \quad \quad \quad \vdots \\  \mu \mu_1 \quad \mu_1 \\  [dai^H m\alpha \text{ } \alpha \text{ } n] \text{ tis} \\  [[dai^H m\alpha \text{ } \alpha \text{ } n]_{\omega} \text{ ti}^{H\%} s]_{\omega}^{\max}  \end{array}  $		-1		<b>-3</b>

By embracing adjunction and the relational notion of projection, three different types of  $\omega$  in Ancient Greek can now be identified: (a)  $\omega^{\max}$ , which is signaled by the H% (27a); (b)  $\omega$ , which is demarcated by the L% (27b); and (c)  $\omega^{\min}$ , which is designated by extrametricality, that is, the weakening of the final mora and the consequent silencing (non-realization) of the boundary tone (27c). Curiously, the Ancient Greek  $\omega$ , unlike  $\omega^{\min}$  and  $\omega^{\max}$ , is constructed either at the lexical or at the post-lexical level, depending on the moraic composition of a word's right edge.

(27)	a.	$\omega^{\max}$ :	δαίμων τινός	[[dai <sup>H</sup> mo <sup>L</sup> ɔ <sup>L%</sup> n] <sub>ω</sub> tino <sup>H%</sup> s] <sub>ω</sub> <sup>max</sup>	‘someone’s god’ (8a)
	b.	$\omega$ :	ἀντήρ ὁδός τινος ἡδός τινος	[a <sup>H</sup> nt <sup>H</sup> rɔ <sup>L</sup> ɔ <sup>L%</sup> po <sup>H%</sup> s ti <sup>L</sup> no <sup>L%</sup> s] <sub>ω</sub> [hodo <sup>H</sup> s ti <sup>L</sup> no <sup>L%</sup> s] <sub>ω</sub>	‘someone’s man’ (8b) ‘some street’ (8c)
	c.	$\omega^{\min}$ :	δαίμων ἀντήρ ὁδος	[dai <sup>H</sup> mo <sup>L</sup> ɔ <sup>L%</sup> n] <sub>ω</sub> [a <sup>H</sup> nt <sup>H</sup> rɔ <sup>L</sup> ɔ <sup>L%</sup> <pos>] <sub>ω</sub> <sup>min</sup>	‘god’ (2b) ‘man’ (1c)

#### 4 Alternative accounts of Ancient Greek accentuation, and conclusions

Inspired by Itô & Mester’s tone-based approach of the Ancient Greek recessive pattern, we advanced a modified version of their analysis in order to empirically cover data from enclitic constructions and the so-called *σωτήρα* words. In this section, we will review two metrical analyses of the same data, and will discuss them in relation to the analysis offered in this article.

According to metrical accounts, Ancient Greek is a mixed system: a metrical apparatus determines the position of the accented mora, whereas tonal constraints decide on the distribution of tones to these metrically prominent positions. Steriade (1988), for instance, offers a rule-based analysis of Ancient Greek accentuation that posits a set of foot formation rules which first render extrametrical both the word-final consonant ([C]) and the word-final light syllable (<CV[C]>), and then build a quantity insensitive trochee at the right edge of the word: (*ant<sup>H</sup>rɔɔ*)<po[s]>, (*oi*)<ko[s]>. The H is associated to the metrically prominent syllable of such a foot (indicated with underlined font): (*a<sup>H</sup>nt<sup>H</sup>rɔɔ*)<po[s]>, (*o<sup>H</sup>i*)<ko[s]>. Moreover, intrametrical (i.e. non-final) consonants project a mora and, given that the extrametricality condition is weight sensitive, VC[C]-final syllables are visible to the foot formation rule: *ka(pa<sup>H</sup>dok)[s]*. It is worth emphasizing that this analysis can derive the word pattern of *σωτήρα* words without any additional stipulations: (*ke<sup>H</sup>eryk*)[s]. To account for the three-mora restriction attested in VV[C]-final words, however, Steriade resorts to a special *mora rule*, which is designed to cause a left-dominant nuclei to shift rightwards, so that the H will end up being associated to the second mora of the heavy nucleus, i.e. ( $\mu^H\mu.\mu\mu$ )  $\rightarrow$  ( $\mu\mu^H.\mu\mu$ ): *an(t<sup>H</sup>rɔɔ<sup>H</sup>ɔpoo)*  $\rightarrow$  *an(t<sup>H</sup>rɔɔ<sup>H</sup>poo)*.

By exception, a structure-building rule that constructs right-headed quantity insensitive feet is in effect in enclitic constructions. Thus, enclitic material is parsed into right-headed feet with the H occupying the head position of such an iambically-shaped foot: *ka(pa<sup>H</sup>doks)* (*tino<sup>H</sup>s*), (*ke<sup>H</sup>eryks*) (*tino<sup>H</sup>s*). Subminimal feet are permitted and receive a H tone as well: (*a<sup>H</sup>nt<sup>H</sup>rɔɔ*)(*po<sup>H</sup>s*) (*ti<sup>H</sup>s*), (*o<sup>H</sup>i*)(*ko<sup>H</sup>s*) (*tino<sup>H</sup>s*), but they are subject to de-stressing under clash: (*a<sup>H</sup>nt<sup>H</sup>rɔɔ*)(*po<sup>H</sup>s*) *tis*, (*o<sup>H</sup>i*)(*ko<sup>H</sup>s*) *tinós*.

Although descriptively successful, a major problem with Steriade’s analysis, pointed out by Sauzet (1989), is the discrepancy between the quantity-insensitive footing, on the one hand, and the quantitative sensitive aspects of the language, on the other, such as the dependence of extrametricality and the mora rule on the weight of the final syllable, and so on. This inconsistency in the design of the analysis extends to enclitic accentuation. Post-lexical feet not only are totally impervious to weight distinctions but they are also iambically shaped and often sub-minimal, contra to the cross-linguistic expectations on canonical iambs (e.g. Hayes 1980, 1995). In our analysis none of these problems arises. The same pattern of recessive accentuation applies globally but different outputs are generated depending on the moraic configuration of the host, which has an effect on the distribution of boundary tones and, by extension, to the emergence of a layered  $\omega$ .

Golston (1990), building on Sauzet’s (1989) analysis of the Ancient Greek recessive pattern, assumes a H+L\*contonation that associates to the specific positions of moraic trochees, built iteratively

from right to left.<sup>19</sup> (Final consonants are also considered extrametrical.) More specifically, the L component of the H+L\* pitch accent is linked to the head of the rightmost foot, whereas the H is realized on the immediately preceding vocalic element:  $(a^H n)(t^H r \sigma^L \sigma) po[s]$ ,  $an(t^H r \sigma^H \sigma)(po^L o)$ ,  $(k\varepsilon^H \varepsilon)(ry^L k)[s]$ .<sup>20</sup> To account for enclitic accentuation, Golston has to make a few unwarranted stipulations: First, disyllabic enclitics are considered to be lexically specified with a floating H, e.g.,  ${}^H tinos$ , which ends up being realized on the preceding host,<sup>21</sup> provided its final syllable does not carry an accent/tone itself:  $/(a^H n)(t^H r \sigma^L \sigma) pos {}^H tinos/ \rightarrow (a^H n)(t^H r \sigma^L \sigma) po^H s tinos$ . Otherwise, the H sponsored by the clitic is realized within the clitic:  $(dai^H)(m\sigma^L \sigma n)$  ( $ti^H nos$ ),  $(k\varepsilon^H \varepsilon)(ry^L ks)$  ( $ti^H nos$ ). However, because a foot clash situation is created in this context, the H of the clitic is forced to move rightwards, yielding on the surface outputs with a H on the final syllable of the disyllabic clitic:  $(dai^H)(m\sigma^L \sigma n)$  ( $tin\sigma^H s$ ) and  $(k\varepsilon^H \varepsilon)(ry^L ks)$  ( $tin\sigma^H s$ ), respectively.

Second, all finally-accented words (e.g.  $hodo^H s$ ,  $pyl\sigma^H \sigma n$ ) – even those that are traditionally considered recessively accented (e.g.  $p^H \sigma^H \sigma s$  ‘light-NOM.SG’,  $pa^H is$  ‘child-NOM.SG’) – are taken to be lexically associated to a H\*, the sole motivation of which is to block the floating H of the clitic from docking on the last syllable of the host:  $ho(do^H s) {}^H(tinos)$ . Besides the fact that there is no obvious reason as to why the H+L\* contonation has to split between two different feet, with the L tone being associated to the foot-head, contra to cross-linguistic tendencies that favor H tones in metrically strong positions (see de Lacy 2002), the analysis offered for the enclitic data introduces several ad hoc assumptions which diminish its explanatory force. In sharp contrast, our analysis enjoys a broader empirical coverage and provides a uniform interpretation of the accentual patterns attested in both word and enclitic constructions.

To conclude, we have presented some thoughts on the possible ways Itô & Mester’s treatment of recessive accentuation in Ancient Greek can be successfully extended to cover more empirical data. We have shown that many creases pertaining to certain recessive and enclitic patterns can be easily ironed out if our analytical tools are enriched with gradient symbolic representations and the concept of phonological adjunction. Gradient representations, for instance, help us differentiate the accentual behavior of seemingly equivalent moraic representations, whereas adjunction provides the necessary layering to accommodate all types of  $\omega$ ’s the Ancient Greek grammar constructs at the lexical and at the post-lexical level. We have put these ideas to work in examining some aspects of Ancient Greek accentuation but there is no doubt that more research needs to be done in order to acquire a deeper understanding of the language’s accentual grammar.

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<sup>19</sup> The gist of their analysis is also adopted by Kiparsky (2003) and Blumenfeld (2004).

<sup>20</sup> The author does not explain how the contour HL tone surfaces on the head mora of  $(k\varepsilon^H \varepsilon)$  in  $\sigma\omega\tau\eta\rho\alpha$  words like  $k\varepsilon\eta\rho\kappa s$ .

<sup>21</sup> Blumenfeld (2004) also treats enclitics as pre-accenting.

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