

# Phrase-level and word-level syllables: Resyllabification and prosodization of clitics

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## 0. Introduction

Prosodic Theory and, in particular, the Strict Layer Hypothesis (SLH), maintain that each level of the prosodic hierarchy is fully contained within the level dominating it (Nespor and Vogel 1986; Selkirk 1995). However, in some languages a syllable is not necessarily contained within a single Prosodic Word (PW). In this paper, we investigate two such cases of violation of the SLH, and offer a new analysis of the facts.

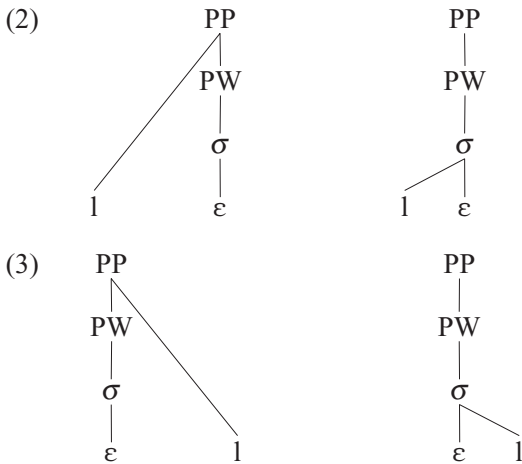
First, we examine data involving the prosodization of Romance “free” clitics, or clitics that are incorporated into prosodic structure at the level of the Phonological Phrase (PP) (Selkirk 1995). The northern Italian dialect of Donceto has free subject clitic pronouns. As we can see in (1) within Donceto clitic + host units, the syllable boundaries are clear: there is a single syllable in each case.

- (1) /l/ + /ε/ > [lε]      ‘he is’  
      /ε/ + /l/ > [εl]      ‘is he?’

But where are the Prosodic Word (PW) boundaries in (1)? Since free clitics, by definition, are not part of the same PW as the host, the clitic + host unit does not form a PW. None of the representations in (2)–(3) capture the fact that clitic + host form a single syllable, but the clitic /l/ is not part of the PW.<sup>1</sup>

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<sup>1</sup> Although /ε/ ‘is’ might not be considered to be a PW, we use it to illustrate our point. The same syllabification issues arise with other vowel-final verbs with enclitics (for ex., /be:v\_l/ ‘does he drink?’), but we are not able to test our claims using other vowel-initial verbs since there are no vowel-initial verbs in this dialect. Common Romance vowel-initial verbs are consonant-initial in this dialect: It. *amare* = /vu’le beN/ ‘to love’, It. *uscire* = /na fōra/ ‘to exit’, It. *incontrare* = /tru’va/ ‘to meet’, etc.



Second, we examine phrasal resyllabification, or the situation in which a single syllable contains elements belonging to two different words.<sup>2</sup> For example, a word-final consonant may be resyllabified as the onset of the following vowel-initial word, as illustrated in the data from Spanish in (4).<sup>3</sup> This particular process is attested in many Romance languages, Turkish, Korean, Arabic, Indonesian, etc.

(4) *club elegante* ‘elegant club’ [klu.βe.le.ɣan.te]

While the syllable boundaries are uncontroversial, the Prosodic Word (PW) boundaries are not so clear. Some possibilities are suggested in (5).

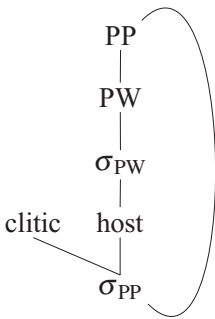
(5) [klu.β#e.le.ɣan.te]  
 [klu.#βe.le.ɣan.te]  
 [klu.βe.#le.ɣan.te]

<sup>2</sup> We do not address the topic of (re)syllabification within morphologically complex words, only resyllabification across word boundaries.

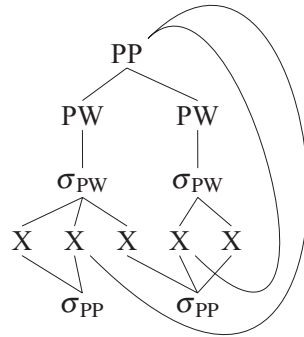
<sup>3</sup> In addition to speaker intuition, segmental processes in Spanish varieties provide evidence of resyllabification. For example, in the Chinato dialect of Western Spain, certain consonants are aspirated in coda position. Those consonants aspirate in word-final position before a consonant-initial word (among other contexts), but not before a vowel-initial word (Hualde 1991). These facts have been interpreted as evidence that a word-final consonant before a vowel-initial word is resyllabified to onset position and, therefore, is not subject to aspiration. Similar patterns are attested in the Spanish dialect of Coria (Cummins 1974) and in some varieties of Buenos Aires Spanish (Goldsmith 1981: 6, Kaisse 1999).

We propose that the resyllabification facts and the prosodization of free clitics can be best accounted for by adopting a model of the prosodic hierarchy in which there is an additional phrasal syllable level nested under the PP-level. In other words, there are two syllable representations: the syllable that is embedded under the PW ( $\sigma_{PW}$ ) and an additional “phrasal” syllable ( $\sigma_{PP}$ ).

(6) a. clitic prosodization



b. resyllabification



We conclude by analyzing some restrictions on the types of syllables that can be formed in resyllabification and clitic prosodization contexts. In neither of these situations can a consonant resyllabify to form part of a complex onset or coda. Compare (7a) and (8a) in which a word-final consonant syllabifies into onset position, with (7b) and (8b) in which a word-final consonant cannot syllabify to form part of a complex onset. We argue that these facts, too, can be best captured by making reference to phrasal syllables.

(7) Catalan clitic prosodization

- a. *reb-ho* ‘receive it (indef.)’ /reb/ + /o/ > [rɛ.βu]
- b. *reb-la* ‘receive her’ /reb/ + /la/ > [rɛβ.la]  
 \*[rɛ.βla] (N. B. [βl] is an acceptable onset)<sup>4</sup>

(8) Spanish resyllabification

- a. *club elegante* ‘elegant club’ [klu.βe.le.ɣan.te]
- b. *club lindo* ‘pretty club’ [kluβ.lin.do]  
 \*[klu.βlin.do] (N. B. [βl] is an acceptable onset)

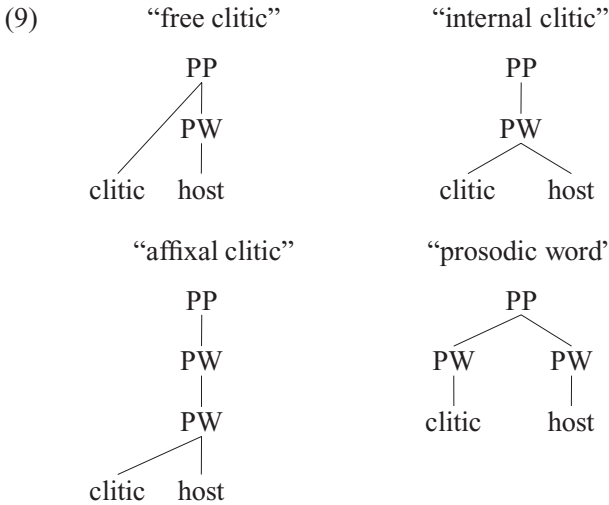
This paper is organized as follows. First, in section 1, we discuss the prosodization of free clitics. We show that the traditional prosodic hierarchy cannot handle

<sup>4</sup> /b/ > [β] in onset position after a vowel (Bonet and Lloret 2005a).

all the data, and we introduce a new ‘phrasal’ syllable level which is independent of the PW and nested directly under the Phonological Phrase (PP). In section 2, we review previous analyses of resyllabification, point out problems with these approaches, and show that phrasal syllables can account for these facts as well. We then investigate the restrictions on clusters in these two contexts (section 3). We conclude the paper in section 4.

**1. Free clitics**

Clitics may be prosodized differently in different languages and in different contexts (Selkirk 1995). Four types of prosodized clitics are represented below. We do not consider the ‘clitic group’ in this paper [Nespor and Vogel 1986], although it bears a similarity to the model presented in this paper, which we will point out in section 4. We use examples involving proclitics, although the same structures are possible with enclitics.



The representation of free clitics presents a challenge to the prosodic hierarchy since a free clitic may form a syllable with its host, but it cannot be part of the same PW as the host (2)-(3). We investigate this puzzle using data from the northern Italian dialect of Donceto. We begin by showing that the dialect of Donceto has free subject clitics (section 1.1), which, we claim, can best be described using a new model of the prosodic hierarchy which includes phrasal syllables (section 1.2).

1.1. Donceto subject clitics

The dialect of Donceto, which is typical of many northern Italian dialects, has three preverbal subject clitics in declarative sentences, and six postverbal subject clitics in interrogative sentences (see Cardinaletti and Repetti 2004, to appear). We illustrate this using the present indicative forms of the verb ‘drink’ in (10).

(10)		<i>declarative</i>	<i>interrogative</i>
	1sg	'be:v	'be:v -jə
	2sg	ət- 'be:v	'be:v -ət
	3sg	əl- 'be:və	'be:və -l
	1pl	bu'vum	bu'vum -jə
	2pl	bu'vi	bu'vi: -v
	3pl	i- 'be:vən	'be:vən -jə

Do constraints applying to the PW in Donceto affect clitic + host units? If they do, we can conclude that Donceto subject clitics are “internal” or “affixal”. If they do not, we conclude that Donceto subject clitics are “free”.<sup>5</sup>

An obstruent voicing assimilation rule is active in the Donceto dialect: two adjacent obstruents of different voice features assimilate to the voicing of the second obstruent. In the following examples we see that certain unstressed vowels may be deleted, leaving the consonants flanking it adjacent. If the adjacent consonants are obstruents, they must have the same voicing feature.

(11)	['vətʃ] / [(ə)f'tʃajə] (*[(ə)v'tʃajə])	‘old’/‘old age’
	['peza] / [(ə)b'zæ] (*[(ə)p'zæ])	‘scale’/‘to weigh’

This type of assimilation is found within PWs (11), but crucially not across PWs (12) or at clitic boundaries (13).<sup>6</sup>

(12)	/gat/ + /beɪ/ > ['gat 'bɛɪ] (*['gad 'bəl])	‘beautiful cat’
(13)	/t/ + /be:v/ > [ət 'be:v] (*[əd 'be:v])	‘you:sg drink’

<sup>5</sup> Subject enclitics in other northern Italian dialects similar to those in (010) have been analyzed by some scholars as *verbal affixes* (Benincà and Vanelli 1982; Fava 1993; Gorla 2004; Poletto 2000; Rohlfs 1968; Zamboni 1974; etc.), implying that the verb + enclitic unit is a PW (i. e., subject clitics are “internal” or “affixal”). Cardinaletti and Repetti (to appear) use various diagnostics to show that the postverbal material in (10) cannot be considered as an inflectional suffix, i. e., as word-internal.

<sup>6</sup> In rapid speech in Spanish and French, word-final obstruents agree in voicing with the following word-initial segment (Harris 1980; Casagrande 1984).

Another example of the difference between PWs and host + clitic units involves consonant clusters. Donceto PWs may contain onset clusters and coda clusters; however, in verb + clitic units they are restricted, as illustrated in the chart in (14). (See section 3 below for further discussion.)

(14)	<i>onset clusters</i>	<i>coda clusters</i>
PW	[tri] 'three'	[ust] 'August'
clitic	*[t-rõ:f] 'you:sg snore'	*[pas-t] 'do you:sg pass?'
+ host	([æt-rõ:f])	([ˈpas-æt])

Evidence that the subject clitic in the examples in (14) is lexically /t/ and not /æt/ comes from the fact that when adjacent to a vowel, the clitic surfaces as [t], suggesting that the schwa in (14) is epenthetic.

(15)	t-ε bu'vi:d	*æt-ε bu'vi:d	'you:sg have drunk'
	ε-t bu'vi:d	*ε-æt bu'vi:d	'have you:sg drunk?'

Furthermore, verbal suffixes affect stress assignment, but enclitic pronouns do not, as seen in the following data from Padua (a related northern Italian dialect spoken in the Veneto region).

(16)		<i>verb stem + suffix</i>	<i>verb + enclitic pronoun</i>
a.	Does the post-verbal material affect stress?	YES máɲ+i 'you:sg eat' maɲ+émo 'we eat'	NO máɲi 'you:sg eat' máɲi-to 'do you:sg eat?' (*maɲi-to)
b.	Is the 'three syllable window' respected?	YES teléfon+i 'you:sg call' telefon+émo 'we call' (*teléfon+emo)	NO teléfoni-to 'do you:sg call?' (*telefóni-to; *telefoní-to)

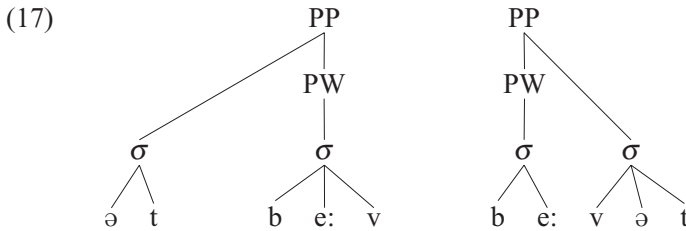
In (16a) we see that inflectional suffixes affect the position of stress on the verb, while the addition of enclitic pronouns does not. In (16b) we see that the familiar 'three syllable window' of stress assignment (whereby stress falls on one of the final three syllables) is respected within verb stem + suffix units, but not within verb + enclitic pronoun units.<sup>7</sup>

<sup>7</sup> Note that in Italian the 'three syllable window' is violated with some verb stem + 3pl suffixes: *teléfonano* 'they telephone'. However, this is not the case in Paduan, Donceto, or any of the other northern Italian dialects that we have considered.

If the clitic pronouns were part of the same PW as the verb, we would expect the processes described above to apply to the verb + clitic unit; however, this is not what we find. We conclude that clitics are not part of the same PW as the host, therefore, they cannot be internal clitics or affixal clitics. Furthermore, Donceto subject clitics cannot be independent Prosodic Words (PW) since they do not meet word minimality requirements, they cannot be stressed, they cannot appear in isolation, etc. In Cardinaletti and Repetti (to appear) we conclude that they are “free clitics”, meaning that they are adjoined to their host at the level of the PP.<sup>8</sup>

1.2. Prosodic representation of free clitic + host units

We have determined that Donceto subject clitics can be described as free clitics. How can we represent the prosodization of these clitics? In (17) (using the 2sg forms) we represent one possibility inspired by Peperkamp (1997) in which the PW boundaries are redrawn when a clitic is added. (See § 2.1 for further discussion of Peperkamp 1997.)

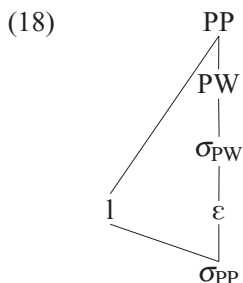


The model in (17) takes the PW to be either [bɛ:v] (with proclitic) or [bɛ:] (with enclitic), and can handle the representation of these data. However, the prosodic representation of other clitic + host structures cannot be described in as straightforward a manner. Consider the Donceto data in (1). Using the “traditional” model, neither the representation in (2) for the form with the proclitic ([lɛ]), nor the representation in (3) for the form with the enclitic ([ɛl]) captures

<sup>8</sup> Some scholars have analyzed Romance object clitics in the same way, for example, Italian object clitics are analyzed as “free” clitics by Peperkamp (1997) and Bafile (1991–1992). In other works, however, Romance object clitics are taken to be “internal clitics” (Bonet and Lloret 2005a for Catalan; Bafile 1991–1992 for Neapolitan; Monachesi 1996 for Italian and Neapolitan single clitics, but not clitic clusters, which are taken to be PWs), “affixal clitics” (Peperkamp 1997 for Neapolitan; Loporcaro 2000 for all Romance object clitics), or part of the “clitic group” (Nespor and Vogel 1986).

the fact that clitic /l/ is part of the same syllable as the host verb /ε/, but it is not part of the PW (since it is a free clitic; see also footnote 1.)

We propose that in phrasal contexts, there are two syllable representations: the syllable that is a daughter of the PW ( $\sigma_{PW}$ ), and an addition ‘phrasal’ syllable ( $\sigma_{PP}$ ) that is nested directly under the PP level (18).<sup>9</sup>



This structure captures the fact that free clitic prosodization is a phrasal phenomenon, and it correctly shows that the clitic /l/ is PW-external, and that [.lε.] constitutes a syllable.

We will now see that the representation in (18) does not violate the basic principles of the Prosodic Hierarchy. The Prosodic Hierarchy is subject to the Strict Layer Hypothesis (Nespor and Vogel 1986) (19), which can be restated as a series of constraints on Prosodic Domination (Selkirk 1995) (20).

(19) *Strict Layer Hypothesis*

- a. a given non-terminal unit is composed of one or more units of the immediately lower category
- b. a unit of a given level is exhaustively contained in the superordinate unit of which it is part

(20) *Prosodic Domination*

Layeredness: no  $C_i$  dominates  $C_j$ ,  $j > i$

Headedness: any  $C_i$  must dominate  $C_{i-1}$

Exhaustivity: no  $C_i$  immediately dominates  $C_j$ ,  $j < i-1$

Non Recursivity: no  $C_i$  dominates  $C_j$ ,  $j=i$

Peperkamp (1997:35–36) points out that none of the *Prosodic Domination* constraints in (20) concern the second clause of the *Strict Layer Hypothesis*. She suggests that the second clause of the *Strict Layer Hypothesis* can be inter-

<sup>9</sup> The two syllable levels provide domains of certain constraints, as will be illustrated in section 3. For reasons of space, we ignore the question of foot structure.





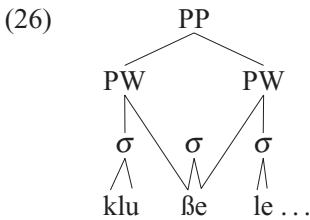
More recent work on resyllabification is framed within the formalism of Optimality Theory (OT). Typical of this approach is Face (2002) who proposes the following OT analysis. Three well-attested constraints – ONSET, ALIGN, NoCODA – ranked in a particular order allow us to account for the resyllabification of a word-final consonant as a simple onset (as well as other resyllabification facts).

- (23) ONSET – syllables must have an onset  
 ALIGN(PD,  $\sigma$ ) – every left edge of a phonological domain should align to the left edge of a syllable (Face’s alignment constraint refers to “phonological domains” in order to account for the (re)syllabification of prefixes.)  
 NoCODA – syllables must not have codas
- (24) ONSET  $\gg$  ALIGN(PD,  $\sigma$ )  $\gg$  NoCODA

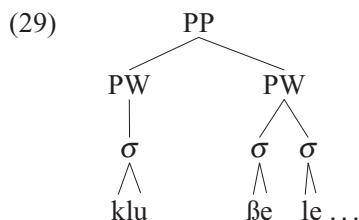
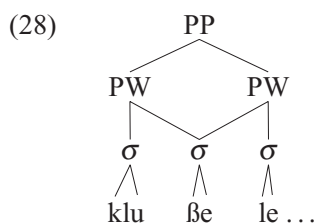
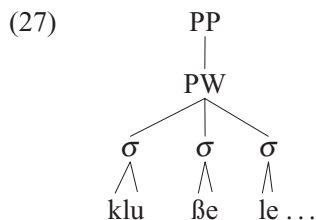
(25)	<i>club elegante</i>	ONSET	ALIGN	NoCODA
a.	[kluβ <sup>#</sup> .e.le.ɣan.te]	*!		**
b.	[klu.β <sup>#</sup> e.le.ɣan.te]		*	*

In (25a) the non-resyllabified form violates high-ranked ONSET, while the candidate in (25b) does not, even though it violates lower-ranked ALIGN.

While both the derivational and the OT type of approach successfully account for resyllabification, neither approach deals directly with the prosodic representation of the resyllabified form. Face’s analysis suggests that in the winning candidate in (25) the PW boundary and the syllable boundary are misaligned, but he does not offer an explanation of how the diacritics (i.e., the period representing syllable boundaries, and the pound sign representing PW boundaries) would translate into a prosodic representation. The representation in (26) is one possible interpretation, but it is ill-formed since the middle syllable is not contained within a PW.



Peperkamp (1997) directly addresses the prosodic representation of resyllabified structures. She proposes various possible analyses, represented in (27)–(29):



Peperkamp points out the problems in these structures. In (27) she notes that one PW is eliminated, but there are still two main word stresses implying the existence of two prosodic words, and in (28) Strict Layering is violated since the second syllable is not exhaustively contained within a single PW. Instead, Peperkamp proposes that PW boundaries are readjusted when resyllabification takes place, so that the resyllabified consonant (an onset) is part of the second PW. The result is that PW boundaries do not coincide with morphological word boundaries (29).

Note that the representation proposed by Peperkamp in (29) does not violate any of the principles of the SLH or the constraints on Prosodic Domination or Proper Nesting. However, there are some problems with this structure. Peperkamp (1997:30) notes there is no longer a direct correspondence between the morphological word and the prosodic word, but states that since “morphological structure and prosodic structure are represented on separate planes . . . this does not result in an ill-formed representation.” A more serious problem, however, is that constraints applying within the domain of the PW do not necessarily apply to the “resyllabified” PWs. In the following paragraphs we discuss two constraints applying to Italian PWs which are violated in “resyllabified”

structures.<sup>10</sup> The first constraint is that PWs cannot end in an obstruent,<sup>11</sup> and the second is that PWs must be minimally bimoraic.

Consider the following Italian phrase: *piatto sporco* ‘dirty dish’ [pját.tos. pór.ko] in which the initial /s/ + consonant cluster of *sporco* resyllabifies as a coda + onset sequence. Following Peperkamp, the PW boundaries would be analyzed as [pját.tos. #.pór.ko]. However, the first PW violates the well-formedness constraint banning word-final obstruents in Italian.

A similar situation arises in the well-studied phonological process known as *raddoppiamento sintattico* in which a word-initial consonant is lengthened if the preceding word ends in a stressed vowel (Bullock 1991; Loporcaro 1997; Repetti 1991): *città vecchia* ‘old city’ [tʃit.táv.vék.kja]. Again, if we analyze the PW boundaries as readjusted to coincide with syllable boundaries [tʃit.táv. #.vék.kja], the first PW violates the ban on final obstruents.

Another example involves the five Italian consonants that are always long in intervocalic position (word-internally and across word boundaries), and short elsewhere: /ʃ/, /ʒ/, /ɲ/, /ts/, /dz/. We illustrate these patterns using words with /ts/.

(30)		<i>short /ts/</i>	<i>long /ts/</i>		
a.	utterance-initial	[tsio]	*[tstio]	<i>zio</i>	‘uncle’
b.	post-consonantal	[martso]	*[martstso]	<i>marzo</i>	‘March’
c.	intervocalic (word-internal)	*[pitsa]	[pitstsa]	<i>pizza</i>	‘pizza’
d.	intervocalic (word-initial)	*[miotsio]	[miotsttio]	<i>mio zio</i>	‘my uncle’

These consonants are commonly represented as being underlyingly long or moraic (Burzio 1989; Chierchia 1986; Davis 1990; Vanelli 1992), and their mora (or length) can be realized only in intervocalic position (30c–d), but not in absolute initial position (30a) or after a consonant (30b) since Italian syllables cannot begin or end with a long consonant or certain consonant clusters such as /rts/ in [30b]. How are we to analyze the last example in (30)? If, following Peperkamp (1997), we analyze the PW divisions as [mi.ots. #.tzi.o], this representation is ill-formed because the first PW ends in an obstruent.

<sup>10</sup> For more on the PW in Italian, see Nespor (1985); Nespor and Vogel (1986); van Oostendorp (1999); and Peperkamp (1997).

<sup>11</sup> The constraint banning word-final obstruents refers to PWs and not lexical words. Evidence of this comes from the fact that in the past, as well as in some modern varieties, borrowings ending in an obstruent were/are generally adapted by epenthesis of a PW-final vowel: *beefsteak* > *bistecca*, *stop* [stɔp]/[stɔppe] in Florentine Italian, etc. (See Bafle 2002.) However, many relatively recent neologisms are obstruent-final (*prof*, *gas*, *jeep*, etc.).

Can the constraint on bimoraic word minimality be violated in resyllabification contexts, such as in the phrase *bar elegante* ‘elegant bar’ [bá.re.le.gán.te]?<sup>12</sup> If, following Peperkamp, we posit the word boundaries as – [bá. # .re.le.gán.te] – the first PW incurs a violation of the bimoraic word-minimality constraint. Evidence that the first PW ([ba]) is not bimoraic comes from the fact that it does not induce *raddoppiamento sintattico* (\*[bár.re.le.gán.te]) and the vowel of the first syllable is not lengthened (\*[bá:.re.le.gán.te]).<sup>13</sup>

Within a constraint-based model of phonology, like Optimality Theory, we might be able to account for these phonological violations by ranking the constraints requiring *Proper Nesting* (21) – i.e. the constraints requiring alignment of PWs and syllables – higher than the constraints requiring alignment of prosodic words and lexical words and the markedness constraints banning monomoraic prosodic words and PW-final obstruents.

(31) ALIGN(PW,  $\sigma$ ) – align the L/R edge of the PW to the L/R edge of a syllable

WORD-ALIGNMENT – align the L/R edge of every lexical word to the L/R edge of every prosodic word (Selkirk 1995)

BIMORAIC WORD MINIMALITY – a PW must not be monomoraic

\*FINAL-OBS – a PW must not end in an obstruent

(32) ALIGN(PW,  $\sigma$ )  $\gg$  WORD-ALIGN, BIMORAIC-WORD-MIN, \*FINAL-OBS

We illustrate this approach using the phrases *bar elegante* (33) and *cittá vecchia* (34). (The symbol  $\bullet^*$  after a candidate indicates that it is incorrectly chosen as the winner.)


(33)

<i>bar elegante</i>	ALIGN(PW, $\sigma$ )	WORD-ALIGN	BI-WORD-MIN.
a. [ba.r # e.le.gan.te]	*!		
b. [ba. # .re.le.gan.te]		*	*

<sup>12</sup> Other examples of this type include *tir italiano* [tí.ri.ta.ljá.no] ‘Italian truck’, *CAR aretino* [ká.ra.re.tí.no] ‘Aretino military training center’, etc. We only found examples of monosyllables ending in /r/ which pattern this way. Polysyllabic oxytones ending in /r/ and all other consonant-final lexical items undergo final consonant lengthening in this context, for example, *bazar aperto* [badz.dzár.ra.pér.to] ‘open bazaar’, *tram elettrico* [trám.me.lét.tri.ko], etc. (see also Chierchia 1986).

<sup>13</sup> However, we do not generally expect vowel lengthening of word-final stressed vowels. See Repetti (1989) for the bimoraic stressed syllable requirement in Italian, and D’Imperio and Rosenthal (1999) for the phonetics and phonology of stress in Italian.

(34)

<i>cittá vecchia</i>	ALIGN(PW, $\sigma$ )	WORD-ALIGN	*FINAL-OBS
a. [tʃit.tá. # .vɛk.kja] 			
b. [tʃit.táv. # .vɛk.kja]		*!	*

In (33a) the PW is not aligned with a syllable, a form which cannot be represented using the traditional prosodic hierarchy (see [26] above), is correctly ruled out. The candidate in (b) with the redrawn word boundaries is the winner.

This ranking makes the wrong prediction in the other tableau. If the Word-Align constraint is ranked high, candidate (34a) would incorrectly emerge as the winner. Any other high-ranked constraint proposed to rule out candidate (34a) – such as a constraint on faithfulness to input moras or a constraint requiring bimoraic stressed syllables – would then incorrectly rule out the winning candidate in (33b).

Given the problems with the prosodic representations of these resyllabified phrases, we will explore the new approach involving a “phrasal” syllable level.

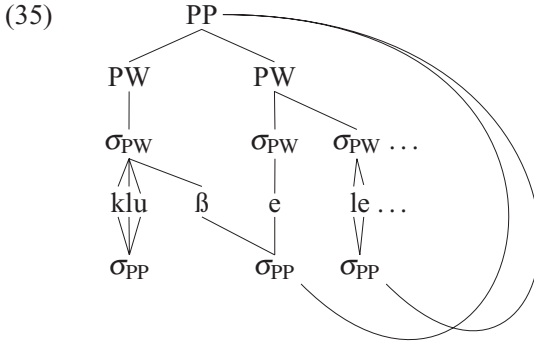
## 2.2. New analysis

We propose that in resyllabification contexts (which, as we have noted, are phrase-level contexts), there are two syllable representations: The syllable level that is a daughter to the PW ( $\sigma_{PW}$ ), and an additional “phrasal” syllable level that is nested directly under PP ( $\sigma_{PP}$ ). The structure in (6b) captures the fact that resyllabification is a phrasal phenomenon, it does not violate the basic principles of the Prosodic Hierarchy, and it allows us to solve the problems discussed in section 2.1.

How are phrasal syllables formed? Phrasal syllables are identical to the PW syllables with the following differences: Violations of the onset are avoided through “resyllabification” at the  $\sigma_{PP}$  level, adjustments to syllable structure due to segmental or metrical constraints (such as the Italian examples discussed above) are represented here, and an unprosodized element (such as a free clitic) is incorporated into the prosodic hierarchy at the  $\sigma_{PP}$  level. Crucially, word-level constraints do not apply to phrasal syllables.

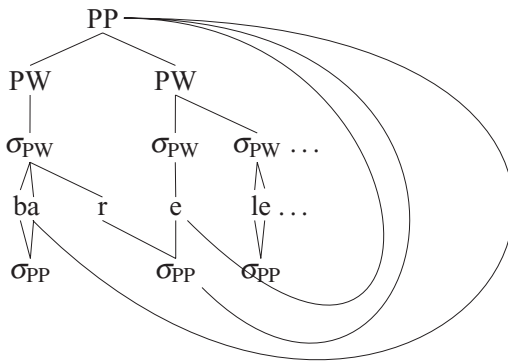
Using this model, we can account for the Spanish and Italian data discussed above. The Spanish resyllabification data can be handled using this model since, for example, the /b/ in *club elegante* is a coda at the  $\sigma_{PW}$  level, but an onset at the  $\sigma_{PP}$  level.<sup>14</sup>

<sup>14</sup> In some varieties of Spanish we have spirantization of coda /s/ in resyllabification contexts, while in other varieties we do not. These facts can be handled as follows:



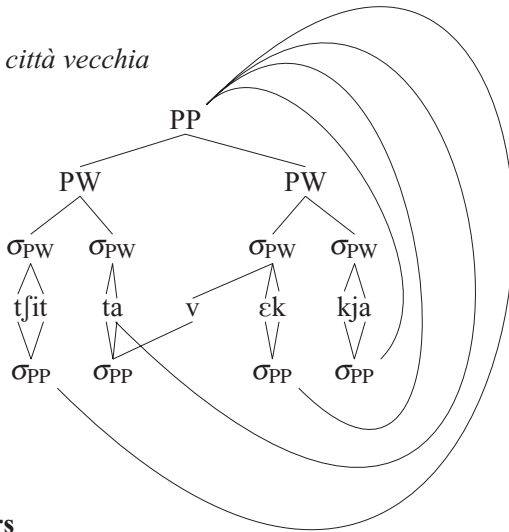
In addition, the Italian data which constituted problems for Peperkamp’s analysis are readily accounted for using this model. Since the  $\sigma_{PW}$  level remains independent of the  $\sigma_{PP}$  level, none of the Italian PW-level constraints are violated in the ‘resyllabified’ contexts. For example, in (36a) *bar elegante* we see that the first PW satisfies the word minimality requirement, even though at the phrasal level the word-final /r/ is resyllabified as an onset. In (36b) *città vecchia* we see that at the  $\sigma_{PP}$  level the /v/ spreads to form part of the coda of the first word, but at the  $\sigma_{PW}$  level the first word does not end in an obstruent (although it may end in an empty mora, see Bullock 1991; and Repetti 1991).

(36) a. *bar elegante*




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spirantization of coda /s/ may apply at the  $\sigma_{PW}$  level (for example *mes es* [meh eh] ‘month is’) or at the  $\sigma_{PP}$  level (for example, *mes es* [mes eh]). The constraints banning coda /s/ in the various domains ( $\sigma_{PW}$  and  $\sigma_{PP}$ ) would be ranked relative to each other and to input-output faithfulness constraints. For dialect variation in Spanish spirantization, see Kaisse (1999) and footnote 3.

b. *città vecchia*

### 3. Clusters

By examining data from various Romance languages, we have determined that the process of resyllabification and the incorporation of free clitics into prosodic structure are both phrasal phenomena that can best be characterized by adopting a model of the prosodic hierarchy with two orthogonal syllable tiers. Another characteristic shared by these two processes (i. e., resyllabification and clitic prosodization<sup>15</sup>) has to do with restrictions on the types of syllables that result.

Within resyllabification contexts, a word-final consonant can resyllabify as the onset of the following vowel-initial word, but not if the result would be a complex onset (37). (In this and all subsequent examples, all candidate onset and coda clusters are acceptable in that language.)

$$(37) \quad CVC_{\alpha}\#C_{\beta}VC > *CVC_{\alpha}C_{\beta}VC$$

For example, a word-final /b/ cannot resyllabify as the onset of the following consonant-initial word, even if the resulting onset cluster is acceptable, as illustrated in the following data from Spanish.

$$(38) \quad \textit{club lindo} \textit{ 'pretty club' } *[\textit{klu.βlin.do}]; [\textit{kluβ.lin.do}]$$

This restriction on complex onsets has been accounted for within derivational approaches by saying that post-lexically only simple onsets can form. So, while

<sup>15</sup> In this section, the type of clitic is irrelevant. The constraints on syllabification seem to apply to all clitics equally, regardless of whether they are characterized as free, internal, or affixal.



the word-final /b/ of *club* can resyllabify as the simple onset of a following vowel-initial word, it cannot resyllabify as part of a complex onset (Kenstowicz 1994).

(39)

	<i>club elegante</i>	<i>club lindo</i>
lexical level	kluβ # e.le.yan.te	kluβ # lin.do
post-lexical level	klu.βe.le.yan.te	–

(resyllabification to form simple onsets, not complex onsets)

This restriction on clusters has also been successfully accounted for within Optimality Theory. Using the constraints and ranking in (23) and (24), Face (2002) shows that clusters are avoided in Spanish resyllabification. In (40), ONSET is not violated in either candidate, so the alignment constraint eliminates the second candidate, leaving the non-resyllabified candidate as the winner.

(40)

<i>club lindo</i>	ONSET	ALIGN	NoCODA
a. [kluβ#.lin.do]	☞		**
b. [klu.β#lin.do]		*!	*

Bonet and Lloret (2005a, 2005b) notice that the syllabification of Catalan clitics (which they analyze as ‘internal’ clitics, meaning that the clitic + host unit forms a single PW) follows the same general principles as resyllabification: the consonantal portion of a clitic can syllabify as a simple onset or coda, but it does not adjoin to another onset/coda to form part of a complex unit. The facts are illustrated below.<sup>16</sup> (Catalan data are from Bonet and Lloret 2005a, Harris 1993, and Francisco Ordóñez.)

Within a clitic + host unit, a consonant will syllabify as a simple onset as in (41) and (43), however, not as part of a complex onset as in (42) and (44).

- proclitic + host*
- (41) (V)C<sub>α</sub>- + #VC > (V).C<sub>α</sub>VC  
/t/ + /imita/ > [ti.mi.ta] ‘s/he imitates you’
- (42) (V)C<sub>α</sub>- + #C<sub>β</sub>V > \*(V).C<sub>α</sub>C<sub>β</sub> V  
/t/ + /rius/ > \*[tri.us] ‘you:sg laugh’ ([ɔt.ri.us] with epenthetic schwa)
- host + enclitic*

<sup>16</sup> The syllabification of Catalan clitics is similar to data described for other Romance languages (see also Cardinaletti and Repetti 2004 and to appear).

- (43)  $CVC_\alpha \# + -V > CV.C_\alpha V$   
/rɛb/ + /o/ > [rɛ.βu] ‘receive it’
- (44)  $CVC_\alpha \# + -C_\beta V > *CV.C_\alpha C_\beta V$   
/rɛb/ + /la/ > \*[rɛ.βla] ‘receive her’ ([rɛb.la])<sup>17</sup>

In addition, asyllabic enclitics (C and CC) may syllabify into coda position. An asyllabic (C) enclitic will not syllabify as part of a coda cluster (045), but it will syllabify as a simple coda (46), and an asyllabic enclitic with a CC structure will form its own coda cluster (47).

- host + enclitic*
- (45)  $CVC_\alpha \# + -C_\beta > *CVC_\alpha C_\beta$   
/tirin/ + /s/ > \*[ti.rins] ‘throw (pol., pl.) to yourselves’ ([ti.rin.sə] with epenthetic schwa)
- (46)  $CV\# + -C_\alpha > CVC_\alpha$   
/miri/ + /s/ > [mi.ris] ‘look (pol.) at yourself!’
- (47)  $CV\# + -C_\alpha C_\beta > CVC_\alpha C_\beta$   
/tiri/ + /ns/ > [ti.rins] ‘throw (pol.) to us!’

The generalization appears to be that a consonant can be resyllabified (or an asyllabic clitic can be syllabified) as an entire subsyllabic constituent – an onset or a coda – but not as part of a subsyllabic constituent, for example, not as part of a complex onset or coda. Although these patterns are similar to the resyllabification facts, the constraints discussed above to handle resyllabification cannot account for the clitic data. As we see in the following tableaux, high-ranked Onset needed to account for the output in (48) incorrectly eliminates the actual winner in (49).

(48)	/t/ + /imita/	ONSET	ALIGN	NoCODA
a.	[ɔ̣t.i.mi.ta]	**!		*
b.	[ti.mi.ta]		*	

(49)	/t/ + /rius/	ONSET	ALIGN	NoCODA
a.	[ɔ̣t.ri.us]	*!		*
b.	[tri.us]		*	

<sup>17</sup> See footnote 4.

Bonet and Lloret (2005a) propose the Alignment constraint in (50)0 to account for the Catalan clitic patterns.

- (50) ALIGN(lex, sub- $\sigma$ ) – the edge of a lexical word has to coincide with the edge of some subsyllabic constituent: a margin (M) or nucleus (N). (The constraint refers to lexical words and not to PWs, since they analyze clitic + host units as PWs).

This constraint says that the edge of a lexical word cannot be the internal member of a subsyllabic unit, such as an onset, but must be at the edge of such a unit. The constraint does not rule out resyllabification completely, but only resyllabification (or clitic prosodization) that would add to a subsyllabic unit.

The tableaux (53) and below show how this constraint, along with two other well-attested constraints in (051), ranked as in (52)0, allow us to explain the Catalan clitic syllabification facts.

- (51) FINAL-C – every PW ends in a consonant  
 ALIGN-R(lex,  $\sigma$ ) – the right edge of a lexical word is aligned with a syllable

- (52) ALIGN-R(LEX, SUB- $\sigma$ )  $\gg$  FINAL-C  $\gg$  ALIGN-R(LEX,  $\sigma$ )

In (53) we show that an asyllabic clitic can form a simple coda, and in (54) an asyllabic clitic with a CC structure can form its own complex coda. In all of the candidates in these two tableaux, the right edge of the lexical word (the verb) is aligned with the edge of a subsyllabic unit (the nucleus). As a result, the high-ranked alignment constraint is not violated, leaving Final-C to choose the winner.

- (53) /tirə/ + /n/ > [ti.rən] *tira'n* ‘throw some!’

/tirə/ + /n/	ALIGN-R(LEX, SUB- $\sigma$ )	FINAL-C	ALIGN-R(LEX, $\sigma$ )
a. ti.rən $\rightarrow$			*
b. ti.rən.ɳ		*!	

- (54) /tiri/ + /nz/ > [ti.Rins] *tiri'ns* ‘throw (pol.) to us!’

/tiri/ + /nz/	ALIGN-R(LEX, SUB- $\sigma$ )	FINAL-C	ALIGN-R(LEX, $\sigma$ )
a. ti.rins $\rightarrow$			*
b. ti.rin.zɳ		*!	*

However, an asyllabic clitic cannot encliticize to a host ending in a consonant to form part of a complex coda (55). In candidate (55a) the right edge of the lexical word /tirin/ is not aligned with the edge of the coda, so this form violates the ALIGN(lex, sub- $\sigma$ ) constraint, leaving candidate (55b) as the winner.

- (55) /tirin/ + /s/ > [ti.rin.sə] *tirin-se* ‘throw (pol., pl.) to yourselves’

/tirin/ + /s/	ALIGN-R(LEX, SUB- $\sigma$ )	FINAL-C	ALIGN-R(LEX, $\sigma$ )
a. ti.rins	*!		*
b. ti.rin.sə		*	

The ALIGN(lex, sub- $\sigma$ ) constraint can also be used to account for the Spanish resyllabification facts. In (56) the /b/ is either a simple coda (in candidate [56a]) or a simple onset (in candidate [56b]), so the high-ranked ALIGN(lex, sub- $\sigma$ ) is not violated, and Onset chooses the correct winner. In (57), the /b/ is a simple coda in candidate (57a), so it does not violate the alignment constraint. However, in candidate (57b) the /b/ is part of a complex onset, meaning that the right edge of *club* is not properly aligned with the edge of the onset, nor is the left edge of *lindo*. As a result, this candidate violates the ALIGN(lex, sub- $\sigma$ ), leaving candidate (57a) as the winner.

- (56)

<i>club elegante</i>	ALIGN(LEX, SUB- $\sigma$ )	ONSET
a. [kluβ.e.le.ʃan.te]		*!
b. [klu.βe.le.ʃan.te]		

- (57)

<i>club lindo</i>	ALIGN(LEX, SUB- $\sigma$ )	ONSET
a. [kluβ.lin.do]		
b. [klu.βlin.do]		*!

While the ALIGN(lex, sub- $\sigma$ ) constraint does allow us to account for restrictions on syllable structure in these two contexts (clitic prosodization and resyllabification), the approach taken in this paper with two syllable levels ( $\sigma_{PP}$  and  $\sigma_{PW}$ ) might be able to explain these facts in a more straightforward way. We can capture the insights of the ALIGN(lex, sub- $\sigma$ ) constraint through a series of identity constraints:  $\sigma_{PW}$  subsyllabic units must be faithfully represented at the phrasal syllable level.

- (58) IDENT- $\sigma_{PW}$ - $\sigma_{PP}$ -ONSET – the  $\sigma_{PW}$  onset must be identical at the  $\sigma_{PP}$  level  
 IDENT- $\sigma_{PW}$ - $\sigma_{PP}$ -CODA – the  $\sigma_{PW}$  coda must be identical at the  $\sigma_{PP}$  level

These constraints require the  $\sigma_{PP}$  syllables to be identical to the  $\sigma_{PW}$  syllables. The two sets of syllables are compared at the subsyllabic level, and violations are categorical: if the  $\sigma_{PW}$  has an onset/coda, it must be faithfully reflected at the  $\sigma_{PP}$  level (i. e., no additions or deletions); if the  $\sigma_{PW}$  does not have an onset/coda, the constraint does not apply to the candidate outputs.

The familiar Onset constraint can apply to either of the two syllable levels ( $\sigma_{PW}$  or  $\sigma_{PP}$ ).

- (59) ONSET- $\sigma_{PW}$  – the  $\sigma_{PW}$  must have an onset  
 ONSET- $\sigma_{PP}$  – the  $\sigma_{PP}$  must have an onset

The two Ident constraints in (0 are crucially ranked relative to the Onset- $\sigma_{PP}$  constraint, and all three are ranked higher than DEP.

- (60) IDENT-ONSET  $\gg$  ONSET- $\sigma_{PP}$   $\gg$  IDENT-CODA  $\gg$  DEP

In the following tableaux each candidate output consists of two forms which represent the syllabification of the two syllable tiers: the first is the  $\sigma_{PW}$ -level, and the second is the  $\sigma_{PP}$ -level. We only include candidates in which the PW-level syllabification constraints are satisfied (implying that  $\sigma_{PW}$ -bound constraints are higher ranked).

In the tableaux, the IDENT-ONSET constraint compares the  $\sigma_{PW}$ -level onsets with the  $\sigma_{PP}$ -level onsets. If the  $\sigma_{PW}$ -level onsets are identical to the  $\sigma_{PP}$ -level onsets, no violations are incurred, as in (61), (62), (63), (64) and (66). Notice that in each of these tableaux there are candidates with new onsets on the  $\sigma_{PP}$ -level that do not exist on the  $\sigma_{PW}$ -level, but these do not violate the IDENT- $\sigma_{PW}$ - $\sigma_{PP}$ -ONSET constraint. Notice also that the first candidates in (65) and (67) violate the IDENT-ONSET constraint since the  $\sigma_{PW}$ -level onsets (/r/ in [65] and /l/ in [67]) are not faithfully reproduced at the  $\sigma_{PP}$ -level, where instead we find a CC cluster (/tr/ in [65a] and /bl/ in 67a).

The IDENT-CODA constraint works in the same way as the IDENT-ONSET constraint. The first candidate in (63) incurs a fatal violation of the IDENT-CODA constraint since the PW-level syllable contains a coda /n/, while the PP-level syllable adds a consonant, resulting in a coda /ns/ cluster. In (66a) and (67a)  $\sigma_{PW}$  coda /b/ is not present at the  $\sigma_{PP}$ -level resulting in a violation of the IDENT-CODA constraint.

The ONSET- $\sigma_{PP}$  constraint evaluates all  $\sigma_{PP}$  regardless of the PW syllabification. Violations are found in tableaux (64), (65), and (66), and those violations are fatal in (64) and (66). Finally DEP eliminates the losing candidates in (61) and (62).

- (61) /tirə/ + /n/ > [ti.rən]
- tira'n*
- 'throw some!'

/tirə/ + /n/	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a. ti.rə / ti.rən ↗				
b. ti.rə / ti.rə.n̩ ↗				*!

- (62) /tiri/ + /ns/ > [ti.Rins]
- tiri'ns*
- 'throw (pol.) to us!'

/tiri/ + /nz/	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a. ti.ri / ti.rins ↗				
b. ti.ri / ti.rin.z̩ ↗				*!

- (63) /tirin/ + /s/ > [ti.rin.sə]
- tirin-se*
- 'throw (pol., pl.) to yourselves'

/tirin/ + /s/	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a. ti.rin / ti.rins			*!	
b. ti.rin / ti.rin.sə ↗				*

- (64) /t/ + /imita/ > [ti.mi.ta] 's/he imitates you'

/t/ + /imita/	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a) i.mi.ta / ti.mi.ta ↗				
b) i.mi.ta / ət.i.mi.ta/		**!		*

- (65) /t/ + /rius/ > \*[tri.us] 'you:sg laugh'

/t/ + /rius/	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a) ri.us / tri.us	*!	*		
b) ri.us / ət.ri.us ↗		**		*

- (66)

<i>club elegante</i>	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a) kluβ#e.le... / klu.βe.le... ↗			*	
b) kluβ#e.le... / kluβ.e.le...		*!		

- (67)

<i>club lindo</i>	IDENT-ONSET	ONSET-σ <sub>pp</sub>	IDENT-CODA	DEP
a. kluβ#lin.do / klu.βlin.do	*!		*	
b. kluβ#lin.do / kluβ.lin.do ↗				

#### 4. Conclusion

We have seen that the prosodization of free clitics and the resyllabification facts – both phrasal phenomena – can be best accounted for by adopting a model of the prosodic hierarchy in which there is an additional phrasal syllable level ( $\sigma_{PP}$ ) nested under the PP-level. We have also been able to account for many of the puzzles involving resyllabification and clitic prosodization, including the restriction on complex onsets and codas, and constraints on PWs that do not seem to apply in these contexts, using this model.

We conclude the paper with some questions. Perhaps the approach introduced in this paper could be extended to other prosodic phenomena that have represented puzzles to the traditional approach, for example, the fact that syllable requirements seem to be relaxed at word edges. This has often been accounted for by positing extrametrical segments. Can extrametrical consonants be thought of as outside the  $\sigma_{PW}$  but included in the  $\sigma_{PP}$ ? In addition, the similarity between the approach suggested in this paper and other proposals – ambisyllabicity (Gussenhoven and Jacobs 1998, etc.), the “clitic group” (Nespor and Vogel 1986, etc.), and stratal OT (Kiparsky 2000, etc.) – is striking. Can the insights of ambisyllabicity, the “clitic group”, and stratal OT be captured by phrasal syllables? We think that the answer to each of these questions is “yes”, and we hope to address these topics in future research.

#### Abbreviations

indef (indefinite), PD (Phonological Domain), pl (plural), pol (polite), PP (Phonological Phrase), PW (Prosodic Word), sg (singular)

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