

Spanish secondary stress without gradient alignment

Eugene Buckley

University of Pennsylvania

1. Gradient alignment

Traditional metrical phonology uses ordered rules to create iterative feet (Hayes 1995) or similar metrical structure (Halle and Idsardi 1995) by building one constituent at a time in a particular direction. For example, in Pintupi (Hansen and Hansen 1969) stress occurs on the first syllable and on every subsequent odd-numbered syllable, excluding the final. This pattern can be generated by building a disyllabic foot on the first two syllables, then on the next two, and so forth, until there are no longer at least two syllables remaining. The fact that the final syllable in a word of odd parity is unfooted follows from the left-to-right direction of the parse. (Forms are given orthographically.)

- (1) a. (pú liŋ) (kà la) tju ‘we (sat) on the hill’
b. (tjá mu) (lim pa) (tjùŋ ku) ‘our relation’
c. (tí li) (ři ŋu) (ləm pa) tju ‘the fire for our benefit flared up’
- (2) tí li ři ŋu lam pa tju
→ (tí li) ři ŋu lam pa tju
→ (tí li) (ři ŋu) lam pa tju
→ (tí li) (ři ŋu) (ləm pa) tju

Theories of metrical structure in classic Optimality Theory (Prince and Smolensky 1993) face the fundamental task of positioning multiple feet correctly without iterative operations. A close analogy to iterative foot construction involves gradient alignment of all feet toward one end of the domain (McCarthy and Prince 1993, Gordon 2002, Hyde 2002); in this case, ALL-FT-LEFT penalizes every foot that is not at the left edge of the word, and does so *gradiently* by counting the number of syllables that intervene. PARSE-SYL and FT-BIN are ranked high to favor the maximum number of binary feet.

(3)

	FT-BIN	PARSE-SYL	ALL-FT-LEFT
a. (tí lǐ) (ǎi ɲu) (làm pa) (tju)	*!		0+2+4+6 = 12
☞ b. (tí lǐ) (ǎi ɲu) (làm pa) tju		*	0+2+4 = 6
c. (tí lǐ) (ǎi ɲu) lam (pà tju)		*	0+2+5 = 7!
d. (tí lǐ) ǎi (ɲù lam) (pà tju)		*	0+3+5 = 8!
e. ɬi (lí ǎi) (ɲù lam) (pà tju)		*	1+3+5 = 9!
f. (tí lǐ) ǎi ɲu lam pa tju		**!***	0

In Harmonic Serialism (McCarthy 2000), such feet can be constructed one by one just as in traditional approaches, while maintaining gradient alignment (Pruitt 2010). Other authors argue, however, that gradient alignment of feet, like all gradient constraint evaluation, should be rejected on formal and typological grounds in favor of constraints that are strictly categorical (Kager 2001, 2005, McCarthy 2003, Buckley 2009). General arguments against gradient alignment include that fact that the notion of alignment has been used inconsistently, but primarily in a categorical manner, so that a more consistent approach would have only categorical interpretations (Zoll 1996, McCarthy 2003); that gradient evaluation is massively nonlocal in its formal properties and cannot be modeled by a finite state machine (Eisner 2000, Bíró 2003, Riggle 2004, Heinz 2009); and that for these reasons, not only alignment but all constraints in OT should be categorical in their interpretation (Eisner 1997, McCarthy 2003). I focus here on a rhythmic approach to foot placement as an alternative to gradient alignment.

1.1 Rhythmic constraints

In a categorical approach that evaluates fully footed candidates, methods other than gradient alignment are necessary to control the positioning of medial feet, which are not adjacent to any edge and therefore cannot be categorically aligned with an edge. Kager (2001, 2005) argues that most feet should in fact be positioned not by alignment at all, but by reference to rhythmic structure – especially the positions of lapses, or adjacent unstressed syllables. Here ALIGN-WORD-LEFT is categorical, violated if no foot occurs at the left edge of the word. *LAPSE penalizes any sequence of two unstressed syllables, whereas LAPSE-AT-END penalizes only a lapse that occurs in any position other than the end (right edge) of the word. The final constraint is discussed below.

- (4) ALIGN-WORD-LEFT Align (PrWd, Left, Foot, Left)
 *LAPSE No two adjacent unstressed syllables.
 LAPSE-AT-END Lapse must be adjacent to the right edge.
 LAPSE-AT-PEAK Lapse must be adjacent to the peak.

(5)

	ALIGN-L	*LAPSE	LAPSE-AT-END
☞ a. (tí lǐ) (ǎi ɲu) (làm pa) tju		*	
b. (tí lǐ) (ǎi ɲu) lam (pà tju)		*	*!
c. (tí lǐ) ǎi (ɲù lam) (pà tju)		*	*!
d. ɬi (lí ǎi) (ɲù lam) (pà tju)	*!		

Kager argues that rhythmic constraints provide a better typological account of the world's stress patterns, avoiding predictions of gradient alignment that he considers to be empirically unmotivated.¹ McCarthy (2003) advocates the same constraints because they are categorical in nature, and thus are both formally and empirically superior to gradient evaluation. Buckley (2009) argues for a more rigorously local formulation of the constraints that evaluate different rhythmic configurations, and therefore makes different typological predictions, but does this within a strictly categorical framework.

A central aspect of the rhythmic theory is that the evaluation of lapses depends on the location of main stress. This effect derives from the additional constraint LAPSE-AT-PEAK, where the “peak” is the main stress. This constraint accounts for languages such as Garawa (Furby 1974), which is similar to Pintupi except that the lapse occurs immediately after the initial foot, rather than at the right edge. (The medial stresses are of lower, tertiary prominence, but this is independent of the exact positioning of the feet.)

- (6) a. (ɲán ki) ři (kì rim) (pà yi) ‘fought with boomerangs’
 b. (ná ři) ɲin (mù ku) (ɲì na) (mì ra) ‘at your own many’

In Pintupi, LAPSE-AT-END generates the apparent effect of left-to-right iterative parsing, by ensuring that the leftover syllable is at the right edge. In Garawa, on the other hand, LAPSE-AT-PEAK ensures that the unparsed syllable occurs immediately after the initial, main stress foot.²

(7)

	ALIGN-L	*LAPSE	LAPSE-AT-PEAK
a. (ɲán ki) ři (kì rim) (pà yi)		*	
b. (ɲán ki) (ři ki) rim (pà yi)		*	*!
c. (ɲán ki) (ři ki) (rim pa) yi		*	*!
d. ɲan (kǐ ři) (kì rim) (pà yi)	*!		

This constraint set predicts that there will be no “anti-Garawa” language (Kager 2005) in which the lapse occurs after an initial secondary stress foot, because neither LAPSE-AT-END nor LAPSE-AT-PEAK favors that outcome. Yet precisely this “initial dactyl” pattern – named for the long-short-short sequence (σ̄σσ̄) of a dactylic foot in classical meter – has been cited for certain languages with main stress at the right edge, such as Indonesian (Cohn 1989, 1993). Here only loanwords are revealing, since native vocabulary shows cyclic effects.

¹Kager (2012) argues against the lapse-based rhythmic theory and introduces a new approach in which ternary feet are sometimes created by adjoining one syllable to a binary foot, as in the pseudo-dactyl ([σ̄σ]σ). Such feet would presumably yield an account of the Spanish initial dactyl effect discussed below without reference to lapses, but Kager does not give an analysis of secondary stresses. At any rate, the new theory, like Kager (2001, 2005), does not make use of gradient alignment and is consistent with the general claim of this paper.

²Kager (2005) replaces LAPSE-AT-PEAK with *LAPSE-IN-TROUGH, i.e. no lapse between secondary stresses, which makes different overall typological predictions but does not differ for the current data; form (7c) does not violate *LAPSE-IN-TROUGH but would be ruled out by undominated ALIGN-WORD-RIGHT.

- (8) a. (kòn ti) nu (á si) ‘continuation’
 b. (ò to) (bì o) (grá fi) ‘autobiography’
 c. (à me) ri (kà ni) (sá si) ‘Americanization’
 d. (dè mi) li (tè ri) (sá si) ‘demilitarization’
 e. (èk sis) ten (sì a) (lís me) ‘existentialism’

Words with just two feet, such as *(kònti)nu(ási)*, do not present a formal problem in the categorical theory, since one need only align a foot categorically at both the left and right edges; and with full footing, as in *(òto)(bìo)(gráfi)*, there is no issue of where the lapse occurs. The challenge comes in long words with five syllables preceding the main stress, since the medial foot then has to be placed without appeal to gradient alignment.³

Using numerals to indicate the level of stress, we can summarize that a gradient theory easily generates initial dactyl (20)0(20)(10) as well as right-aligned 0(20)(20)(10). (Here “right-aligned” is intended to be descriptive, and not to imply the use of ALL-FT-R.) For Kager, due to the role of main stress in determining the positions of lapses, an initial dactyl is possible in left-headed (10)0(20)(20) but not in (20)0(20)(10). Similarly, the rhythmic theory generates the pattern attested in Piro, (20)(20)0(10), and rules out “anti-Piro”, (10)(20)0(20), with primary stress at the left but a lapse before a final secondary stress foot.

For Indonesian, LAPSE-AT-PEAK would favor **(àme)(rika)ni(sási)*, with the lapse before the final foot, equivalent to Piro (Kager 2001). Kager attributes the medial secondary stress not to the native phonology, but rather to Dutch, the source language for the relevant loanwords. Kager notes that all Indonesian words cited with this pattern are borrowed from Dutch, where they arise cyclically from the primary stress on the contained adjective (*Amerikáan, militáir, existéntieel*), but claims that in Indonesian it is an arbitrary fact about these words. Thus, although Indonesian could be analyzed by gradient alignment, the evidence comes from loanwords in which the right solution is not obviously a matter of productive metrical phonology.

Another potential challenge is Hawaiian as presented by Prince (1983), with patterns such as *(pùle)le(húa)* ‘butterfly’. But not all words show the apparent initial dactyl, for example *ma(kúa)(híne)* ‘mother, aunt’ (Schütz 1978). Kager states that this pattern (and perhaps a similar pattern in Fijian) cannot be generated solely by the basic metrical constraints and requires lexicalized secondary stresses. There may also be a role for morphological or special word-internal prosodic structure (Schütz 1981).

The third potentially problematic language that Kager (2001) mentions is Spanish. He says that in this language the “initial dactyl pattern is not basic, but derived”; the facts that he describes, however, are not the complete pattern. Nevertheless, I argue in this paper that his essential response is correct, and that the Spanish facts present no problem for the rhythmic theory and do not require gradient alignment constraints.

³Similarly, although English also has an initial-dactyl effect, words such as *(Winne)pe(sáukee)* are too short to have a medial foot, and categorical left-alignment of a foot will account for the secondary stress.

2. Spanish stress

Primary stress in Spanish falls within a three-syllable window at the right edge of the word, depending partly on syllable structure but also heavily affected by morphological and idiosyncratic properties of words. This fact can be illustrated by some minimal contrasts, presented in standard orthography with the addition of accent marks for stress in words that normally lack them (as also throughout this paper).

- | | | | |
|------|----|-------------|--------------------|
| (9) | a. | per dí da | ‘lost, stray (f.)’ |
| | b. | pér di da | ‘loss, waste’ |
| (10) | a. | so li ci tó | ‘he/she solicited’ |
| | b. | so li cí to | ‘I solicit’ |
| | c. | so lí ci to | ‘solicitous’ |

These and other differences can be generated by a combination of lexical stresses, extra-metricity, and syllable weight (see, for example, Harris 1983), but I will not pursue a specific analysis of the primary stress facts here.

Secondary stress, on the other hand, does not show any effects of syllable weight or lexical or morphological properties. In the most commonly attested pattern, when a word is sufficiently long, Spanish secondary stress occurs on alternating syllables preceding the main stress. Important for the present discussion is that we find the initial dactyl effect when an odd number of syllables precedes the main stress (Harris 1983, Roca 1986, Hyde and McCord 2012); here I indicate the inferred trochaic foot structure as well as the levels of stress.

- | | | |
|------|------------------------------|--------------------------------------|
| (11) | (gène)ra(tívo) | ‘generative’ |
| | (gràma)ti(cál) | ‘grammatical’ |
| | (Còstan)ti(nópla) | ‘Constantinople’ |
| (12) | (gràma)ti(càli)(dád) | ‘grammaticality’ |
| | (màte)ma(tíci)(dád) | ‘mathematicity’ |
| | (nàtu)ra(liza)(ción) | ‘naturalization’ |
| | (ràcio)na(liza)(ción) | ‘rationalization’ |
| | (bùro)cra(tiza)(ción) | ‘bureaucratization’ |
| | (Tlàtla)u(quíte)(péc) | municipality in Puebla state, Mexico |
| (13) | (còstan)ti(nòpo)(liza)(ción) | ‘Constantinoplization’ |

As shown by Hyde and McCord (2012), only a subset of these words can be accounted for by means of a cyclic derivation, or by some equivalent in Optimality Theory such as multiple lexical strata (Kiparsky 2000, Bermúdez-Otero 2011). For example, the medial stress in *(gràma)ti(càli)(dád)* could be attributed to a relationship with the contained constituent *(gràma)ti(cál)*, since the medial secondary stress in the noun corresponds to the primary stress in the adjective. Such words do not, therefore, present a problem for Kager’s rhythmic theory if supplemented by morphological relationships.

In forms such as *(màte)ma(tìci)(dád)*, however, reference to the stress in related *(màte)(máti)co* ‘mathematical’ makes exactly the wrong prediction for the medial foot, i.e. **(màte)(màti)ci(dád)*. The same problem exists for *(nàtu)ra(liza)(ción)*, where the medial stress fails to match either *(nàtu)(rál)* ‘natural’ or *(nàtu)(ràli)(zár)* ‘to naturalize’. Further, borrowed placenames such as *(Tlàtla)u(quite)(péc)* presumably have no internal structure in Spanish, so the stress placement is necessarily determined without reference to another form, and such loanwords are also a problem for the purely rhythmic account. Hyde and McCord argue on this basis that the theory requires gradient alignment in order to be empirically adequate. I claim, however, that a fuller picture of Spanish secondary stress placement requires two steps in the derivation, and that these two steps – each one evaluated rhythmically – make gradient alignment unnecessary.

2.1 Variation in Spanish secondary stress

Detailed descriptions of Spanish secondary stress (Harris 1983, Roca 1986) report two variants: one, more common and colloquial, that follows the initial-dactyl pattern already illustrated in the previous section; and another, more formal or emphatic, in which feet are fully aligned to the right. Harris reports this as one of several “firmly established” generalizations regarding Spanish stress. (Hyde and McCord mention the second pattern, but do not analyze it.) Harris (1983) says that the right-aligned pattern “has a rhetorical tinge” and is “often heard in newscasting, in lecturing, and in highlighted chunks of otherwise informal speech.” Hualde (2007) reports that this style is “very frequent in news broadcasts”, is “also found in other types of public discourse, such as lectures and speeches”, and “conveys a certain ‘didactic’ tone.” I follow Harris in calling this the rhetorical style.

Hualde (2007) reports a number of examples of such pronunciations that he observed in news broadcasts and lectures; some that reflect right-aligned footing are given here.

(14)	<i>de(tèrmi)(nádo)</i>	‘determined’
	<i>en(càmi)(náda)</i>	‘directed, aimed’
	<i>ca(pàci)(dád)</i>	‘capacity, ability’
	<i>in(tròdu)(cír)</i>	‘to introduce’
	<i>me(tàlin)(güísti)ca</i>	‘metalinguistic’

Roca (1986) gives a set of morphologically related words to illustrate this style of footing in domains of various lengths.

(15)	<i>(Còstan)(tíno)</i>	‘Constantine’
	<i>Cons(tànti)(nópla)</i>	‘Constantinople’
	<i>(còstan)(tino)(pléño)</i>	‘Constantinople guy’
	<i>cons(tànti)(nòple)(ár)</i>	‘to hang out in Constantinople’
	<i>(còstan)(tino)(pòli)(táno)</i>	‘Constantinopolitan’
	<i>cons(tànti)(nòpo)(liza)(ción)</i>	‘Constantinoplization’

Because this stress pattern reflects a different style or register of speech, rather than a different dialect of the language, there is intraspeaker variation in the realization of secondary stresses.

- | | | | |
|------|------------------------------|---|-------------------------------|
| (16) | (gène)ra(tívo) | ~ | ge(nèra)(tívo) |
| | (gràma)ti(càli)(dád) | | gra(màti)(càli)(dád) |
| | (Còstan)ti(nópla) | | Cons(tànti)(nópla) |
| | (còstan)ti(nòpo)(liza)(ción) | | cons(tànti)(nòpo)(liza)(ción) |

The very existence of these two pronunciations calls into question an account that focuses on generating just the colloquial style. Plainly, the grammar of any speaker who controls both these styles must include a way of generating either stress pattern.

2.2 Secondary stress and phrasal context

In addition, secondary stress interacts with phrasal context in a way that requires a further dimension to the analysis. For instance, word-internal stresses may show a rhetorical-type pattern if a syllable is added to the left within the phrase and a new foot is constructed over the two free syllables (Roca 1986).

- | | | |
|------|------------------------------------|----------------------------|
| (17) | Cons(tànti)(nópla) | ‘Constantinople’ |
| | (èn Cons)(tànti)(nópla) | ‘in Constantinople’ |
| | cons(tànti)(nòpo)(liza)(ción) | ‘Constantinoplization’ |
| | (là cons)(tànti)(nòpo)(liza)(ción) | ‘the Constantinoplization’ |

But just as we find variation within words, two patterns are possible in at least some phrasal configurations (although the full extent of variation possible is not thoroughly described in the literature).

- | | | |
|------|--|-------------------|
| (18) | (Còstan)(tíno) | ‘Constantine’ |
| | por (Còstan)(tíno) ~ (pòr Cons)tan(tíno) | ‘for Constantine’ |

The position of the secondary stress on *(Còstan)(tíno)* is not variable, but this position may or may not be what is found in the larger phrase; it can be preserved, in which case *por* is unfooted and we have the effect of full right-alignment; or a new foot can be constructed that begins with *por*, resulting in an initial dactyl effect. This is precisely the kind of variation attested within a single word of the same length, such as *generativo*.

When a syllable must remain unfooted, however, the initial dactyl pattern is commonly found across word boundaries in phrases (Navarro Tomás 1977); compare these examples to *(gène)ra(tívo)*.⁴

⁴The sources focus almost exclusively on examples of nouns and noun phrases, but verbs and their proclitics are assumed to behave in a similar manner, setting aside the frequent morphological basis of primary stress in verbs.

- | | | |
|------|---|--|
| (19) | (sòbre) la (frénte)
(pòr la) ma(ñána)
(èn la) cor(riénte) | ‘on the front’
‘in the morning’
‘in the current’ |
|------|---|--|

But the equivalent of right-alignment is also attested in phrases (Hualde 2007), parallel to *ge(nèra)(tívo)*.

- | | | |
|------|--------------------------------------|--------------------------------|
| (20) | la (pòbla)(ción)
en (èl e)(xílio) | ‘the population’
‘in exile’ |
|------|--------------------------------------|--------------------------------|

An example such as *la (pòbla)(ción)* can be generated simply by maintaining the lexical stress – something that is also true of all the other nouns here. But stress on the article *el* in *en (èl e)(xílio)* cannot be a hold-over from the lexical derivation. This issue is addressed below in section 7.

3. A two-stage analysis

A formal analysis must include some account of the stylistic variation – for example, two possible constraint rankings depending the speech style. The obvious constraints that have to change their ranking are ALIGN-FT-L and *LAPSE, since the two styles differ in their satisfaction of them. Why not one-stage variation in ranking of the constraints, to generate both options? Because we would still be using gradient alignment, ALL-FT-R, and I have claimed that this power is not available to the theory.

In addition, we also need to take into account footing at the phrasal level, when a function word is grouped with the following lexical word. The analysis I propose is that the right-aligned pattern is basic, and assigned lexically; the initial dactyl is (sometimes) later derived from it at the phrasal level.

Lexically, right-aligned feet are created. This is consistent across speech styles, but what happens phrasally depends on the style of speech. In colloquial style, a left-aligned foot overrides faithfulness to the lexical foot structure. (Or, in a rule-based approach, a rule inserting a foot occurs only in the colloquial style.) A left-aligned trochee is created, relative to a prosodic constituent that has been constructed over an XP; examples include prepositions and articles. The exact outcome depends on style and the interaction of lexical footing with new syllabic material; but in rhetorical style, faithfulness wins and no initial dactyl arises.⁵ When sufficient material is added before the noun, a new foot can be created faithfully it need not affect the structure that is already present; this is a single syllable before a word that does not have an initial stress, or two or more syllables added before any word.

We can generate the effect of rightward alignment by the ranking *LAPSE >> ALIGN-FT-L; this gives us the rhetorical style. But we generate the colloquial style, potentially with an initial dactyl, under the ranking ALIGN-FT-L >> *LAPSE and FT-FAITH.

⁵Higher faithfulness always holds for the main stress, since it is not shifted phrasally in short words.

- (21) a. (Còstan)(tíno) *lexical footing*
 b. por (Còstan)(tíno) *phrasal footing: faithful to the lexical*
 (pòr Cons)tan(tíno) *phrasal footing: unfaithful left-alignment*

Under the right configuration, both constraints can be satisfied in the same output.

- (22) a. Cons(tànti)(nópla) *lexical footing*
 b. (èn Cons)(tànti)(nópla) *phrasal footing: faithful and left-aligned*

The same variable ranking at the phrasal level generates the attested variation in the placement of secondary stresses within single words. The lexical footing 0(20)(20)(10) will become phrasal (20)0(20)(10) or remain 0(20)(20)(10) depending on whether ALIGN-FT-L is high ranked for colloquial style, over both *LAPSE and FT-FAITH.

- (23) a. gra(màti)(càli)(dád) *lexical footing*
 b. gra(màti)(càli)(dád) *phrasal footing: faithful to the lexical*
 (gràma)ti(càli)(dád) *phrasal footing: unfaithful left-alignment*

Note, crucially, that the position of the medial secondary stress was determined in the lexicon, when all feet were right-aligned; at the phrasal level, this stress is the result of preservation of that stress, and is not directly determined by phrasal rhythmic properties. Because ALIGN-FT-L does not interact with the medial foot, faithfulness is observed for (càli) even when it is not for (màti). The unattested candidate *(gràma)(tica)li(dád) would require a gratuitous violation of faithfulness and is correctly excluded.

3.1 Phrasal prosodic structure

In broad strokes, this analysis predicts that a form such as (pòr Cons)tan(tíno) is more characteristic of colloquial style, with which it shares the phrasal ranking *LAPSE >> ALIGN-FT-L, FT-FAITH, whereas *por* (Còstan)(tíno) is predicted to be rhetorical. The complication, however, is that there also appears to be variation in prosodic structure at the phrasal level.

As noted above, a phrase such as a PP may show left-alignment of a foot or the equivalent of full right-alignment. This variation can be fully independent of any possible differences from lexical stress, as in the following words.

- (24) e(xílio) *lexical footing*
 en (èl e)(xílio) *phrasal footing, all feet right-aligned*
- (25) cor(riénte) *lexical footing*
 (èn la) cor(riénte) *phrasal footing, one foot left-aligned*

The pattern *en (èl e)(xílio)* is ambiguous between right-alignment of feet in the entire domain, or left-alignment of a foot in some domain smaller than the full PP, namely that defined by the DP *el exilio*. The right-aligned pattern is not difficult for the rhythmic

theory to generate; all one needs is a high ranking of *LAPSE to prefer the right-aligned pattern in a trochaic system. Nonetheless, an alternative is to locate the variation in the relation of feet to the XP structure rather than the position of feet relative to the entire domain.

- (26) $[_{PP} (\grave{e}n [_{DP} la] [_{N} cor(ri\grave{e}nte)]]]$ *aligned with PP*
 $[_{PP} en [_{DP} (\grave{e}l [_{N} e](x\acute{i}lio))]]$ *aligned with DP*

Following a long line of work that aligns larger constituents such as prosodic phrases with XP boundaries (see Selkirk 2011), I assume that the point of variation in locating the additional secondary stress at the left is mainly a matter of the prosodic phrasing rather than the feet directly, and ALIGN-FT-L then refers to this structure. In other words, *en (\grave{e}l e)(x\acute{i}lio)* reflects a prosodic boundary at the left edge of the DP, whereas *(\grave{e}n la) cor(ri\grave{e}nte)* lacks a boundary in that position.

A further pair of examples (Hualde 2007) provides another sort of pattern; note that the first form might be more properly *(de la) (lite)ra(túra)* with poor realization of the first foot, or the two function words might be adjoined to the noun in such a way as to preclude them from forming a foot together.⁶

- (27) *de la (lite)ra(túra)* ‘of (the) literature’
de (là li)(tèra)(túra) *emphatic*

Hualde identifies *de (là li)(tèra)(túra)* as uncommon and “highly emphatic”, and attributes it to a rhythmic alternation across the word (from right to left, or right-aligned). Equally it could result from high-ranked *LAPSE at the phrasal level. If one assumes a separate lexical derivation in which both *li(tèra)(túra)* and *(lite)ra(túra)* are possible outputs – as one might find in a theory that includes gradient alignment – then *(lite)ra(túra)* could simply be faithful to that output. But my analysis produces only *li(tèra)(túra)* in the lexicon, and the change to *(lite)ra(túra)* occurs phrasally due to ALIGN-FT-L. This means that ALIGN-FT-L here refers to the left edge of the NP, indirectly via a prosodic phrase.

The choice of phrasal prosodification might be affected by pragmatic or stylistic conditions that are not identical to the colloquial versus rhetorical context that determines whether a foot is left-aligned within the phrase. Although this case is interesting, there is not clear enough data available for all the possible configurations and points of variation to say whether left-alignment is the entire story at the phrasal level.

3.2 Against a purely phrasal analysis

Roca and Hualde essentially assume that all secondary stresses are assigned at a phrasal level. Why not adopt this approach? The first problem, central to the point of this paper, is that OT would then require gradient alignment at the phrasal level. But this is a theory-internal reason. More generally, alternating stress systems seem to assign feet

⁶See Selkirk (1995) for discussion of various types of prosodic structures that may arise in phrases that combine function and lexical words.

iteratively as a default option – in some theories (e.g. Halle and Idsardi 1995), iterative footing is the only choice, and in OT the constraint PARSE-SYL ensures that multiple feet should be created unless there is a specific reason not to do so. It is therefore actually the unmarked choice to have iterative lexical footing.

Since a foot can cross a word boundary, we clearly need phrasal footing of some sort. But that level never determines more than the leftmost foot in the relevant domain. Thus the simplest (and most unmarked) approach is two steps: iterative footing within the word, and just one extra foot in the (potentially) larger phrase, which can disrupt the leftmost lexical foot but does not disturb any others.

Hyde and McCord are correct that word-internal faithfulness or cyclicity will not generate all the Spanish data in a categorical alignment approach. But the alternative to gradient alignment nonetheless lies in a different variety of faithfulness, between the lexical and phrasal components, as assumed here. Any complete theory requires some account of the difference between lexical and phrasal patterns (see Kaisse and McMahon 2011); the analysis proposed here simply makes use of that architecture.

4. Empirical questions

The literature has often been vague or conflicting about the status of secondary stresses in Spanish. Hualde (2010) reports that secondary stresses are not common in most conversational speech, and typically will not be found in read experimental materials, which has limited the effectiveness of lab studies; but they can reach a high frequency in certain styles (emphatic or “didactic”). He also notes a lack of explicitness on the part of phonologists regarding the relative abstract character of the stress patterns that they have described. I assume that feet may be present that are not always (or not saliently) realized phonetically; that is, I accept the presence of metrical heads that might not always be realized (Buckley 2009), or might not be realized very clearly.

I have analyzed data here that motivate a grammar in which both stress patterns are possible; the lexical derivation produces the rhetorical pattern, which is most often modified in the phrasal component. Could there be grammars of Spanish in which the “rhetorical” stress pattern is completely absent? This would mean that for such speakers, phrasal left-alignment is obligatory, i.e., ALIGN-FT-L >> *LAPSE, FT-FAITH without variation. But do they still create the rhetorical pattern in the lexicon, even if it is not realized on the surface? The theory advocated here requires that assumption.

In any model that includes both lexical and phrasal effects, a derivation with right-alignment in the lexicon and one left-aligned foot in the phrase will be available to the learner. If the theory also permits gradient directionality, then (*gràma*)*ti(càli)(dád)* has two possible derivations: different categorical alignments in the two components as proposed here, and single-representation generation of the initial-dactyl effect. From this perspective, gradient alignment is redundant and gives unneeded power. In essence, the learner notices that all the feet align to the right except for the leftmost foot, which is also influenced by the larger phrasal context. If gradient alignment is unavailable in the formal apparatus of the theory, then the learner has no choice but to posit two stages of footing subject to slightly different principles.

4.1 Typological predictions

Taking into account phrasal alignment changes Kager's (2001, 2005) typological predictions, which were a central part of the original motivation for the rhythmic theory. He relies on a single step of metrical evaluation for his claims, which is very common in the typological literature. But there is already evidence that these predictions are too restrictive and cannot be sustained; for example, they exclude the rare but attested languages that exhibit left-edge extrametricality (Buckley 2009).⁷

I propose that we acknowledge, and exploit, the already necessary power of the lexical–phrasal distinction and thereby avoid the computational and formal complexity of gradient alignment. This distinction, in some form, is independently motivated by decades of research on phonological patterns. This step keeps the metrical system itself more restricted, and we continue to make specific typological predictions. For example, we predict that no pattern like Spanish could occur strictly at the Stem level, but could be between the Stem and Word. By contrast, gradient alignment combined with lexical strata does predict the initial-dactyl effect within the Stem domain, which could then interact with new footing at the Word or Phrase. This difference could, however, only be tested in a language with quite long stem constituents.

5. Conclusion

The essential insight of this analysis is that the rhetorical pattern in Spanish secondary stress, with right-alignment of all feet, characterizes the lexical derivation. At the phrasal level, a new trochaic foot can be left-aligned with a prosodic phrase that has been constructed over an XP, depending on whether the speaker chooses the colloquial or rhetorical style.

Any serious theory of phonology requires some account of the difference between lexical and phrasal patterns. While Hyde and McCord are correct that faithfulness to morphologically defined bases such as (*màte*)(*máti*)*co* will not generate the Spanish data with categorical alignment, the answer nonetheless lies in a different type of faithfulness, that between the lexical and phrasal components.

References

- Bermúdez-Otero, Ricardo. 2011. Cyclicity. *The Blackwell companion to phonology*, ed. by Marc van Oostendorp, et al., 2019-2048. Hoboken, NJ: Wiley-Blackwell.
- Bíró, Tamás. 2003. Quadratic alignment constraints and finite state Optimality Theory. *Proceedings of the Workshop on Finite-State Methods in Natural Language Processing (FSMNL)*, 10th Conference of the European Chapter of the ACL, Budapest, 119-126.

⁷Kager (2012) does account for left-edge extrametricality by replacing the lapse constraints with a different approach based on two- to three-syllable windows at either edge of the domain, but as mentioned above does not address secondary stress.

- Buckley, Eugene. 2009. Locality in metrical typology. *Phonology* 26, 389-435.
- Cohn, Abigail. 1989. Stress in Indonesian and bracketing paradoxes. *Natural Language and Linguistic Theory* 7, 167-216.
- Cohn, Abigail. 1993. The Initial Dactyl Effect in Indonesian. *Linguistic Inquiry* 24, 372-381.
- Eisner, Jason. 1997. What constraints should OT allow? Paper presented at the 71st Annual Meeting of the Linguistic Society of America, Chicago. Available on Rutgers Optimality Archive, ROA 204, <http://roa.rutgers.edu/>.
- Eisner, Jason. 2000. Directional constraint evaluation in Optimality Theory. *COLING 2000: Proceedings of the 18th Conference on Computational Linguistics, Saarbrücken*, vol. 1, 257-263. San Francisco: Morgan Kaufmann.
- Furby, Christine. 1974. *Garawa phonology*. Canberra: Australian National University.
- Gordon, Matthew. 2002. A factorial typology of quantity-insensitive stress. *Natural Language and Linguistic Theory* 20, 491-552.
- Halle, Morris, and William Idsardi. 1995. General properties of stress and metrical structure. In *The handbook of phonological theory*, ed. by John Goldsmith, 403-443. Oxford: Blackwell.
- Hansen, Kenneth C. and Lesley E. Hansen. 1969. Pintupi phonology. *Oceanic Linguistics* 8, 153-170.
- Harris, James. 1983. *Syllable structure and stress in Spanish: A nonlinear analysis*. Linguistic Inquiry Monograph 8. Cambridge, MA: MIT Press.
- Heinz, Jeffrey. 2009. On the role of locality in learning stress patterns. *Phonology* 26, 303-351.
- Hualde, José I. 2005. *The sounds of Spanish*. Cambridge: Cambridge University Press.
- Hualde, José I. 2007. Stress removal and stress addition in Spanish. *Journal of Portuguese Linguistics* 5.2/6.1, 59-89.
- Hualde, José I. 2010. Secondary stress and stress clash in Spanish. *Selected Proceedings of the 4th Conference on Laboratory Approaches to Spanish Phonology*, ed. Marta Ortega-Llebaria, 11-19. Somerville, MA: Cascadilla Proceedings Project.
- Hyde, Brett. 2002. A restrictive theory of metrical stress. *Phonology* 19, 313-339.
- Hyde, Brett, and Bethany McCord. 2012. The inadequacy of a faithfulness-based approach to Spanish secondary stress. Ms., Washington University. Available on Rutgers Optimality Archive, ROA 1151, <http://roa.rutgers.edu/>.
- Kager, René. 2001. Rhythmic directionality by positional licensing. Handout from the Fifth Holland Institute of Linguistics Phonology Conference, University of Potsdam. Available on Rutgers Optimality Archive, ROA 514, <http://roa.rutgers.edu/>.
- Kager, René. 2005. Rhythmic licensing theory: An extended typology. *Proceedings of the 3rd Seoul International Conference on Phonology*, 5-31.
- Kager, René. 2012. Stress in windows: Language typology and factorial typology. *Lingua* 122, 1454-1493.
- Kaisse, Ellen, and April McMahon. 2011. Lexical phonology and the lexical syndrome. In *The Blackwell companion to phonology*, ed. by Marc van Oostendorp, et al., 2236-2257. Hoboken, NJ: Wiley-Blackwell.
- Kiparsky, Paul. 2000. Opacity and cyclicity. *The Linguistic Review* 17, 351-367.
- McCarthy, John J. 2000. Harmonic serialism and parallelism. *Proceedings of NELS* 30, 501-524.

- McCarthy, John J. 2003. OT constraints are categorical. *Phonology* 20, 75-138.
- McCarthy, John J., and Alan S. Prince. 1993. Generalized alignment. In *Yearbook of Morphology 1993*, ed. Geert Booij and Jaap van Marle, 79-153. Dordrecht: Kluwer.
- Navarro Tomás, Tomás. 1977. *Manual de pronunciación española*. 19th ed. Madrid: Consejo Superior de Investigaciones Científicas.
- Prince, Alan S. 1983. Relating to the grid. *Linguistic Inquiry* 14, 19-100.
- Pruitt, Kathryn. 2010. Serialism and locality in constraint-based metrical parsing. *Phonology* 27, 481-526.
- Riggle, Jason. 2004. *Generation, recognition, and learning in finite state Optimality Theory*. Doctoral dissertation, University of California, Los Angeles.
- Roca, Iggy. 1986. Secondary stress and metrical rhythm. *Phonology Yearbook* 3, 341-370.
- Zoll, Cheryl. 1996. *Parsing below the segment in a constraint-based framework*. Doctoral dissertation, University of California, Berkeley. Published 1998, Stanford: CSLI.
- Schütz, Albert J. 1978. Accent in two Oceanic languages. *Anthropological Linguistics* 20.4, 141-149.
- Schütz, Albert J. 1981. A reanalysis of the Hawaiian vowel system. *Oceanic Linguistics* 20, 1-43.
- Selkirk, Elisabeth. 1995. The prosodic structure of function words. In *Papers in Optimality Theory*, ed. by J. Beckman, L. Walsh Dickey and S. Urbanczyk, 439-470. Amherst, MA: GLSA Publications.
- Selkirk, Elisabeth. 2011. The syntax-phonology interface. In *The handbook of phonological theory*, 2nd Edition, ed. John A. Goldsmith, Jason Riggle, and Alan C. L. Yu, 435-484. Hoboken, NJ: Wiley-Blackwell.

Department of Linguistics
619 Williams Hall
University of Pennsylvania
Philadelphia, PA 19104

gene@ling.upenn.edu