Superfeet as Recursion

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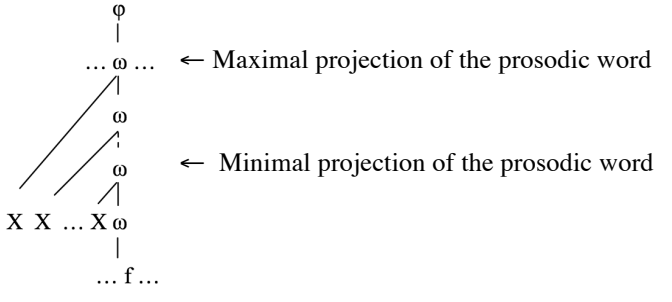
1. Introduction: restricting the universal Prosodic Hierarchy

In Prosodic Phonology Theory (Selkirk 1981, 1984, Nespor & Vogel 1986, Hayes 1989), the particular hierarchical organization of a set of universally available prosodic constituents (σ, ω, φ, etc.) captures the rhythmic patterns of languages and the domain of application of a wide variety of phonological processes. Rather than targeting isolated segments or arbitrary groups of segments within the phonological string, the assignment of lexical and post-lexical stress/tone, as well as the conditions/properties of certain phonological and morphophonological processes (e.g. fortition, deletion, truncation, reduplication...) are best modeled by directly referring to a small set of innate prosodic constituents and the universal way in which they are structured.

Detailed research in certain prosodic systems has, however, significantly weakened the strong hypothesis of a universal Prosodic Hierarchy (PH) since language-particular categories have been claimed to exist in individual languages. A reasonable solution to this challenge has been explored in recent research by Ito & Mester (2007a,b, 2009a,b, 2010, to appear). In particular, these authors have shown that the fixed number of universal prosodic primitives can still be maintained if the structural possibilities of the hierarchy are enlarged. Building on research on prosodic recursion (Nespor & Vogel 1986, Ladd 1986, 1996, Gussenhoven 1991, Wagner 2005, Truckenbrodt 1999), Ito & Mester propose that additional layers in the PH may arise through recursion, namely, through adjunction. Within this proposal, just as syntactic categories present minimal and maximal projections, prosodic constituents above the prosodic word can exhibit minimal and maximal projections via prosodic recursion. Thus, by exploiting this recursion-building-mechanism, the universality and restrictiveness of the PH is preserved. For instance, by allowing prosodic word-recursion (see 1) and permitting the reference of phonological processes to the minimal and maximal projections of the prosodic word, Ito & Mester accurately predict several phonological phenomena in Japanese, English and German, without introducing new categories to the hierarchy, as opposed to previous analyses.

(1) Prosodic Word (ω) recursion (Ito & Mester 2007, 2009a,b, to appear)



In this paper, I expand on Ito & Mester's model and suggest that prosodic recursion can also occur at the foot level. Although recursion was originally thought to apply only within higher prosodic categories (i.e. above the prosodic word) due to their close relation with syntax, I show that feet can

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also undergo recursion. More specifically, I claim that recursion takes place at the foot level in order to better fulfill other important prosodic requirements, such as the one that ensures binary branching (BINARITY) or exhaustive parsing (EXHAUSTIVITY). Recursion at the foot level is more restricted and less common than at higher prosodic categories because it only arises as a last resort device to avoid degenerate feet and unparsed syllables. To support the idea that domain-sensitive processes may target recursion-based prosodic feet, I provide some data from Wargamay and Yidiny, two Australian languages (Dixon 1977a,b, 1981), and an Eskimo language, Chugach Alutiiq (Leer 1985; Rice 1992). In particular, I examine the nature of two lengthening processes in Wargamay and Yidiny, where lengthening occurs only in some vowels in odd-parity forms, and the not so common stress pattern of Chugach, which seems to combine binary and ternary feet. I demonstrate that a recursion-based foot account of both phenomena correctly captures the mysterious properties of lengthening and the mixed pattern of stress in Chugach. More specifically, I propose that the context of lengthening in the two Australian languages is restricted to the vowel of a double-headed foot (i.e. a recursive foot) and that stress in Chugach is assigned to maximal projections of the foot. Thus, this proposal complies with previous studies where an intermediate category between the prosodic word and the foot —the *superfoot* or the *colon*— was posited (McCarthy 1982, Halle & Vergnaud 1987, Green 1996, van Oostendorp 1995 and Davis 2005, among others). However, the present analysis crucially deviates from the former proposals in that recursive feet are not conceived here as a distinct or new category. By contrast, along the lines of Ito & Mester's work above the prosodic word (2007a,b, 2009a,b) —where the phonology distinguishes only a small number of universal categories, but additional layers may arise through prosodic adjunction to these categories— the superfoot is understood as a maximal or recursive projection of the foot. Once this additional layer is active in the phonology of some languages, several phonological phenomena can easily be accounted for. The difference between prosodic category *vs*. prosodic layer is not simply a matter of notational variation. It entails a difference regarding the type of predictions with respect to possible prosodic structures. A theory that enlarges the number of universal prosodic categories is less restrictive, since it needs to augment also the number of prosodic constraints referring to those categories. By doing so, the theory automatically increases the number of possible constraint interactions and takes the risk of overgenerating (see Ito & Mester 2007 for discussion).

2. Data

2.1. Wargamay and Yidiny lengthening

Wargamay and Yidiny have a small inventory of vowels that contrast in length: /i, iː, a, aː, u, uː/.[1] Apart from the underlying length contrast, both languages undergo a lengthening process, which targets a subset of the stressed vowels in words with an odd number of syllables. Namely, the vowel in the penultimate syllable of odd-parity forms is lengthened in Yidiny (2d-f), whereas Wargamay lengthens the peninitial syllable (3c-d), but only if the first vowel is not already long (i.e. underlyingly long; see 3e). Surface lengthening never occurs in words with an even-number of syllables (2a-c, 3a-b) (the vowel that lengthens appears in boldface):

(2) Yidiny

Even forms		Odd forms		
a. gáliŋ	'go-Present'	d. galína	→ ga**lí:**na	'go-Purposive'
b. madʸindána	'walk up-Purposive'	e. madʸíndaŋ	→ ma**dʸí:n**daŋ	'walk up-Present'
c. gúdagágu	'dog-Purposive'	f. gudágudága	→ gudágu**dá:**ga	'dog-Redup-Abs'

(3) Wargamay

Even forms		Odd forms		
a. báda	'dog'	c. gagára	→ ga**gá**ˑra	'dilly bag'
b. gígʸawùlu	'freshwater jewfish'	d. ɠuɽágay-mìri	→ ɠu**ɽá**ˑgay-mìri	'Niagara Vale-FROM'
		e. gíːbara		'fig tree'

[1] In Wargamay, underlying long vowels are restricted to the initial position.

Lengthening in Yidiny is phonological and categorical (Dixon 1977a,b; Crowhust & Hewitt 1995, but cf. Hayes 1997, who denies the synchronic character of this process), whereas in Wargamay it is frequent, but optional[2] (Dixon 1981: 20). In either case, as Hyde (2002) points out, standard accounts have neither a principled way to provide a device for lengthening, nor to locate the syllable that undergoes lengthening. These patterns are puzzling because lengthening only applies in odd-parity forms, and the vowel that undergoes lengthening does not necessarily coincide with primary stress. For instance, stressed syllables in Yidiny are described as having equal prominence (Dixon 1977a), yet lengthening applies only in some penultimate stressed syllables.[3] With respect to Wargamay, it is true that lengthening can coincide with primary stress, but not all vowels with primary stress exhibit lengthening (3a, b), nor do all vowels in peninitial syllables undergo lengthening (see 3e).

2.2. Chugach stress

Chugach has a complicated stress pattern, which has been the subject of several analyses.[4] Here I concentrate on the assignment of stress in words with light syllables, i.e. CV and CVC (but see Martínez-Paricio, in prep., for a complete analysis). The relevant data is provided in (4):

(4) *Chugach data stress in words with light syllables*

a.	a.**tá**.ka	'my father'
b.	a.**kú**.ta.**mék**	'kind of food (abl sg)'
c.	a.**tú**.qu.ni.**kí**	'if he (refl) uses them'
d.	pi.**sú**.qu.ta.**qú** .ni	'if he (refl) is going to hunt'
e.	ma.**ŋár**.su.qu.**tá**.qu.**ní**	'if he (refl) is going to hunt porpoise'

Chugach stresses the second syllable in a form, and every subsequent third syllable given sufficient length (Rice 1992:110). This generalization correctly captures the stress pattern in 3, 5 and 6 syllables-words. However, 4-syllable forms have alternating stress (σ'σσ'σ) and 7-syllable words stress the final syllable, even if it is not in a "subsequent third syllable" from the second syllable. Previous analyses of Chugach stress had to either: (a) give up on binarity and postulate ternary feet (Halle & Vergaund 1978, Halle 1990, Rice 1992, Hewitt 1992), (b) propose some kind of mixed mechanism that choses exhaustive parsing for some forms, while non-exhaustive for others (Kager 1993, Elenbaas & Kager 1999, Hayes 1995) or (c) allow improper bracketed structures, making use of ambipodal syllables (Hyde 2001, 2002). In the next section I show that we can do without all of the former unwarranted mechanisms once we allow recursion at the foot level —a move which is not stipulative but rather falls out from other well-established constraints on the PH.

3. Resolving the puzzle: recursive feet and prosodic prominence

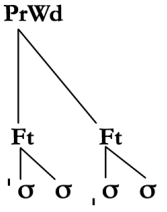
The processes described above find a straightforward explanation if recursion at the foot level is allowed. On the one hand, I propose that lengthening in Yidiny and Wargamay targets the head of a recursive foot, on the other, I analyze Chugach as a language that assigns stress to the heads of maximal foot projections (i.e. feet that are not dominated by other feet, see § 3.1). Thus, the present proposal builds on a very important dichotomy in the prosodic hierarchy: the head-dependent asymmetry (Dresher & van der Hulst 1998). This distinction is based on the fact that prosodic heads are positions in the hierarchy that are more prominent and privileged, in the sense that they generally allow more structure and/or contrasts than dependents. Additionally, heads are often singled out from other elements, becoming the target of specific processes. For instance, I propose that in Yidiny and

[2] Furthermore, Dixon reports that the vowels that undergo lengthening in Wargamay are not as long as the underlying ones, and thus, he represents them differently (eg. underlying length [í:], derived length [í·]).
[3] Moreover, other scholars have suggested that if there is one stress more prominent than the other, is the leftmost Hayes (1995) citing Hale (personal communication). Thus, at the opposite edge where lengthening occurs.
[4] Leer (1985), Rice (1992), Halle & Vergnaund (1978), Halle (1990), Hewitt (1992), Hayes (1995), Kager (1993), Elenbaas & Kager (1999), Hyde (2001, 2002).

Wargamay the only vowels that are interpreted as long are the ones that appear in the head of a recursive foot (i.e. a double-headed foot) due to their greater phonological prominence. This phonological prominence finds a clear phonetic correlate in the languages under study. In Chugach, vowels in a recursive foot are not necessarily phonetically more prominent than vowels in a head of a regular foot. They both receive primary stress. However, allowing foot recursion under certain circumstances correctly predicts the location of stress without having to invoke a mixed binary/ternary system, or a combination of exhaustive and weak parsing. Additional evidence for recursion-based parsing, as well as further details of how and why recursion takes place in each language are given below.

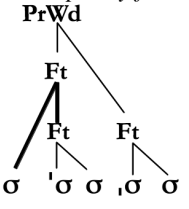
The idea of postulating an intermediate category between the prosodic word (ω) and the foot (ϕ) — referred to as the *superfoot* or *colon*— is not new in prosodic research. It has been present in the literature for some time and invoked for a variety of languages (Dutch, Irish and English, among others). However, the superfoot never had much success because it entailed the postulation of a new descriptive category. By introducing language particular categories, the universal hierarchy clearly looses some of its restrictive power. In addition, the new category was not defined in a unified way but, on the contrary, all types of *superfeet* were proposed within the same or different languages (e.g. superfeet consisting of a foot and a syllable, of two feet, of a binary foot, a degenerate foot...). Far from this unrestricted and category-based definition, the superfoot is conceived here as an additional layer in the hierarchy, which arises through recursion. In particular, this layer emerges through left or right adjunction of a syllable to a preceding or following foot. Furthermore, I propose that recursive feet in the languages studied here are a last resort device, i.e. they are only built to avoid unparsed syllables or prevent degenerate feet. Thus, if binary non-recursive feet can be built, this option is preferred and adjunction does not take place. This is illustrated in (5), with data from Wargamay:

(5) a. *Even-parity form: 4σ*



gí gʸa wù lu 'freshwater jewfish'

b. *Odd-parity form: 5σ*



ɠu **ƭá**· gay-mì ri 'Niagara Vale-from'

(5a) and (5b) exemplify the preference for binary feet to be built whenever possible. While this strategy works perfectly for an even-parity form (5a), problems arise for and odd-parity form (5b), since there is one syllable remaining. Assuming that particular grammars consist of different rankings of universal constraints, different solutions can be pursued with respect to the prosodification of the remaining syllable. I argue that languages will vary in the treatment of this syllable depending on the specific ranking of a small set of basic prosodic constraints. In particular, I propose that there are three general options regarding the prosodification of a "left-over" syllable. First, the initial syllable in (5b) could constitute a foot of its own. This option would create a degenerate foot and, thus, incurred a violation of BINARITY (i.e. the constraint ensuring binary branching at the foot level, based on Prince 1980, Kager 1989, 1993 among others). A second option could be to parse the syllable in a higher level of the hierarchy, such as the prosodic word. This type of parsing avoids a violation of BINARITY, since now all feet are binary. However, this candidate introduces a violation of a fundamental constraint regulating the structure of the prosodic hierarchy: EXHAUSTIVITY (Selkirk 1995). This constraint ensures strict layering in the sense that it bans *level-skipping*. Its formal definition is given below in (6):

(6) EXHAUSTIVITY: No C^i immediate dominates a constituent C^j, j<i-1 (abbr.: EXHAUST)
E.g. 'No PWd immediately dominates a σ'

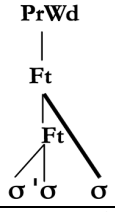
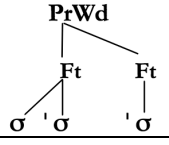
Finally, a third logical option, which I propose is the one instantiated in Wargamay, Yidiny and Chugach, is to adjoin the remaining syllable to a preceding/following foot, as illustrated in (5b). This

type of adjunction, however, incurs a violation of another important constraint regulating the type of prosodic relations in the hierarchy. Namely, the constraint against *level-repetition* or recursion:

(7) NONRECURSIVITY: No C^i dominates C^j, j=i. (abbr.: NONREC) (Selkirk 1995) E.g. 'No Ft dominates a Ft'

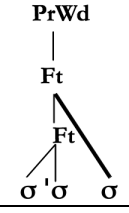
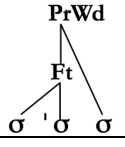
I propose that in Wargamay, Yidiny and Chugach this constraint is dominated by BINARITY and EXHAUSTIVITY. In that way, we account for the fact that some of the words in these languages exhibit recursive feet. Tableaux (8) and (9) illustrate the relevant ranking arguments with simplified trisyllabic inputs.[5] In (8), the candidate with a degenerate foot is ruled out because it incurs a violation of BINARITY. Candidate (8a), in which the last syllable is left-adjoined to the preceding foot is the optimal form. As already argued, even if it incurs a violation of NONRECURSIVITY, this is done so as to avoid a violation of the higher-ranked BINARITY constraint:

(8) BINARITY >> NONRECURSIVITY(FT)

σσσ	BINARITY	NONREC
a. ☞ 		*
b. 	*!	

Another possible candidate, which violates neither BINARITY nor NONRECURSIVITY, is candidate (b) in tableau (9). This candidate directly parses the last syllable into the prosodic word. However, by doing so, one category in the hierarchy is skipped out and, thus, this type of configuration violates EXHAUSTIVITY. Since this constraint is dominating NONREC, here again the optimal candidate is the one with a recursive foot, i.e. (9a).

(9) EXHAUSTIVITY >> NONRECURSIVITY(FT)

σσσ	BIN	EXHAUST	NONREC
a. ☞ 			*
b. 		*!	

The empirical need for distinguishing the structures in (9a) *vs.* (9b) —that is, for positing recursion at the foot level rather than extrametrical syllables parsed into the prosodic word— is clear in

[5] I proceed in this way for ease of presentation, however, the general assumption is that the inputs do not contain syllable structure and this is also derived by a specific hierarchy of constraints.

languages where the dependent of a minimal foot seems to be weaker than the dependent of a maximal foot (see, for instance, van Oostendorp's 1995 analysis of vowel reduction in Dutch). However, with the exception of Chugach (see § 3.2), the cases studied here do not show a distinction within dependents, still, foot recursion is needed. In particular, recursive feet are needed in Wargamay and Yidiny to capture a difference within foot heads, which cannot be just derived from the distinction between primary stress (head of the prosodic word) and non primary stresses (head of a foot, but not the head of the prosodic word). This distinction is better perceived in words with five or more syllables. For instance, a five-syllable word in Yidiny is represented with the final syllable adjoined to a preceding foot rather than the prosodic word (as shown below in 13a) in order to make the head of that foot distinguishable and more prominent from the first foot in a word, which also carries primary stress.

To sum up, the three languages studied here prefer to have recursion at the foot level as a last resort device, even if this creates a not so common recursive structure below the prosodic word.

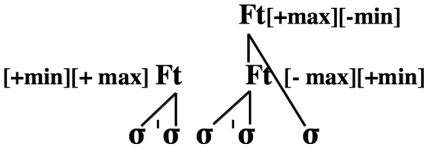
3.1. Minimal and maximal foot projections

Ito & Mester (2007, 2009a,b, to appear) and Selkirk (2009, 2011) show that prosodic categories above the prosodic word can exhibit recursion, giving rise to minimal and maximal projections of particular prosodic categories. Since syntax allows for a great amount of recursion, and word-external prosodic categories are generally governed by syntax-phonology mappings, it is not surprising that recursion is reflected in the prosody. Expanding on this theory of prosodic recursion, I just proposed that feet can also exhibit recursion, in order to fulfill higher-ranked constraints on the prosodic form, such as BINARITY and EXHAUSTIVITY. That is, not only phonology-syntax mappings can generate recursive prosodic structures, but also pure prosodic constraints.[6] Furthermore, Ito & Mester (to appear), employ the binary projection features [±max] and [±min] (Haider 1993: 40) and combine them to create different types of minimal and maximal projections of prosodic categories. Building on their definitions of minimal/maximal categories, I provide a characterization of maximal and minimal feet in (10):

(10) a. Maximal foot: Foot not dominated by another Foot
b. Minimal foot: Foot not dominating another Foot

Taking these formulations into account, (11) illustrates the type of minimal and maximal feet projections encountered in Wargamay, Yidiny and Chugach:

(11)



On the one hand, the leftmost foot, which is simultaneously a minimal and a maximal projection of the foot, represents the traditional metrical feet. On the other hand, recursive feet are [+max] and [-min] and, thus, share with traditional feet the value of the maximal projection feature. However, recursive feet are different from traditional ones in that they dominate another foot (i.e. they are [-min]). Finally, the foot that is dominated by the recursive foot is [+min, -max]. A fourth type of foot is a projection of the foot that combines the negative values of the two features (i.e. [-min, -max]). This type of intermediate configurations exists at higher levels of the hierarchy (see Elfner's work on Conamara Irish, 2011). The possibility of feet that are [-min, -max] should be explored in future research. For the moment, however, I remain suspicious to their existence. My intuition is that the high degree of recursive embedding predicted by [-min, -max] would probably never arise due to the joint effect of other prosodic constraints (eg. LAPSE, EXHAUSTIVITY). Rhythm and other foot-related

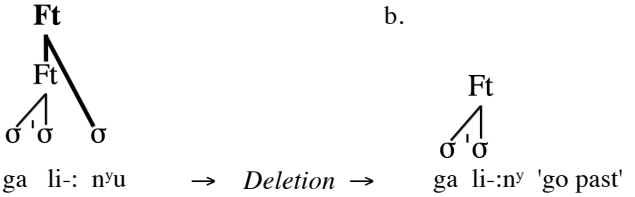
[6] Ito & Mester and Elfner (2011) also provide some examples where higher prosodic categories exhibit recursion due to pure prosodic constraints, such as binarity, rather than by interface constraints.

phenomena are substantially different from the type of phenomena associated to prosodic categories above the prosodic word and, thus, it is not surprising that the degree of recursion allowed in each domain is different.

3.2. Further support for a recursion-based analysis

Apart from lengthening and stress, there are three phenomena that provide further support for the recursion-based analysis posited here. First, in Chugach, there is a process of fortition that targets the onset of the unstressed syllable that immediately precedes stress (Leer 1985, Rice 1992). Although unstressed syllables are weak positions, and generally allow fewer contrasts than stressed syllables, the context of fortition finds a straightforward explanation if it is defined with respect to the edges of a the prosodic constituent of the foot. More specifically, fortition can be described as targeting every consonant at the left edge of a maximal projection of a foot. It is a well-known fact that the edges of prosodic constituents very often have clear phonetic correlates in the languages of the world. Thus, following Rice (1992:114), I suggest that this process can be considered an additional cue for foot constituency in Chugach. To illustrate this, take a 6-syllable form in Chugach. We know that its prosodic structure contains two recursive feet, rather than three binary feet, because a form like **[(**s**a.ɣá).ni].[(**w**a.káɣ).tuq]** only exhibits fortition in the first and fourth syllable, i.e. coinciding with the left edges of the feet. Second, the distribution of pitch in Chugach can be easily accounted for if the distinction between the dependent of a recursive foot and the dependent of a non recursive foot is made available in the language. In particular, a low pitch can only dock to the dependent of recursive foot (e.g.: $((\sigma'\sigma_H)\sigma_L)(\sigma'\sigma_H))$), whereas dependents of minimal feet remain pitchless [7] (e.g. $((\sigma'\sigma_H)(\sigma'\sigma_H))$). Finally, the additional support for a recursive-foot analysis in Yidiny comes from a syllable deletion rule applying to certain suffixes. There are about ten suffixes that exhibit phonologically conditioned allomorphy, i.e. depending on the number of syllables of the stem, one or another allomorph is selected. More specifically, the correct allomorph is always selected in a way that creates an even-syllabled word. Dixon (1977) proposes that for each allomorph, the longer one constitutes the underlying form and, then, a deletion rule applies to remove the material that creates an odd number of syllables. This is illustrated in (12) with the past suffix /-nʸu/. When it is attached to an even-parity form, such as *galin* 'go', it creates an odd number of syllables. The deletion rule applies and the surface allomorph in even parity forms becomes [:nʸ]:

(12) a. b.



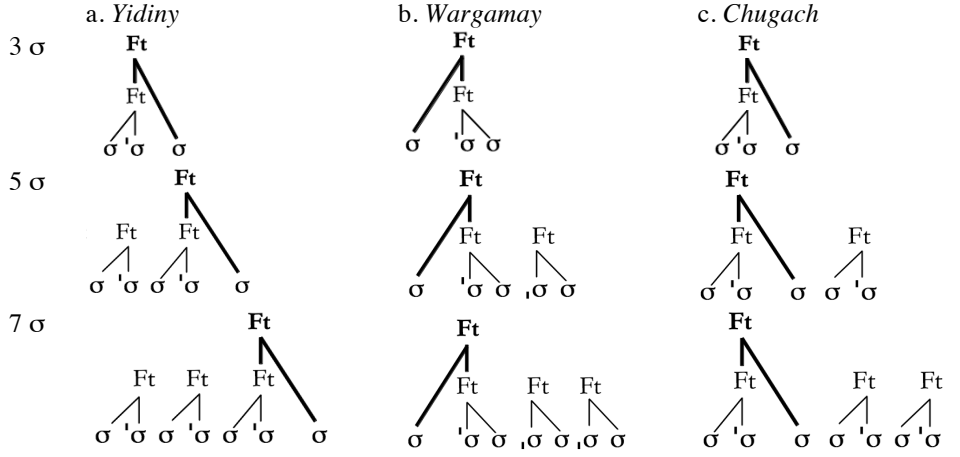
In an odd-parity stem, the suffix /-nʸu/ creates an even-syllabled word (e.g. [madiʸnda-nʸu] 'walk up-past') and the rule does not apply. If the context of deletion is defined as targeting the adjoined syllable of a recursive foot, it is clear why even-parity forms do not undergo deletion: they do not contain a recursive foot and thus the target of the rule is not met. Additionally, it makes sense that the allomorph of [nʸu] is [:nʸ], where the preceding stem vowel is lengthened; that vowel used to be the head of a recursive foot, and it keeps the length as a trace of that affiliation.

[7] See Martínez-Paricio (in prep.) for a complete analysis of the distribution of pitch in the language.

3.3. Cross-linguistic differences: types and location of recursive feet

Since recursive feet in these languages are only built as a last resort device --i.e. when traditional binary feet cannot be built-- odd-parity forms are the only ones exhibiting recursion.[8] As it can be seen in (13), the difference between the three languages lies in the shape of the recursive foot (with left or right adjunction) and its location within the prosodic word (whether it is aligned to its left or right edge):

(13)



These differences can be derived via the specific ranking of two types of categorical ALIGNMENT constraints (McCarthy 2003). The first type establishes the position of the head of a foot (14), and the second type, has the effect of aligning the recursive feet with the right or the left edge of the prosodic word (see 15):

(14) a. **ALIGN-LEFTHEADFT**: Assign a violation mark for every foot whose head is non-initial (based on Hayes 1995) (abbr.TROCHEE)
b. **ALIGN-RIGHTHEADFT**: Assign a violation mark for every foot whose head is non-final (based on Hayes 1995) (abbr.IAMB)

(15) a. **ALIGN-BY-FOOT(FOOT, PRWD, R/L)**[9]**:** For each foot Fx, assign a violation if another foot Fy intervenes between Fx and the right/left edge of its containing prosodic word.

The definitions in (14) and (15) are category-based and, therefore, these constraints target all kinds of feet (minimal and maximal). Consequently, the three languages will incur some violations of these constraints, since the heads of their recursive feet are never completely aligned to the right or left edge of the foot (see the representations given in 13). This is not true, however, for other languages, such as Dutch (van Oostendorp 1995) or English (McCarthy 1982, Davis 2005), where recursive feet respect at every level a left-aligning constraint, i.e. minimal and maximal feet respect the TROCHEE constraint since recursive feet are of the type (('σσ)σ). I argue that the difference between languages like Wargamay and languages like Dutch lies in the specific ranking of the head-alignment constraints and the constraint LAPSE, which assigns violations for every sequence of two unstressed syllables. This is illustrated in tableau (16):

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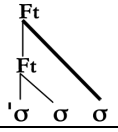
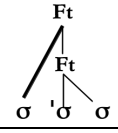
[8] 6 σ-forms in Chugach also present recursion. The difference between Yidiny and Wargamay, where only odd-parity forms allow recursive structures, and Chugach, can be derived by high-ranking an alignment constraint in Chugach that prefers a structure with two recursive feet [i.e. Ft[+max, -min], rather than three non-recursive feet (i.e. Ft[+max, +min]). This could be done with the following alignment constraint: ALIGN-L(Foot[+max], *Foot: for each maximal foot Fx, assign a violation mark if another foot Fy intervenes between Fx and the left edge of its containing prosodic word.

[9] Thanks to Ryan Bennett for suggesting this constraint.

(16)

σσσ	LAPSE	TROCHEE	IAMB
a. 	*!		**
b. ☞ 		*	**

Furthermore, LAPSE is independently needed to rule out unlimited recursion at the foot level.[10]

Finally, there would be two high-ranked positional markedness constraints in each language. One causing the lengthening of vowels that are simultaneously the head of two feet (i.e. vowels that are heads of recursive feet) would be high-ranked in the two Australian languages.[11] The other, HEADFOOT[+MAX]STRESS, would be high-ranked in Chugach, assigning stress to maximal projections of its feet. The complete rankings for each language are provided in the appendix.

4. Conclusions

This paper has proposed recursive-foot-based accounts of the puzzling patterns of stress assignment in Chugach and vowel lengthening in Wargamay and Yidiny, which allowed us to correctly capture the distribution of stress and surface long vowels. Furthermore, I have shown that in these languages foot recursion emerges only as a last resort device in order to fulfill higher-ranked prosodic constraints such as BINARITY and EXHAUSTIVITY. Thus, in addition to the previously attested motivations for prosodic recursion (i.e. syntax-phonology mappings and pure prosodic constraints on higher-domains of the prosodic hierarchy; Ito & Mester, to appear), this paper introduces a new factor that favors prosodic recursion under certain circumstances. In particular, I have argued that prosodic constraints on the well-formedness of word-internal categories can give rise to recursion at the foot level.

Within prosodic theories that completely adhere to *Strict Layering* by banning recursivity (Selkirk 1981, Nespor & Vogel 1986), an explanation of these complicated facts remained inaccurate. However, an alternative account for exactly these data, that does not make use of recursion, can be found in Hyde (2001, 2002). This author allows improper bracketing of prosodic categories and claims that the puzzling patterns can be accounted for if stress and lengthening target only ambipodal syllables with one or two gridmarks. However, there is no strong independent evidence for this type of structures, which seem to contradict one of the most important dichotomies in prosodic theories (i.e. head *vs*. non head). Furthermore, the alleged typological restrictive power of improper bracketed feet has been challenged, because it is too strong (see Buckley 2009, who provides a pattern of stress that is ruled out within Hyde's model). Finally, to get the ambipodal-syllables analysis to work, two different systems of prominence are needed (i.e. the metrical grid and prosodic constituents). In contrast, by allowing prosodic recursion at the foot level, the present proposal can derive all the patterns by just referring to prosodic constituency.[12]

[10] In Chugach, rather than the general LAPSE constraint, it is the more specific LAPSE-INITIAL (avoiding lapses in word-inital position) that needs to be dominating IAMB. That ranking, together with the interactions of the other constraints in (14) generate the correct structures of the language.

[11] In Wargamay, where the lengthening process is not categorical, it can be argued that lengthening is not the result of such a phonological constraint, but rather a question of phonetic implementation: sometimes the phonetics would interpret the head of a recursive foot as long, sometimes it would not.

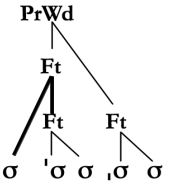
[12] Additionally, the improper bracketed feet analysis cannot account for the distribution of pitch in Chugach.

Appendix: language-particular rankings

Wargamay

a. LAPSE >> TROCHEE >>IAMB
b. AL-BY-FT (FT, PRWD, L) >> AL-BY-FT(FT, PRWD, R)

Foot[+max][-min]: *ft with left adjoined σ*

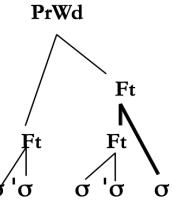


ɠu ɽá· gay- mì ri 'Niagara Vale-FROM'

Yidiny

a. LAPSE >> TROCHEE >> IAMB
b. AL-BY-FT (FT, PRWD, R) >> AL-BY-FT(FT, PRWD, L)

Foot[+max][-min]: *ft with right adjoined σ*



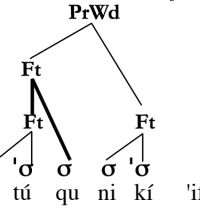
gu dá gu dá: ga 'walk up-PRESENT'

Chugach

a. IAMB >> TROCHEE
b. LAPSE-INITIAL >> IAMB
c. AL-BY-FOOT (FT, PRWD, L) >> AL-BY-FT(FT, PRWD, R)

LAPSE-INITIAL
Assign a violation mark for every sequence of two unstressed σ at the beginning of a word (based on Kager 2001)

Foot[+max][-min]: *ft with right adjoined σ*



a tú qu ni kí 'if he (refl) uses them'

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