

Metrical Structure as the Organizing Principle of Yidin^y Phonology

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1 .INTRODUCTION

The study of phonological systems often turns up rules that are in some sense interrelated — that is, rules which clearly represent different processes, but nonetheless apply in similar environments. Consider, for example, the following three rules of English, all of which apply both before # and before stressless vowels:

$$(1) \quad \emptyset \rightarrow t / n _ s \left\{ \begin{matrix} \# \\ \check{v} \end{matrix} \right\}$$

prínce, píncĕr vs. cónsòrt

$$(2) \quad t \rightarrow [+lax] / [-cons] _ \left\{ \begin{matrix} \# \\ \check{v} \end{matrix} \right\}$$

hít, híttĕr vs. Híttìte

$$(3) \quad n \rightarrow \eta / _ k \left\{ \begin{matrix} \# \\ \check{v} \end{matrix} \right\}$$

hónk, cónquĕr vs. cóncòurse

The recurrent, mysterious disjunction found in these rules has been clarified by Kiparsky (1979), who suggested that they be restricted to apply *within the metrical foot*, where feet can be defined independently on the basis of the English stress system (cf. Selkirk 1980). For example, in *prince* and *pincer*, the [n] and [s] are within the same foot, thus permitting [t] insertion, whereas in *consort* the intervening foot boundary blocks the rule:

$$V \rightarrow V: \quad / \quad \text{---} \quad (C) \quad + \left\{ \begin{array}{l} \text{-dYi} \\ \text{-li/-ri/-ri} \\ \text{-da} \end{array} \right\}$$

cf. barganda-d^y_i:-n^y_u → barganda:-d^y_i:-n^y_u

magi-ri-ŋal-da-n^Yu:-nda → magi:-ri-ŋa:l-da-n^Yu:-nda

$$i \rightarrow i: / ______ y \#^1$$

The remaining long vowels are underlying, occurring in just a handful of morphemes such as *durgu*: ‘mopoke owl’, *waɾa:buga* ‘white apple tree’, and *-dʰulu*: ‘durative’,

(7) Illicit Length Elimination (PRY 18)

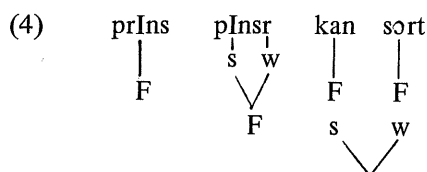
If a long vowel . . . occurs in an odd-numbered syllable of an odd-syllabled word . . . then it is shortened.

This rule converts *barganda*:- $\text{d}^{\text{y}}\text{i}$:- $\text{n}^{\text{y}}\text{u}$ to *barganda*:- $\text{d}^{\text{y}}\text{i}$:- $\text{n}^{\text{y}}\text{u}$ and *guri*:*li* to *guri*:*li*, but leaves *guda*:*ga* intact, as the long vowel is in an even syllable. *wuyaba* :- $\text{d}^{\text{y}}\text{i}$:- η ‘hunt-antipassive-present’ is similarly left alone, as it contains an even number of syllables.

The long vowels that remain then determine the placement of stress by the following rule:

(8) Stress Assignment (PRY 3)

Stress is assigned to the first syllable involving a long vowel. If there is no long vowel, it is assigned to the first syllable of the word. Further stresses are then assigned (recursively) to the syllable next



Kiparsky showed that many other rules of English respect foot structure; for example the devoicing of /l/ after /s/, the mutual assimilation of /k/ and /t/, and the reduction of vowels to schwa. This insight raises the possibility of a new mode of phonological description: we can now capture generalizations about a language that go *across* phonological rules, by showing how the rules all refer to the same prosodic constituent structure. In this sense, metrical structure serves as an organizing principle for much of English phonology.

In Dixon (1977a, hereafter PRY), the phonology of Yidin^Y, an Australian language, is described with clarity and insight. This article is an attempt to show that there is a pervasive link among virtually all the phonological rules of Yidin^Y, similar to that among the rules of English, and that the metrical theory of stress is both sufficient and necessary to provide a formal account of this link. As a further benefit, we will find that many of Dixon's rules are considerably simplified under a metrical analysis.

2. DATA

The central feature of Yidin^Y phonology is the interaction of vowel length, syllable count, and stress. According to Dixon, most of the long vowels of Yidin^Y result from one of the following three rules:

(4) Penultimate Lengthening (PRY 6)

In every word with an odd number of syllables, the penultimate vowel is lengthened.

cf. barganda-d^Yi-n^Yu → bargadad^Yi:n^Yu 'pass by-antipassive-past'

gudaga → guda:ga 'dog'

magi-ri-ŋal-da-n^Yu-nda → magiriŋaldan^Yu:nda

'climb up-going-comitative-coming-subordinate-dative'

but one before, and the next but one after, a stressed syllable.

- cf. galbí:
 gudá:ga
 yad^Yí:ri-ŋá-l 'walk about-going-comit.-pres.'
 bargándad^Yí:n^Yu
 wúŋabá:-d^Yi-ŋ
 magí:riŋá:ldan^Yú:nda
 gúygal 'bandicoot'
 gúdagá-ŋgu 'dog-ergative'
 mád^Yindá-ŋal-n^Yú:nda 'walk up-comitative-subordinate-dative'

A striking aspect of these rules is that three of them refer to an alternating count of syllables: Stress Assignment, Penultimate Lengthening, and Illicit Length Elimination. The "alternating count" in the latter two is implicit in any procedure that determines whether a word has an odd or even number of syllables — an odd syllabled word, after all, is just a word in which a syllable is left over after syllables have been counted off in pairs. Further facts reinforce our suspicion that a generalization is being missed: reference to an alternating syllable count seems to be pervasive in Yidin^Y phonology. An obvious case is Dixon's rule of Final Syllable Deletion (PRY 15):

(9) Final Syllable Deletion

$$(C)V_i \rightarrow \emptyset / \# X V \langle + \rangle_a \left[\begin{array}{c} C \\ +son \\ -round \end{array} \right] \text{ — } \#^2$$

Conditions:

- A. The input form is odd syllabled.
 B. Either

- (i) a is present; or
 (ii) V_i is a "morphophoneme"; i.e. occurs in a restricted set of roots.

cf. bama-yi → bama:-yi → bama:-y 'person-comitative'

barganda-d^Yi:n^Yu → bargandad^Yi:n^Y

gindanu → ginda:nu → ginda:n 'moon'
 [+Rule 9]

alternating, and for two is an odd or even word and off in a being pervasive Syllable

d set of

(10) a. Rhotic Dropping (GY 127, 129)

obligatory if X is even syllabled
optional if X is odd syllabled

b. y Deletion (GY 130)

where Xy is odd syllabled

c. Nasal Cluster Simplification (GY 132-133)

where X_n^y is odd syllabled

d. n Drop (GY 135)

where X_m is even syllabled
(optional, coastal dialect only)

e. Genitive i Backing (GY 135-136)

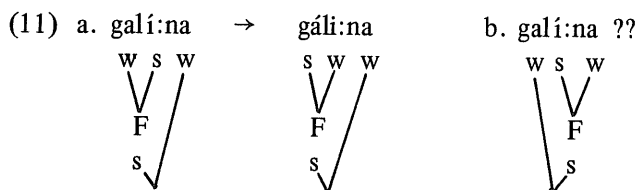
where XV is even syllabled³

The point here is that rules which delete or modify segments based on an odd-even syllable count are not especially common – it would be a colossal coincidence to find eight of them in a single language if all applied on an independent basis, particularly when the language in question has an alternating stress pattern. Clearly, there must be some common basis or organizing principle for all of these Yidin^Y rules. Dixon partially recog-

nizes this (cf. PRY 1,4), but fails to provide a formal account of the problem. An adequate treatment is possible under metrical theory.

3. A METRICAL ANALYSIS

It is straightforward to determine the proper metrical structure for Yidin^Y. The feet obviously must be disyllabic; and they must be assigned from left to right across the word. The evidence for the latter claim is as follows. (a) All of the rules that count off syllables from one end of the word (those of (10)) count off from the beginning, not the end. (b) The rules that simply refer to the length of the word (i.e. Penultimate Lengthening and Final Syllable Deletion) have their effects at or near the right edge. These rules can refer to a local property (whether the word ends with a left over syllable or not), and thus avoid the use of variables, provided that we assign the feet from left to right instead of right to left. (c) Yidin^Y has a late, optional rule of Stress Fronting (PRY 5), which may shift stress from the second syllable to the first, as in *galí:-na* → *gáli:na* 'go-purposive'. This rule can be formulated as a very simple relabelling, provided that the first two syllables of a word always constitute a foot; cf. (11)a:



In contrast, if we posit right to left construction (as in (11)b), there is no simple formal operation that will both place stress on the first syllable and remove it from the second.⁴

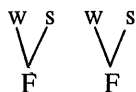
The only difficulty here concerns how the feet are to be labelled. As we shall see shortly, labelling depends on the distribution of long vowels in the word, including long vowels induced by Penultimate Lengthening. But Penultimate Lengthening itself refers to the odd-even distinction, and thus by hypothesis is sensitive to metrical structure. The way around the problem is to construct the trees first, let Penultimate Lengthening refer to them, and only then provide them with their final labelling. We are of course free to assign a preliminary labelling and change it later; this strategy has minor advantages which are shown below.

On the basis of this reasoning, I would offer the following specific analysis:

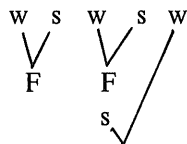
(12) Tree Construction

Going from left to right across the word, group syllables into binary feet, labelled w s.

cf. a. guygal

b. mad^yindaŋaln^yundac. bargandad^yin^yu

I assume that any syllable not affected by (12) is adjoined as a weak member of the adjacent foot by a universal Stray Syllable Adjunction convention, discussed in Hayes (1981, 73). After the convention has applied, (12)c would appear as follows:

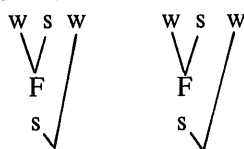
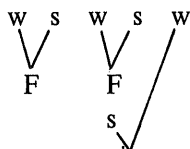
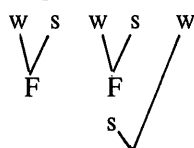
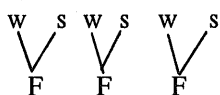
(13) bargandad^yin^yu

The feet constructed by (12) form the basis on which the other rules apply – instead of counting the syllables of the word over again for each rule, we can have the rules refer to local properties of the metrical structure, just like the rules of English outlined above. For example, Penultimate Lengthening can now be formulated to lengthen metrically strong penultimate vowels, as under (14):

(14) Penultimate Lengthening (metrical version)

$$V \rightarrow V : / \quad \begin{array}{c} s \\ | \\ \underline{\quad} \end{array} \quad (C) \quad X \quad \# \quad \text{where } X \text{ is a syllable}$$

cf. a. gudaga → guda:ga

b. bargandad^Yin^Yu→ bargandad^Yi:n^Yubut c. mad^Yindaŋaln^Yunda no change

Similarly, the rule of Final Syllable Deletion can be reformulated to delete syllables in weak metrical position:

(15) Final Syllable Deletion (metrical version)

$$(C)V \rightarrow \emptyset / V \left[\begin{array}{c} C \\ +\text{son} \\ -\text{round} \end{array} \right] \overline{\text{w}} \#$$

The rationale for assigning a preliminary labelling to the metrical feet can now be seen to be phonetic naturalness: it is the norm for stressless vowels to be deleted and stressed vowels to be lengthened. Notice, however, that the preliminary labelling is not crucial, as the rules in question could just as well refer to position within the foot rather than metrical labelling.

Similar reanalyses of the syllable counting rules under (10) can be made. The lesson of these rules is the same as before: by making them refer to prosodic structure, we can show how they fit into the overall phonological pattern of Yidin^Y, rather than treating them as isolated phenomena.


The placement of stress in its correct surface position can be carried

out by the following rule:


(16) Stress Shift

Relabel all sister nodes *s w*, unless there is a strong node dominating a long vowel.

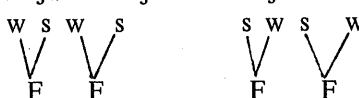
cf. a. *guygal* → *guygal*



b. *mad^yindaŋaln^yunda* → *mad^yindaŋaln^yunda*



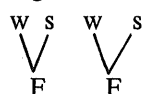
c. *wuŋaba:d^yiŋ* → *wuŋaba:d^yiŋ*



but d. *guda:ga* no change



e. *barganda:d^yi:n^y* no change



The “unless” clause of Stress Shift is highly reminiscent of the “right nodes strong iff branching” convention from other metrical analyses (cf. Liberman and Prince 1977, Hayes 1981).⁵ This similarity can be made explicit, given the appropriate formal devices, i.e. a projection of vowels and geminate representation of length. What is unusual about the rule is that it postulates *labelling harmony*: if one foot of the word receives *w s* labelling by the “unless” clause, the others must follow suit. Note, however, that this is not a necessary ingredient of the analysis, as a more localistic (though slightly more complex) version can be formulated.

After stress has been settled in the right place, we can apply a metrical version of Illicit Length Elimination:

(17) Illicit Length Elimination (metrical version)

$$\begin{array}{c} w \\ | \\ V: \end{array} \rightarrow V$$

cf. a. barganda:d^yi:n^y → bargandad^yi:n^y

$$\begin{array}{cc} \begin{array}{c} w \quad s \\ \diagdown \quad \diagup \\ \end{array} & \begin{array}{c} w \quad s \\ \diagdown \quad \diagup \\ \end{array} & \begin{array}{c} w \quad s \\ \diagdown \quad \diagup \\ \end{array} & \begin{array}{c} w \quad s \\ \diagdown \quad \diagup \\ \end{array} \end{array}$$

b. guri:li: → guri:li

$$\begin{array}{cc} \begin{array}{c} w \quad s \quad w \\ \diagdown \quad \diagup \\ F \\ \diagdown \quad \diagup \\ s \end{array} & \begin{array}{c} w \quad s \quad w \\ \diagdown \quad \diagup \\ F \\ \diagdown \quad \diagup \\ s \end{array} \end{array}$$

but c. wuṇaba:d^yiŋ yad^yi:riŋal no change

$$\begin{array}{cc} \begin{array}{c} s \quad w \quad s \quad w \\ \diagdown \quad \diagup \\ \end{array} & \begin{array}{c} w \quad s \quad w \quad s \\ \diagdown \quad \diagup \\ \end{array} \end{array}$$

Notice that the new rule is a fair improvement over Dixon's: it is intuitively simpler; it no longer has to refer directly to syllable count; and it is phonetically natural, in that it shortens stressless vowels.

The metrical versions of Stress Assignment and Illicit Length Elimination are formulated quite differently from Dixon's rules, and are reversed in their ordering, but nevertheless have the same effects. To see this, consider first words that have an underlyingly odd number of syllables. Here Penultimate Lengthening will apply, inducing iambic labelling of the feet. The odd numbered vowels will therefore be weak and subject to shortening, while the even numbered vowels will receive stress. With the even syllabled words, it is easy to see that the two analyses agree *unless* there are long vowels in both odd and even syllables: for example $V \ V \ V: \ V:$ would surface as $V \ \acute{V} \ V \ \acute{V}:$ under the metrical theory and $\acute{V} \ V - \acute{V}: \ V:$ under Dixon's. However, such cases simply never arise: Penultimate Lengthening does not apply to even syllabled words, and a widespread conspiracy in Yidin^y morphology (cf. PRY 30-34, GY 74-76, 227-232) insures that none of the other sources of vowel length can create a length clash. The predictions of the streamlined analysis are thus exactly the same as those of Dixon's.

4. COMPARISON WITH OTHER THEORIES

I have tried to show that metrical structure provides an adequate basis for characterizing a general pattern of Yidin^y, by which numerous rules refer to an alternating count of syllables going from left to right. We turn now to the other half of the argument, which is to show that metrical structure is *necessary* as well as sufficient. All of the phenomena presented so far might also be handled by rival theories of stress, for example a theory holding that stress is a feature, or the system proposed in Schane (1979a, b). We will argue against these theories by presenting further facts about Yidin^y which can be explained only under the basic assumptions of metrical theory – that is, that stress is to be represented as relative prominence defined on prosodic constituent structure.

In a system in which stress is a feature, the obvious analysis of the Yidin^y facts is to create an intermediate level of representation in which all even-numbered syllables are marked [+stress]:

(18) Initial Stress Assignment (featural version)

$$V \rightarrow [+stress] / \left\{ \begin{array}{c} \# \\ [+stress] \end{array} \right\} C_o \quad V \quad C_o \quad _$$

(left to right iterative)

The output of (18) would naturally parallel the representations created by the metrical rule (12), allowing us to capture the unity of all the rules referring to odd-even syllable count – they would simply refer to the value of [stress] in the relevant syllable rather than to metrical position. The problem arises when we attempt to place the stresses in their correct surface position. This would necessitate a rule of the following form:

(19) Stress Shift (featural version)

$$C_o \quad V \quad C_o \quad \left[\begin{array}{c} V \\ +stress \\ -long \end{array} \right] \rightarrow \quad [+stress] \quad [-stress]$$

1 2 3 4 1 2 3 4

$$/ \quad \# \quad (C_o \quad V C_o \quad \left[\begin{array}{c} V \\ -long \end{array} \right])_o \quad _ \quad (C_o \quad V C_o \quad \left[\begin{array}{c} V \\ -long \end{array} \right])_o \quad C_o \quad \#$$

Aside from its complexity, (19) misses an obvious generalization: it doesn't explain why the placement of stress on the odd numbered vowels happens to be accompanied by the removal of stress from the even numbered vowels. Notice that any rule that involved one of these operations in the absence of the other would be quite unlikely. The metrical theory offers a better account: it represents stress as *relative* prominence among syllables, so that the linking of the two operations follows automatically.⁶

The framework of Schane (1979a, b) offers an improvement over a purely segmental system. The basis of Schane's system is a binary opposition between accented (S) and unaccented (W) syllables, crucially augmented by the following convention:

(20) Weakening Convention (Schane 1979b, 487)

The assignment of S causes any *contiguous* (previously assigned) S to be converted to W.

The Weakening Convention embodies the claim, correct for Yidin^y, that languages avoid stresses on adjacent syllables. It also allows us to meet the objection raised against the account using a stress feature. We would first posit an Initial Stress Assignment rule, entirely parallel to the segmental rule (18):

(21) Initial Stress Assignment (Schane's system)

$$X \rightarrow S / \left\{ \begin{array}{c} \# \\ S \end{array} \right\} X \text{ — (iterative, X is a syllable)}$$

The odd-even syllable count rules could then refer to the distinction between S and W, just as they referred to [+stress] in the featural analysis. Stress Shift can then be formulated as in (22):

(22) Stress Shift (Schane's system)

$$X \rightarrow S / \text{ — } X \left\{ \begin{array}{c} \# \\ S \end{array} \right\} \text{ (right to left iterative)}$$

Condition: may not apply if a long vowel would be weakened to W by (20).⁷

Rule (22) need not contain a separate provision to destress the formerly accented syllables, as this follows automatically from the Weakening Convention, as shown below:

- (23) m a d^y i n d a ŋ a l n^y u n d a
 w s w s w s
 s Stress Shift
 w Weakening Convention
 s Stress Shift
 w Weakening Convention
 s w s w s w Stress Shift

The Schanian analysis is thus not subject to the objection leveled against the featural account. However, there are other arguments that favor the metrical theory over Schane's. The metrical theory claims that Yidin^y words are organized into a constituent structure, which can have effects beyond just that of organizing the phonological rules. Consider, for example, the following performance effect noted in GY (p. 41);

- (24) When (informant) Dick Moses recorded a Yidin^y song, he missed exactly one (word initial) disyllabic unit every time he took breath — this was either a complete word (the first *bun̄gu* of *bun̄gu bun̄gu y'ŋal*), or else the first two syllables of a trisyllabic word (*bugu* from *bugu:ba d^yundulubi d^yanaŋ*).

The metrical analysis provides a straightforward account of what is going on here: Moses was apparently omitting a single metrical foot. However, under the account based on Schane's framework, the material deleted is an arbitrary sequence, unrelated to the phonological structure of the language. A similar argument can be made from reduplication in Yidin^y, the normal mode of which is to copy and prepose the first two syllables of a word, as in (25):

- (25) a. mulari 'initiated man'
 mulamulari 'initiated men'
- b. gindalba 'lizard species'
 gindalgindalba 'lizards'

Again, the metrical account provides a formal insight into the phenomenon which is lacking under Schane's framework: reduplication is simply copying of the stem initial foot. Notice that in neither of the two cases here will reference to the output of rule (21) under Schane's framework be at all helpful.

To summarize, we have seen that other representations for stress could also serve as an organizing principle for the Yidin^y phonological rules in the sense we have described. But the metrical theory is better suited to

the inherent nature of stress: the facts of Yidin^y support the notion that stress is represented as relative prominence, within a prosodic constituent structure.

NOTES

1 Dixon attempts to collapse this rule with another rule which deletes syllable final /y/. His rules appear as follows (PRY 22):

(i) iy → i : / ____ #

(ii) i<:>y → i<:> / ____ C

However, the ostensibly deleted /y/ shows up before a vowel initial clitic, as in *galbi:y#ala* 'catfish—now'. This suggests that the deletion of syllable final /y/ is a separate process, with syllabification allowed across at least internal word boundaries.

2 It might be imagined that the odd syllable condition could be eliminated from the structural description of Final Syllable Deletion by requiring that the vowel preceding the syllable to be deleted be long. Since such vowels will only occur by virtue of Penultimate Lengthening, the odd syllable requirement would then follow from the similar restriction which was placed on the Penultimate Lengthening rule. However, Dixon points out that the ablative suffix *-mu* idiosyncratically blocks Penultimate Lengthening on the vowel that precedes it. In such cases, Final Syllable Deletion nonetheless applies, as in (i):

(i) bun^ya-mu → bun^ya-m 'woman-ablative'

The odd syllable restriction on Final Syllable Deletion is thus still necessary.

3 As with Final Syllable Deletion, some of these rules might be formulated so as to refer to the long vowel induced by Penultimate Lengthening, rather than syllable count. However, in the case of *n* Drop a rule based on vowel length would produce the wrong results: if the deletion of /n/ depended on the presence of a long vowel in the preceding syllable, we should erroneously predict that /n/ could not be dropped in forms like *mud^yam-nu-ŋgu* 'mother-genitive-ergative', where the addition of a further suffix after *-ni* has blocked Penultimate Lengthening. For rules (10)a, b, c, e, it is impossible to determine whether the conditioning factor is vowel length or syllable count. However, given the pattern displayed by all the clear cases, we would expect the latter to be the relevant factor.

4 This constitutes one of the counterarguments to the reanalysis of Nash (1979), who posits right to left foot construction. For full details see Hayes (1981, 137-142).

5 Under the slightly more abstract framework of Hayes (1981), the Yidin^y labelling rule would fall under the convention "dominant nodes strong iff branching," with right nodes marked as dominant by the initial foot construction rule (12). This has the advantage of automatically assigning a preliminary *w s* labelling early in the phonology, as under the theory the default labelling convention is "dominant nodes strong."

6 Yidin^y is of course not the only language in which this sort of argument can be made. In general, "rhythm rules" such as those found in English and other languages can be expressed as a single operation under metrical theory, but require two operations when expressed using a stress feature.

7 The condition attached to rule (22) is needed to block shifting in words like *durgu_{w s}, yad^yi:riŋal_{w s w s}*. It plays the same role as the "unless" condition placed on the metrical rule. (16).

The structure of phonological representations (Part I)

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