TERNARITY IN PIRAHA PHONOLOGY

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ABSTRACT

Rules for Pirahã primary stress, stress shifts in morphemic combinations, and extrametricality crucially refer to ternary feet, requiring us to admit ternarity as a primitive of metrical theory.

INTRODUCTION

A central concern of linguistic theory is to be able to describe the range of relevant phenomena within parameters sufficiently restricted so as to provide a meaningful explanation of the data. Consequently, we must resist the temptation to introduce novel theoretical devices unless absolutely required by the facts. In metrical phonology, for example (cf. [7]; [4]; and others), most researchers would agree with Hammond's [5] (p.193) assertion that "...bounded feet ... are maximally binary." This means that we would need only binary and unbounded feet in our theoretical tool box. It is tempting to speculate that if this is true it is the result of a deeper principle, viz., that heads must be adjacent to their domains. This would then elevate the notion of adjacency to the position of a cross-modular organizing principle, since, for example, the importance of adjacency in the syntax has been noted by various researchers (e.g. [1]; [11]). However, in this paper, a preliminary report on research in progress ([3]; cf. also [2] and [4]), I argue that primary and secondary stress placement in simple and morphophonologically derived words in Pirahã, an Amazonian language, crucially depends on the postulation of ternary feet. Corroborating evidence for this analysis is adduced from extrametricality. This analysis is important for phonological theory in that it provides the clearest evidence to date that bounded feet are not maximally binary and that ternarity must be admitted as an underivable theoretical primitive (cf. [6] for a suggestion that ternarity can be derived, based on the erroneous conclusion that all ternary trees are amphibrachs).

PRIMARY STRESS

The first evidence for ternarity is found in Piraha's rule of primary stress placement:
(1) Primary Stress Placement: Stress the rightmost token of the heaviest syllable type encountered in the rightmost three syllables of the word (—— = 'primary stress'; ═══ = 'secondary stress'; . = 'syllable boundary'. See [4] on the determination of syllable weight in Piraha):

(2) .?a.ba.gi. 'toucan'
(3) .?a.ba.pa. 'Amapa' (city name)
(4) .bii.sai. 'red'
(5) .ho.aa.gai. 'species of flower'
(6) .ka.pii.ga.ii.to.ii. 'pencil'
(7) .pia.hao.gi.so.ai.pi. 'cooking banana'
(8) .kao.ai.bo.gi. 'evil spirit'

In examples like (7) and (8), where a heavier syllable (CVV) occurs to the left of the antepenult, rule (1) will overlook it, seeing only the final three syllables.

Stress is realized phonetically by some, but not all, speakers as intensity. Its phonological relevance is strongly supported by two optional, low-level rules:

(9) [+vd] ---> ([-vd])/ following stress
(10) syl ---> (Ø)/ following stress

We can derive the restriction of (1) to the final three syllables via the algorithm in (11):

(11) Tree Construction: Build a right-dominant, ternary, Obligatory-Branching (OB) foot (See [5] for a discussion of OB feet) at the right margin of the word.
Conditions: (a) The rightmost syllable of the tree must dominate a segment leftadjacent to]. (b) This algorithm applies from right to left.

MORPHEMIC COMBINATIONS

Not only will (11) correctly account for primary stress facts, it also derives the facts of secondary stress and stress shift in morphemic combinations ('[...]' = morpheme; '(...)' = phonological foot'; a. = base form; b. = derived form):

(12)a. [.?a.pi.pai.] [.ho.ao.ba.]
'watch' 'give'
b. ([.?a.pi.pa.]) ([.ho.ao.ba.])
(13)a. [.?a.pi.bai.] [.tio.hio.?io.]
'proper name' 'next'

b. ([.?a.pi.ba.]) ([.tio.hio.?io.])

(14)a. [.ka.hai.] [.?o.ga.ba.gai.]
'arrow' 'want'

b. ([.ka.hi][o.)(ga.ba.gai.])

(15)a. [.bao.sai.] [.bii.sai.]
'cloth' 'red'

b. ([.bao.sa.][.bii.sai.])

(16)a. [.?a.pa.pai.] [.?ii.ta.ha.]
'head' 'hurts'

b. ([.?a.pa.pa.]) ([.ii.ta.ha.])

As seen in these examples, resyllabification occurs in noun + adjective and noun + verb sequences, following deletion of the final vowel in the noun and the initial /?/ in the verb. Secondary stresses are produced by constructing a rightdominant phrase tree over the resultant sequence. These processes, in conjunction with postlexical, ternary foot construction produce the stress changes between the a. and b. examples above. Example (16) shows that stress shift cannot be explained via 'stress clash avoidance' (cf. [10]). Examples (14) and (15) show that the algorithm in (11) does not stop at [. They further illustrate the necessity of condition (a) in (11), since material from the leftmost morpheme has been incorporated into a foot with material from the rightmost morpheme. That is, an independent foot could not be formed at] because after the rightmost tree is constructed, there is no segment left in the noun which is adjacent to] (segments cannot simultaneously belong to separate trees since this would result in "crossing association lines" - out in just about anybody's theory).

EXTRAMETRICALITY

Extrametricality facts offer independent evidence for (11) (Note that the following data also appear to support the proposals in [9], wherein it is claimed that extrametrical syllables may be overlooked by certain rules yet still be relevant to other metrical processes or representations). In Pirahã, the nominalizer /-sai/ may not be stressed when phrase final, although it is always relevant for determining the ternary domain of (1) ('{...}' = extrametrical):

(17) a. [.?oi.boi.bii.{sai}.] 'sp. of fish'
cf. b.*[.?oi.boi.bii.{sai}.]
(18) [.?i.bi.{sai}.] 'hammer'
(19) a. [.?ii.to.pi.{sai}.] 'remover'

cf. b.*[.?ii.to.pi.{sai}.]

In (17), since { -sai} is extrametrical we would normally expect it to be irrelevant to the rule (1) above, falsely predicting that /.?oi./ will receive stress. Condition (a) of (11) correctly stresses /.bii./ To account for this, we can assume a filter along the lines of:

(20) * ...{σ}]Ø

It should also be observed that examples like (18) eliminate an alternative hypothesis, namely, that only the final /i/ of -sai is extrametrical /-sa{i}/, since this would incorrectly stress this word as an oxytone rather than a proparoxytone.

CONCLUSION

In this paper, an analysis of stress placement in Piraha has been presented which demonstrates the necessity of enriching metrical theory to include ternary constituents. This means that either the notion of adjacency is not as important to linguistic theory as previously thought or that we must weaken our conception of it to include systems like Pirahã. Unfortunately, the data presently available on the world's prosodic systems is too scarce in my opinion to favor either possibility.

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