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The Phonology of Tone

The Representation of Tonal Register

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———. 1988. "Declination 'Reset' and the Hierarchical Organization of Utterances." *Journal of the Acoustical Society of America* 84, 530–44.
———. 1989. "Review of Pierrehumbert and Beckman 1988". *Journal of Linguistics* 25, 519–26.
———. 1990. "Metrical Representation of Pitch Register." In *Between the Grammar and the Physics of Speech: Papers in Laboratory Phonology I*, edited by John Kingston and Mary E. Beckman, 35–58. Cambridge: Cambridge University Press.
———. 1991. "An Introduction to Intonational Phonology." In *Gesture, Segment, Prosody: Papers in Laboratory Phonology II*, edited by G.J. Docherty and D.R. Ladd. Cambridge: Cambridge University Press.
———. forthcoming. "Compound Prosodic Domains." Paper presented at the Scuola Normale Superiore, Pisa, March 1990.
Ladd, D.R., Kim Silverman, Frank Tolkmitt, Gunther Bergmann and K.R. Scherer. 1985. "Evidence for the Independent Function of Intonation Contour, Pitch Range, and Voice Quality." *Journal of the Acoustical Society of America* 78, 435–44.
Liberman, Mark and Janet Pierrehumbert. 1984. "Intonational Invariance under Changes in Pitch Range and Length." In *Language sound structure*, edited by M. Aronoff and R. Oerhle, 157–233. Cambridge, Mass.: MIT Press.
Maeda, Shinji. 1976. "A Characterization of American English Intonation." Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge.
O'Connor, J.D. and G.F. Arnold. 1973. *Intonation of Colloquial English*. 2nd ed. London: Longman.
Palmer, Harold. 1922. *English Intonation, with Systematic Exercises.* Cambridge: Heffers.
Pierrehumbert, Janet 1980. "The Phonology and Phonetics of English Intonation." Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge.
Pierrehumbert, Janet and Mary Beckman. 1988. *Japanese Tone Structure.* Cambridge, Mass.: MIT Press.
Pike, Kenneth L. 1945. *The Intonation of American English*. Ann Arbor: Univ. of Michigan Press.
Poser, William J. 1984. "The Phonetics and Phonology of Tone and Intonation in Japanese." Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge.
Thorsen, Nina. 1985. "Intonation and Text in Standard Danish." *Journal of the Acoustical Society of America* 77, 1205–16.
———. 1986. "Sentence Intonation in Textual Context–Supplementary Data." *Journal of the Acoustical Society of America* 80, 1041–47.
Trager, George L. and H.L. Smith. 1951. *An Outline of English Structure.* Battenburg Press, Norman OK. Reprinted in 1957 by the American Council of Learned Societies, Washington.
Williams, Carl E. and Kenneth N. Stevens. 1972. "Emotions and Speech: Some Acoustical Correlates." *Journal of the Acoustical Society of America* 52, 1238–50.

Spreading and Downstep: Prosodic Government in Tone Languages

Victor Manfredi

1. INTRODUCTION*

Since its origin in two studies of Ìgbo, autosegmental phonology has endured a conceptual tension between automatic and rule-governed spreading. Williams' (1971) Tone Mapping rule ensures that toneless morphemes receive tonal specifications, but skips over tonal morphemes and melody-final floating tones. Goldsmith's (1976) Well Formedness Condition (WFC) associates all tones automatically, left-to-right and one-to-one, spreading the melody-final tone onto toneless positions, or linking extra tones onto the final tone-bearing position. Halle and Vergnaud (1982) remark that the WFC does not exclude rules of tone spreading, so that the tone mapping framework, being thoroughly rule-governed, is mechanically simpler. Economy aside, automatic spreading has been challenged by two sorts of claims: nonmorphemic, surface floating tones (in so-called Grassfields Bantu languages, cf. Voorhoeve 1971; Hyman 1972; Tadadjeu 1974) and phonetic default tones on surface toneless elements (in Yorùbá, cf. Akinlabí 1982). To accommodate these cases, Pulleyblank (1983) does away with automatic spreading altogether.

Arguments against rule-governed spreading have, by comparison, been few. There are different views of what is at stake in giving up the WFC. Depending on the content attributed to association lines, their manipulation by phonological rules is a more or less significant departure from the original goals of the theory. If association lines simply encode "synchronization" (Halle and Vergnaud), crucial reference to linking is a straightforward way of stating phonotactic constraints (Hayes 1986). But if association lines denote constituency relations, i.e. predictable locality

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domains, it is inconceivable that they are formally autonomous of the features or elements they connect.

The status of association lines also has consequences for the Obligatory Contour Principle (Leben 1973). Odden (1986) restricts the OCP to underlying representations, so as not to force identical tones to "collapse into a single tone" across morpheme boundaries. Clark (1989) eliminates the OCP even in the lexicon, so that the relative pitch of sequential H tones is encoded in the number of underlying identical autosegments. On the other hand, if the OCP holds both in the lexicon and in phrasal phonology, then association lines reflect independently determined constituency relations. Kaye, Lowenstamm and Vergnaud (1985, 1987) theorize government among syllable constituents (rimes and onsets) and within the segment (heads and operators). In their framework, *rules* of spreading are not statable; the distribution of surface floating and default elements is constrained by structure preservation, minimality and proper government (Charette 1988; Nikiema 1988; Kaye 1989).

Section 2 critiques rule-based tone typology. While every logical combination of {H, L} tones spreads automatically in some Benue-Kwa language, tone spreading is nonrandomly parameterized. H-spreading excludes total downstep but does not conflict with partial downstep. L-spreading excludes partial downstep but is a prerequisite of total downstep. A language with two types of L tone, spreading and non-spreading, has both types of downstep. The spreading of both H and L tones contradicts downstep altogether. These implications are understandable if both spreading and downstep are represented in terms of prosodic government by tonal elements, following Bamba's (1984) claim that downstep is the effect of metrical constituency on the pitch realization of tone elements.[1]

Section 3 establishes prosodic government domains in two languages which have been analyzed in terms of rule-governed spreading: ɣɔmalá?-Yamba and Ìgbo. Prosodic government predicts the tonal effects of syntactic structure, effects which are handled in extant analyses by diacritic tones and association lines. These cases, together with the typology, constitute arguments against rule-governed spreading. Section 4 argues that metrical structure is encoded in the three lexical tone classes of Ìgbo. A concluding comment (section 5) draws the cases together in support of the hypothesis that prosodic phonology requires,

1 Benue-Kwa is the largest genetic constituent of Niger-Congo. Greenberg (1963:39, fn. 13) observes a lack of evidence for an isogloss between Kwa (in which he tentatively includes Kru) and Benue-Congo. Williamson (1989), following the lexicostatistic analysis of Schadeberg (1986), suggests a division in between Gbè and Yoruboid (see Capo 1985 for a critique).

not a level of representation intermediate between syntax and phonology, but a theory of the different subtypes (lexical, phrasal, metrical, tonal, syllabic ...) of the government relation.

2. Tone and locality in Benue-Kwa

Goldsmith's WFC predicts tone contours at the right margin of an association domain, just if the underlying tones exceed the available tone-bearing units in number. But, in some languages, phonetic tone contours occur in other positions, or are restricted to certain tone combinations:

(1)		
	Yorùbá (Awóbùlúyì 1964)	*H spreads onto L* *L spreads onto H*
	Ẹ̀dó (Ámáyó 1976) western forms of Ìgbo	*H spreads onto L*
	"central" Ìgbo	
	ɣɔmalá?-Yamba (Hyman 1985)	*some Ls spread onto H*
	ɣekoyó (Clements 1984)	*L spreads onto H*

This range of options might suggest a parametrized association convention, according to which certain tones have the inherent property of spreading onto tone-bearing positions. Two of the cases could be handled this way. In Ẹ̀dó and western Ìgbo, L never spreads. In ɣekoyó, what has been called "H-spreading" is actually a flop rule across word boundary, and never results in a falling tone contour.

Parametrized association has difficulty with Yorùbá's three tones {H, M, L} because, while H spreads onto L, and L onto H, neither H nor L spreads onto M. (M never spreads.) Akinlabí (1982) suggests that M is a default tone which arises after spreading applies, but this says nothing about ɣɔmalá?-Yamba, a language in which L tones divide into two classes, respectively spreading and non-spreading.

To account for ɣekoyó, Clements and Ford (1979) propose another kind of parametrized association, which they dub accentual. Dispensing with a L-spreading rule like (2a), they treat the formation of word-final LH contours as a WFC effect, by positing a pre-cyclic tone shift or initial tone association rule (ITAR). In (2b), the first tone links to the star [*] diacritic, and the other linkings follow from the WFC:

(2) a. L H → L H

b. L H → L H → L H

Maintaining (2b), Clements' (1984) account of ɣekoyó still requires a highly marked inventory of lexical tone melodies, as well as rules of leftward H tone association and falling tone simplification. And, the ITAR plus WFC can't handle Ẹ̀dó and Yorùbá, languages with contour tones which are non-final in a monomorphemic association domain.

If spreading-induced contours are not tone association effects, two possiblities remain: they result from language-specific rules, or else they attest inherent properties of those elements which spread, as these properties are licensed by the phonological context. In comparing the alternatives, the relation between spreading and downstep is relevant.

For Stewart (1965, 1971, 1983) "downstep" describes the lowered phonetic register of a high tone preceded by a low tone. Lowering is cumulative and persists throughout the tone phrase, but is reversed at syntactic pauses. The triggering L need not surface; if it doesn't, the downstep is "non-automatic". If there is no synchronic evidence for a L tone, downstep is triggered diacritically. L-delinking, which yields non-automatic downstep (marked by a macron), can be expressed by one of the rules in (3). What varies is the direction of assimilation, and the survival vs. elision of the original L-bearing unit:

(3) a. H L H → H L H̄

b. H L H → H L H̄

c. H L H → H L H̄

All the rules in (3) involve two assumptions: a tone automatically delinks from a timing unit which is affected by spreading or elision, and

floating tones do not automatically reassociate. In Akan (Schachter and Fromkin 1968), L is delinked either by rightward or by leftward H-spreading (3a, 3b), or by TBU elision (3c). In "central" Ìgbo, elision is not found, and H-spreading is leftward (3b). Yorùbá, Ẹ̀dó and western Ìgbo attest elision (3c) and–in other contexts–non-delinking, rightward H-spreading (4a). Ámáyó observes that H-spreading is bled by elision: H does not spread across a floating L tone (4b).

(4) a. H L → H L

b. H L L ↛ H L L

Other combinations of spreading and delinking are more problematic. (4a) flatly contradicts (3a). L-delinking (3a–c) bleeds L-spreading (2a), but there is a conceivable feeding relationship by which spreading feeds delinking so as to mimic the effect of (3a) and (3c).[2] In (5), the "early" application of the L-spreading rule functions as a diacritic for subsequent delinking, i.e. for non-automatic downstep.

(5) a. *L-spreading* → *H-spreading, L-delinking* → *LH-simplification*

H L H → H L H → H L H → H L H̄

b. *L-spreading* → *L-delinking via TBU-elision* → LH-simplification

H L H → H L H → H L H → H L H̄

One can exclude the derivations in (5) by stipulating that L-spreading and L-delinking cannot cooccur in one grammar. However, this is falsified by ɣomalá?-Yamba and Yorùbá. In Yorùbá, the downstep which

2 Rightward L-spreading cannot trigger downstep of the type in (5b).

results from L-delinking ("the assimilated low tone") is limited in domain to one syllable: subsequent syllables with the same value as the downstepped tone can exceed its pitch level.[3] In ɣɔmalá?-Yamba, automatic downstep is perseverative but not triggered by all surface L tones, and some non-automatic downsteps are total.

The phenomenon of total downstep, found in ɣekoyó and ɣɔmalá?-Yamba, challenges Stewart's claim that the downstep trigger is always a floating L tone. Total downstep lowers a H tone all the way to the level of a L tone in the same position. A following L tone is lower still. Thus the tonal sequence in (6), where total downstep is marked by a double macron, would have the phonetic interpretation shown.

(6) [H, H̄̄, L] $\begin{bmatrix} \bar{} & - & \_ \end{bmatrix}$

If an abstract L tone was responsible for total downstep, it would possess properties distinct from both kinds of concrete L tones which are found in ɣɔmalá?-Yamba: one kind spreads onto a following H without downdrifting it, as in (7a), while the other kind downdrifts a following H tone (by the interval of a partial downstep), but without spreading onto it, as in (7b).[4]

(7) a. [H, L, H] ⟶ [H, L, L͡H] $\begin{bmatrix} \bar{} & \_ & / \end{bmatrix}$

b. [H, L, H] ⟶ [H, L, H̄] $\begin{bmatrix} \bar{} & \_ & - \end{bmatrix}$

Type (7a), and not (7b), is found in ɣekoyó; the total downstep trigger in that language is distinct from both. Accordingly, Clements and Ford propose that the trigger for ɣekoyó total downstep is not floating L but floating "super-L", a non-surfacing type of low tone. But they do not explain why total downstep is restricted to phrase-level phonology, although partial downstep (in other languages) can occur morpheme-internally. This distributional asymmetry suggests that the triggers of the two downstep types are not formally comparable; below, I will provide a straightforward account for this fact.

In two instances, Stewart (1965) recognized the arbitrariness of floating L tone as the trigger of partial downstep: lexical downsteps where no alternation occurs, and syntactic downsteps for which no low tonal morpheme is motivated (see also Fromkin 1976). Among generative

3 Láníran (1991) provides instrumental descriptions of several highly marked pitch phenomena in the Yorùbá terraced tone system, as compared to systems of the Igbo type.
4 Tadadjeu (1974:284, fn. 1) describes L-spread as optional and limited to utterance-final position.

Bantuists (Voorhoeve et al. 1969; Voorhoeve 1971; Williamson 1970, 1986; Hyman 1972, 1976), the main justification for nonmorphemic floating tones (many of which are diacritic downstep triggers) is historical reconstruction. Notwithstanding Kiparsky's (1974) caveats, some autosegmentalists imported this abstract notation wholesale. Pulleyblank (1983) treats Hyman and Tadadjeu's (1976) floating tones like observational data.

To summarize, it is impossible to account for downstep alone, or for the relation between spreading and downstep, across all the language types in (1) by means of rules, without using tones and/or rules diacritically. The remaining possibility is that every instance of spreading and downstep reflects inherent, parametric properties of tone elements, subject to universal prosodic constraints. I will now show that this alternative premise correctly predicts the co-occurrence of downstep, total and partial, with the full set of spreading phenomena, both intra- and cross-linguistically, for the languages in (1).

Spreading and downstep differ with respect to locality. In most languages, the lowering effect of a downstep (whether partial or total) persists over a potentially unbounded phonetic span. The downstep found in Yorùbá is "local" (nonperseverative). Spreading, by definition, is constrained by adjacency on the relevant tier. Stewart (1981) observes that partial downstep is in complementary distribution with the spreading of a low tone onto the domain of a following high tone. This is borne out for the five types in (1):

(8)

Yorùbá	*local downstep* *H spreads onto L* *L spreads onto H*
Ẹ̀dó/western Ìgbo	*partial downstep* *H spreads onto L*
"central" Ìgbo	*partial downstep*
ɣɔmalá?-Yamba	*some partial downsteps* *some total downsteps* *some Ls spread onto H*
ɣekoyó	*total downstep* *L spreads onto H*

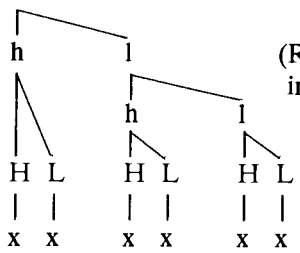
In the terminology of Hyman (1978), a L tone can affect a following H either "horizontally" (by spreading onto it) or "vertically" (by inducing partial downdrift). (8) suggests that both kinds of assimilation cannot be

triggered by the same token of L tone. Further, total downstep correlates with L-spreading. In all, (8) has three sets of implications:

(9) a. Total downstep contradicts H-spreading and requires L-spreading.
b. Partial downstep contradicts L-spreading (but does not require H-spreading).
c. Perseverative, i.e. non-local, downstep contradicts the joint presence of H-spreading and L-spreading.

To express (9) in terms of tone rules minimally requires a distinction between tonal and register tiers of tonal autosegments (Manfredi 1979; Huang 1980; Clements 1981; Inkelas et al. 1987):

(10)



(Register tones are notated in lower-case.)

But the register tone hypothesis only restates the problem as feature geometry: it attributes two nonintersecting sets of properties to identically-named autosegments, depending on which tier they occupy. If (10) represents partial downstep, what prevents the spreading of tonal-L between "tonal feet" (register domains)? And how could a representation like (10) account for the two types of tonal-L (spreading and non-spreading) which cooccur in ɣɔmalá?-Yamba?

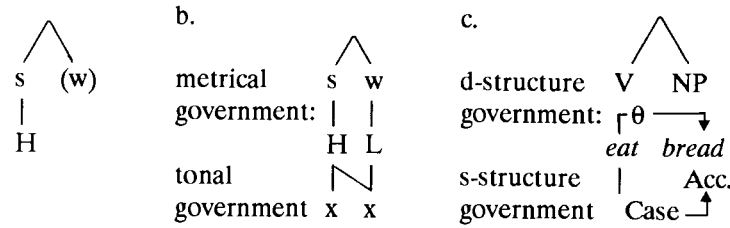
Alternatively, suppose that tones have a single set of properties, all local and invariant, while long distance, relational phenomena like downstep reflect the interaction of tone and metrical structure (Bamba 1984, 1988, 1989). In a kindred vein, Clements and Ford argue that, if the accentual character of ɣekoyó "tone shift" is accepted at face value,

> we would immediately want to take the further step of attributing underlying (or rule-inserted) accent to all lexical tone languages. This is because it would make no sense to argue that Kikuyu had fixed initial accent simply on the basis of the hindsight afforded by tone shift, while denying fixed accent to such typologically similar tone systems as those of Ewe, Igbo or Akan. (1979:198)

Accepting the logic of this statement, I will now show that the three generalizations in (9) can be restated as a single relationship between between tonal and metrical structure. Bamba proposes that the H

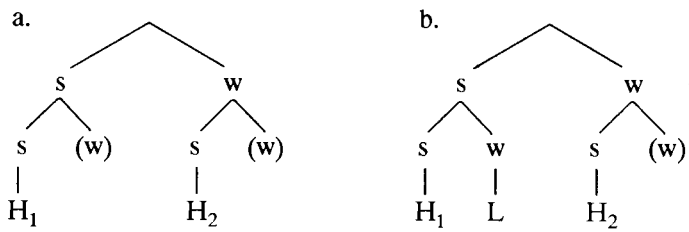
element in a downstep system projects an [s] node which automatically entails a following [w] position, cf. (11a); i.e., it is a *metrical governor*. Correspondingly, a spreading H can be characterized as a *tonal governor*, projecting two positions on the tone-bearing level, as in (11b). In charm-and-government phonology, elements which create contours by spreading domain-internally are said to project two skeletal x-slots (Prunet 1986; Nikiema 1988). This double-projection property is analogous to syntactic government: the co-occurrence of metrical and tonal government in (11b) can be likened to a verb which both governs (θ-marks) and overtly Case-marks its internal argument, as in (11c).

(11)

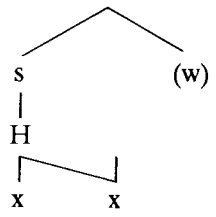


The OCP dictates that phonetically distinct H tones belong to different metrical feet, so that a [HH̄] sequence looks like (12a). An L tone intervening between H_1 and downstepped H_2 occupies the weak position of the first foot, as in (12b). But (12a) respects the OCP even if there is no intervening L tone (the weak position being optional), because the two H tones are not strictly adjacent. Conversely, adjacent H-bearing syllables in the same pitch register must belong to the same metrical constituent, as in (12c). The OCP rules out (12d), with distinct H tones sharing a single foot:

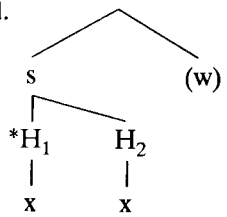
(12)



c.



d.



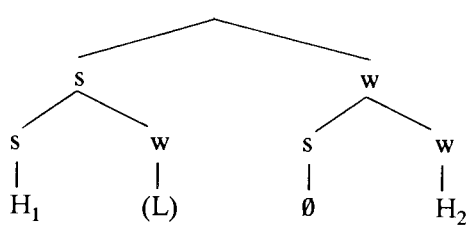
Assuming (11–12), the generalizations in (9b–c) follow from the definition in (13):

(13) *Minimality Condition*
Each domain has a unique governor.

(13) explains why, across downstep systems, L-spreading is more restricted than H-spreading. In an automatic downstep configuration like (12b), (13) excludes the spreading of L onto H_2, since this would require L to govern (tonally) into the second foot—the metrical domain of H_2. Note that (13) does not exclude the co-occurrence of L-spreading and partial downstep in the same *language*, just in the same constituent. In other words, if H is the metrical governor, L-spreading (tonal government) can occur only within a sub-metrical domain, in which by definition H does not govern, as in (20a) below.

This government asymmetry between L and H, essential in all downstep systems, is most vivid with total downstep. Total downstep lowers a H tone to the pitch of a L tone. In (14), this is represented as [$_w$ H_2]: a [w] metrical position directly dominating H2. For pitch interpretation, the timing unit bearing H_2 is equivalent to one bearing L. That is, the tonal content of a weak position is metrically "invisible".[5]

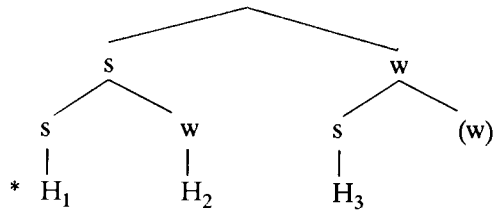
(14)



5 Cf. the process of vowel reduction in "stress" languages (languages in which metrical structure is a projection of syllable weight): a vowel in a weak metrical position gets the phonetic interpretation of a schwa. Metrically weak positions are invisible to projected features—a government-based constraint, analogous to syntactic visibility (Roberts 1985).

(14) shows that a total downstep is immediately preceded by [$_s$ Ø]: an empty [s] position.[6] If the [s] position before a total downstep was occupied by a H tone, such as H_1 as in (15), a partial downstep (on H_3) could immediately follow a total downstep (on H_2):

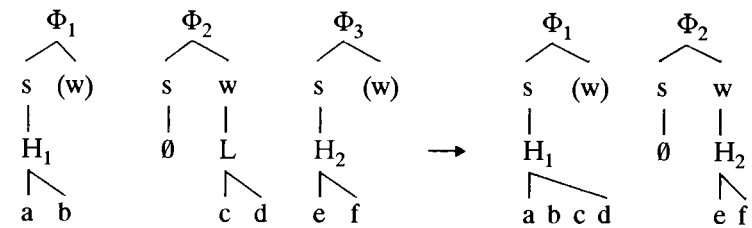
(15)



But (15) is ill-formed. The interpretion of (15) would require a greater pitch drop between metrical feet than occurs in (12a–b) and (14), making tones function as covert accents. To put the matter more simply: downstep, whether total or partial, is by definition a relationship between metrical feet, so the relation between H_1 and H_2 in (15) cannot be downstep of any kind. In Yekoyó, all downsteps are total. Clements and Ford (1978, 1979) observe that the surface tone preceding the downstep is always H. Their downstep displacement rule (16a) is represented as in (16b):

(16) a. $[H^!L_Q] \rightarrow [H_Q{}^!]$ (X_Q = the maximal sequence of X elements)

b.



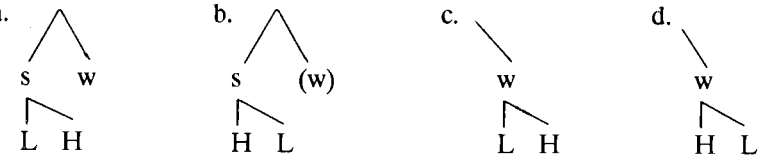
The change in (16b) is driven by well-formedness considerations. The left side of (16b), which arises in phrasal contexts, is phonetically uninterpretable. Unless there was a systematic possibility for a "super-low" L in this position, the [$_s$ L] in the second foot would require a zero pitch drop between Φ_1 and Φ_2—otherwise the pitch change between

6 [$_s$ Ø] (empty, strong position) is a marked type of constituent which occurs in a very restricted set of prosodic contexts. By contrast, weak positions are optional except phrase-finally, where the notation [$_w$ Ø] indicates a weak position that is both obligatory and empty, cf. (18b).

adjacent feet would be diacritically determined by the tones, robbing the metrical hypothesis of content.

(14) suggests that what permits total downstep is a parametric loosening of the bijective mapping between tones and metrical positions found in "pure" partial downstep languages (where H uniquely projects [s]). If either H or L can be immediately dominated by either [s] or [w], two new possibilities arise: [$_w$ ...H...] and [$_s$ ...L...]. This allows two different tone elements to share one (branching) metrical position. The four permutations are given in (17):

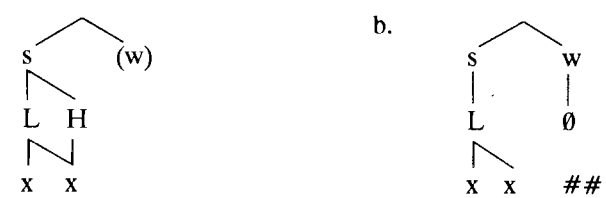
(17) a. b. c. d.



Most of these are independently ruled out. If only [s] can tonally branch, (17c–d) are excluded. This is quite natural since [$_w$ H] is phonetically identical to L, so that both [$_w$ LH] and [$_w$ HL] would be level in pitch. Two possibilities remain: [$_s$ LH] (17a) and [$_s$ HL] (17b). In fact, only (17a) ever occurs–another clue about the relationship of tonal and metrical government.

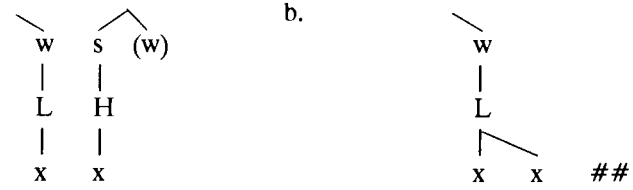
In ɣomalá?-Yamba, Tadadjeu (1974) and Hyman (1985) observe a contrast between two types of L tone: a phonetically raised L which spreads onto the following H (but doesn't downdrift it), and a nonraised L which induces partial downdrift on the following H (but never spreads onto it).[7] Two types of L also contrast in the context "L _ ##": one maintains a steady pitch level, the other drops off. Suppose that in both contexts, the former type of L is the left member of a branching [s] as in (18), and the latter type is immediately dominated by [w] as in (19).

(18) a. b.



7 Contra Hyman (1985:79, fn. 20), I describe the phonetic lowering of an LH sequence in (24c) as downdrift (automatic downstep), so as to preserve a uniform cross-linguistic representation of phonetically and phonologically identical phenomena. The fact that downdrift does not occur after all surface L tones in all languages does not warrant its dismissal as an "old concept".

(19) a. b.



A raised, potentially spreading L tone (a tonal governor) is immediately dominated by [s]; but an [s] position must also contain a H tone, since H is the metrical governor. Because the LH sequence shares the same foot, there is no downdrift between them, cf. (18a). A sentence-final L can be directly dominated by [s] if and only if the following weak metrical position is empty, cf. (18b): although H metrically governs L, [[$_s$ L] [$_w$ Ø]] is nevertheless well-formed because L is metrically stronger than Ø. This theorem gives a principled basis to the frequent observation that the {H~L} contrast is neutralized sentence-finally. In the same way, the fact that L-spreading is restricted to utterance-final position in ɣomalá?-Yamba (cf. footnote 4 above) seems to depend on the fact that there is no following constituent to be metrically governed by the H tone onto which L spreads. In ɣekoyó, too, LH tone contours are apparently restricted to phrase-final position. The parallel restrictions in the two languages follow from (13).[8]

There is no evidence, however, that a non-branching [s] can dominate a nonfinal L, as in (20a). There is also no phonetic distinction between two types of HL sequences, corresponding to the prosodically distinct LH sequences in (18–19). Such a distinction would require some HL sequences, but not others, to exhibit spreading.[9] In fact, no H-spreading occurs in ɣomalá?-Yamba or ɣekoyó, so [$_s$ HL] is excluded, cf. (20b).

(20) a. b.

8 Voorhoeve's idea (adopted by Hyman) is that L-dropoff is blocked by a word-final, floating H tone. My analysis in (18b) is not completely different. Condition (21a) below licenses nonbranching [s L] just in final position, since an L tone is metrically stronger than zero, but a non-final [$_s$ L] must be part of a branching [$_s$ LH] constituent. The difference is that Voorhoeve's floating H is totally abstract: it never surfaces.

9 Stewart's (1983) contrary claim concerns diacritic H-spreading that feeds L-delinking, cf. (3a).

The ill-formed representations in (20) have in common a L tone as the rightmost daughter of a [s] node, i.e. nonfinal L immediately preceding a weak position. Such a restriction is reminiscent of the exclusion of "super-heavy" CVVC syllables, in which both rime and nucleus branch (Kaye, Lowenstamm and Vergnaud 1987; Charette 1988). In both cases, a metrical governor is lacking, adjacent to a weak position.

Tonal elements are potentially both tonal and metrical governors; there is an asymmetry in the constraints on the respective levels. While metrical structure is never fully autonomous of submetrical domains, be these projections of tone or syllable weight (or both, for Kishambaa)[10], the correspondence of tonal and metrical domains can be more or less close. The proposal that metrical domains "extend" the properties of tonal elements as governors/governees recalls the extension of syntactic government to long-distance domains (Kayne 1984; Koster 1986).

(13) has the corollaries in (21). With respect to metrical structure, tonal elements universally respect the constraint in (22), cf. footnote 6 above. A bijective relation between metrical and tonal governors obtains parametrically, cf. (23).

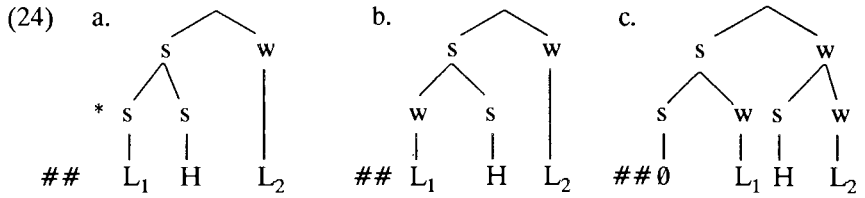
(21) a. *Metrical Projection Theorem*
A [s] position immediately dominates a metrical governor.
b. *Metrical Locality Theorem*
A [w] position is strictly adjacent to a metrical governor.

(22) *Tone Visibility Constraint*
Tonal government is not possible from a [w] position.[11]

(23) *Prosodic Domain Parameter*
A [s] position *uniquely* dominates a tonal governor: {yes}, {no}.

In pure partial downstep systems like Ìgbo and Ẹ̀dó, the value for (23) is {yes}. In these systems, there are three formal possibilities for an initial L tone. The first, adjunction under a strong position as in (24a), is ruled out by (23). Instead, as proposed by Bamba (1988), an initial L can adjoin under a weak position, as in (24b). Alternatively, an initial L could belong to a unique foot projected by an initial [$_s$ Ø] constituent, as in (24c). Initial L tone is phonetically raised in Ẹ̀dó (Elugbe 1977), Ìgbo and ɣɔmalá?-Yamba, but not in Kishambaa (Odden 1986:364, fn. 11). This systematic difference might correspond to the representational distinction between (24b) and (24c), both of which are well-formed in principle.

(24)



(23) also raises the question of what counts as a tonal governor. In pure partial downstep systems, the only candidate is H (the metrical governor). Two variants of partial downstep are distinguished by the presence/absence of tonal government. In Ẹ̀dó and western Ìgbo, H is the tonal governor, spreading onto [$_w$ L] as in (11b). A string of syllables linked to a single H tone has the phonetic tendency to rise in pitch. In "central" Ìgbo, no tone spreads (in the localistic sense: any tone contours involve the docking of a tonal morpheme): therefore, metrical government entirely supplants tonal government, making (23) vacuously true.[12] With the revised parametrization in (25) below, this indeterminacy of (23) is removed.

In Yorùbá, both H and L tones spread, apart from one context. Given (13), this shows that metrical domains are in general not formed. The exception arises via the elision of a L-bearing timing unit: the "floating L" becomes the weak branch of a metrical constituent, and a downstep is produced. This result is confirmed in both Yorùbá and Ẹ̀dó, as already observed in (4b): H-spreading fails to occur just across an "assimilated" (i.e. floating) low tone. This constraint is understandable as a minimality effect: spreading does not cross metrical constituents.

In total downstep systems, tonal and metrical domains are fully distinct: the metrical governor is H and the tonal governor is L. H does not project a strong metrical position: some H tones occur in weak positions, and some L tones occur in strong positions (both initially and non-initially). But total downstep systems still satisfy (21): a nonfinal [s] dominating a L tone must branch to [$_s$ LH], cf. (18a). Nonbranching [s] nodes need not contain H just in case the corresponding [w] position is weaker than L, cf. (18b), where [$_s$ L] governs an obligatorily empty,

10 In Kishambaa there is downstep between all lexical and phrasal H tones, except if a H-bearing domain arises by spreading (Odden 1982). A metrical account, preserving the OCP, would make every [s] position a co-projection of an underlying H and its rime constituent.
11 (22) implies that both L and H are metrically strong in Yorùbá, a claim which is possible only in a three-way system with {H, M, L}. I cannot develop this claim in the present space, but see Láníran (1991) for striking evidence that L is strong in Yorùbá.

12 The syntactic analogue is a language in which structural Case is completely abstract.

sentence final [w] position. (22) is also respected in total downstep systems: no spreading is possible from a weak metrical position.

The typological array in (8) attests the independently varying parameters in (25), subject to the constraints in (13), (21) and (22).

(25) a. *Metrical Government Parameter*[13]
The metrical governor is {H}, {L}, {∅}.
b. *Tonal Government Parameter*
The set of tonal governors is {H}, {L}, {H, L}, {∅}.
c. *Prosodic Domain Parameter* (revised)
Tones freely occupy metrical positions: {yes} {no}.

(25a) selects the basic type of tonal licensing for metrical government domains. The value {H} selects downstep, {L} selects upstep and {∅} selects neither. (25b) accounts for the fact that local tone spreading varies cross-linguistically among four logical possibilities. Closely related languages/dialects differ with respect to (25b), and the learner can determine the setting from the simple, positive evidence of intramorphemic contour tones.

A "mixed" system such as ɣɔmalá?-Yamba, in which only some L tones exhibit spreading, is evidence for the independence of the tonal and metrical parameters. The tonal governor is {L}, but tonal government from a weak metrical position is ruled out by (22). Further, as attested by both ɣɔmalá?-Yamba and ɣekoyó, (13) prevents spreading in a nonfinal [$_s$ LH] constituent, so the actual cases of L-tone spreading are a subset of a subset of the total number of L tones: [[$_s$ LH] [$_w$ ∅]]. Stating this in the form of a spreading rule obscures the generalizations which hold for each of the sub-relations on which it is jointly based, and which have independent, highly valued empirical consequences in other contexts.

(25c) restates (23) more generally, with markedness reversed. A *yes* value for (25c) has three major consequences: H may be dominated by [w], L may be dominated by [s], and [s] may branch. The distinguishing phonetic alternation of a total downstep system, "H⟶L in weak position", can also be observed from simple, positive evidence. Total downstep intrudes marginally in many partial downstep systems: downstepped H in final position is phonetically low in Mbàisén (Ụwaláàka

13 As already noted, the possibility of both {H, L} as metrically strong is probably instantiated in the three-tone system of Yorùbá. The statement of (25a) remains valid for two-tone systems as it stands, for reasons which are intuitively clear: a two-tone system cannot have both tones metrically strong.

1982), Ìzî (Meir et al. 1975) and Ẹ́hụgbò (Manfredi 1979). The possibility of branching [s] can be induced from the contrast between two kinds of L tone: [$_w$ L] which downdrifts but does not spread, and [$_s$ L] which spreads but does not downdrift. This contrast, being supported by two concomitant phonetic cues, is also easily learnable.

A *yes* value for (25c) licenses total downstep. The fact that an [s] position may branch to LH implies the separation of tonal and metrical domains. Once the domains are separate, (13) requires the learner to identify a governor for each. H must remain the metrical governor, because all weak positions are phonetically nonhigh. This makes L the only candidate for tonal governor in a total downstep language.

A *no* value for (25c) makes a metrical foot a pure projection of H, as in (11a): every H is linked to [s], and every L to [w]. Nothing requires every [w] to link to a L tone however, so partial downstep is possible with either *yes* or *no* values of (25c); *no* excludes total downstep. *No* is the unmarked value since positive evidence for this setting is less straightforward.

The next section compares prosodic government domains in the associative constructions of a "Semi-Bantu" language and Ìgbo.

3. Prosodic government

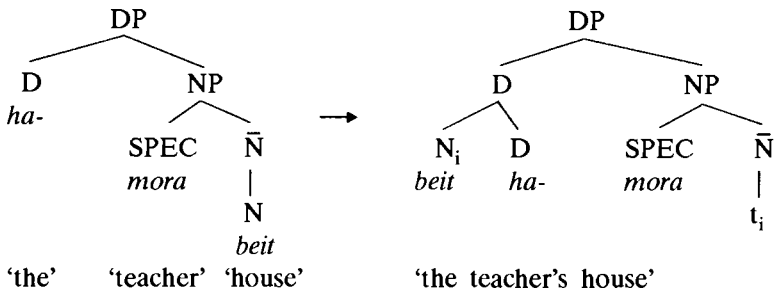
ɣɔmalá?-Yamba ("Dschang-Bamiléké") is discussed by Tadadjeu (1974), Hyman and Tadadjeu (1976), Pulleyblank (1983), Hyman (1985). Their principal data are drawn from the "associative" construction, a complex nominal resembling the Semitic construct state. Although the associative construction is sometimes translated by an English DP like *the feather of the/an eagle*, restrictions in phrasal expansion and definiteness make it semantically closer to an English nominal compound like *eagle feather*. One difference from a compound is the presence of a morpheme between the two nouns. But unlike a possessive morpheme or other determiner, the associative morpheme does not imply definiteness. In other words, as in the construct state, the dependent noun in an associative construction is not independently referential.

The associative morpheme is an agreement prefix on the dependent noun, coindexed with the head noun. Welmers (1963) reconstructs the associative morphemes of proto Niger-Congo as **à** and **ká**. In many daughter languages, its phonetic shape has undergone reduction; some reflexes lost their segmental content but kept the tone. In some languages, agreement morphology has become entirely vestigial, so the

question of abstractness arises. In ɣɔmalá?-Yamba, associative prefix agreement is productive.

For a prosodic account of this construction, the crux is its syntactic licensing. As a nominal clitic, the associative morpheme on the dependent noun spells out a relation between two nominal heads. The best-understood licensing relation is thematic, as defined in X-bar theory (Chomsky 1981), but it is not obvious that this is the appropriate one. For Borer (1983), the Hebrew construct state is a thematic, phrasal projection (but note that Borer 1987, 1989 cites it as an example of word formation in the syntax). Another possibility is that the licensing projection is not thematic but "functional": responding to proposals by Fassi-Fehri (1987), Ritter (1988) proposes that the construct state is a projection of the determiner, essentially as in (26):[14]

(26)

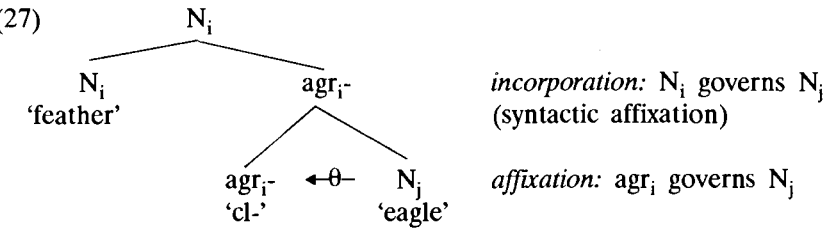


Yet, Ritter must invoke more than head movement to account for the surface order; the unanswered question is why the head noun *beit* 'house' doesn't incorporate to the right of the proclitic *ha-* 'the', yielding an ungrammatical output **ha-beit mora*. My suggestion is that this indeterminacy cannot be resolved because head movement is the only reordering mechanism available within a phrasal (i.e. X-bar) schema. Higginbotham (1985) offers another model of licensing, neologistically called "autonymous" θ-marking, to handle the noncategorial (or syncategoremic) meaning of prenominal adjectives. Since *a big butterfly* may not be big in absolute terms, there are evidently two kinds of semantic composition between the adjective and the noun. The basic relation is θ-identification, as in all predicative constructs: one knows that the properties of bigness and of being a butterfly intersect in the same individual. The extra relation is independent of the head-complement configuration of X-bar theory, on which both Borer (1983)

14 On the categorial status of possessive morphemes as determiners, cf. Fukui (1986), Abney (1987).

and Ritter (1988) rely. Suppose that autonymous θ-marking is a local relationship between thematic heads: an X^0 category can θ-mark the head which governs it. Discussing the similarity of adjective and adverb licensing, Travis (1988) embeds this proposal in an incorporation structure, following Baker (1985): Y^0 autonymously θ-marks X^0 in the structure $[_{X^0}\ X^0 + Y^0\ ]$, where X^0 governs Y^0. I adopt Travis' idea as follows. In (27), the (base-generated) incorporation of N_j is mediated by an agreement chain between N_i and the coindexed clitic. N_j autonymously θ-marks its governor N_i (perhaps via the intermediate governor agr_i). I assume that an affix governs its subcategorized complement (Lieber 1980). In this structure, unlike the noun incorporation structures discussed by Baker (1985), the referential index of 'eagle' cannot percolate.

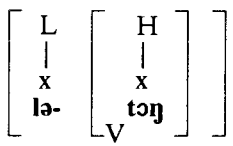
(27)

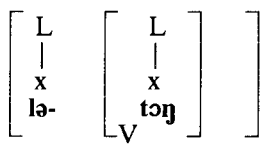


Hyman states that, depending on the agreement class of the head noun, the associative clitic is lexicalized in ɣɔmalá?-Yamba as / **è-** /, / **á-** / or / **é-** /. A propos the underlying form of these morphemes, he astonishingly remarks that "the segmental information is, as far as I have been able to determine, totally irrelevant for the study of tone" (1985:78, fn. 3). But, just as in Hyman's (1976) description of the Àbọ́ dialect of Ìgbo, this assertion obscures syllable-based generalizations about tone association domains (cf. Manfredi 1983a). Two important observations relate to the segmental form of these morphemes: / **á-** / always acquires the quality of the preceding vowel (whether or not a consonant intervenes), while the syllabic features of / **è-** / almost never surface (Hyman 1985:78, fnn. 4, 7). In accordance with the second observation, the two clitics can be represented as in (28):

(28) class 1, 9 agreement prefix: [L] class 7 agreement prefix: [H / x / a]

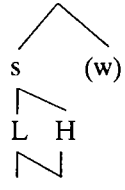
The floating L in (28) is a morpheme, and as such is learnable, given appropriate alternations. The same cannot be said of the nonmorphemic floating tones posited by Voorhoeve and Hyman (and carried over without argument by Pulleyblank); to these I now turn. As noted, ɣɔmalá?-Yamba shows four distinct surface tone patterns on bisyllabic nouns. Tadadjeu and Hyman cite them on the segmental base [**lətɔn**]. The first tone in each pattern is L. Three of the four contrasts are manifested exclusively on the second syllable; in one word, the initial L is predictably raised. Tadadjeu distinguishes the four patterns by positing one morpheme-final, lexical floating tone, justified by appeal to historical reconstructions. The first observation about this tone quadruplet is that it is only near-minimal, because it is composed of two lexical nouns and two infinitives. The latter are unquestionably bimorphemic, presumably formed by syntactic affixation as in (29).

(29) a.


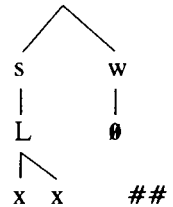
b.


The lexical nouns may also analyze as prefix+root, since there are no high tone-initial nouns.

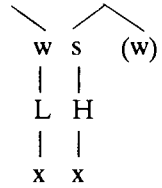
Applying the metrical representations in (18–19), which are phonetically motivated as discussed in section 2, it turns out that the syntactic and lexical **là-** prefixes differ prosodically:

(30) a.


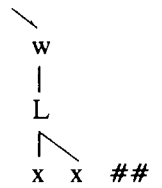
l ə t ɔ ŋ
'feather'

b.


l ə tɔ ŋ
'navel'
(Hyman: **[l à - t ɔ́ ŋ ´]**)

(31) a.


l ə-t ɔ ŋ
'to call'
(Hyman: **[l à - t ɔ́ ŋ `]**)



l ə-t ɔ ŋ
'to reimburse'

The two lexical nouns begin with a metrically strong position, but the infinitive prefix is metrically weak. The generalization in (32) does not translate into a floating tone framework.

(32) *Clitic Prosody Hypothesis*
Syntactic affixes are metrically weak.

Concerning the verb root 'call', Hyman does not indicate underlying tone consistently. At the end of his discussion, he cites the verb with lexical H tone (1985:64, data 28a), disregarding his initial hypothesis of a final, floating L tone (1985:48, data 1c). The floating L seems to be needed just to trigger his rules of "L-metathesis" and "ꜜH-lowering". In a footnote (1985:78, fn. 8), he justifies the floating L on morphological grounds, as an independent suffix which is present on a "nominal" infinitive [**là-tɔ́ŋ-`** ]. This form contrasts with a "verbal" infinitive, otherwise identical, that lacks the suffix. The two infinitives select different concord for their complements: Class 1 Genitive concord is [ `], while the corresponding Accusative concord is [**á**]. Disregarding the nominalizing suffix, the phrases are as in (33):

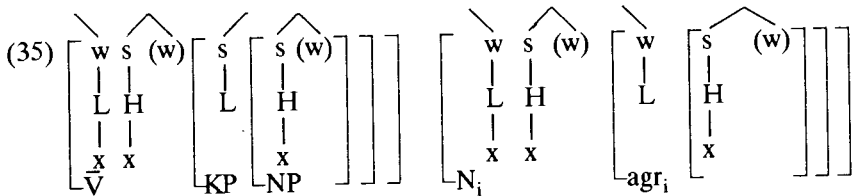
(33) a. 'to call me (Acc.)' **[là-tɔ́ŋ [á-ɣá]]** → **[làtɔ́ŋɔ́wá]**
b. 'to call me (Gen.)' **[là-tɔ́ŋ [`-ɣá]]** → **[là-ꜜtɔ́ŋ ɣă]**

The phonetic output in (33a) is evidently straightforward, with rounding harmony spreading from the verb to its complement. In the output of (33b), the total downstep between L tones, and the spread of L onto the final syllable, must be accounted for. But an associative construction 'bird horn' lacks the L-spread:

(34) 'bird horn' **[ǹ-dɔ́ŋ [`-sáŋ]]** → **[ǹꜜdɔ̀ŋ sáŋ]** ***[ǹꜜdɔ̀ŋ sǎŋ]**

The phonetic discrepancy between (33b) and (34) raises a descriptive problem for Hyman. He posits a final floating L tone equally on both [lə-tóŋ-` ] and [ǹ-dóŋ`], in the latter case presumably not on morphological grounds. But the two floating L tones do not have consistent phonetic consequences: both cause the preceding H tone to be downstepped (in his account), yet only the former triggers a rising tone on a class I complement. Moreover, he cites no syntactic or semantic difference for the twin types of infinitives. In the framework developed in the preceding section, the difference between (33b) and (34) is not tonal but prosodic: a spreading L tone must occupy a [s] position. Given the generalization in (32), there is no way to preserve Hyman's "nominal infinitive" hypothesis. Rather, the phonetic difference reflects a property of the complement. There are a number of possible stories; for the present discussion, nothing much hinges on the choice, once it is clear that the "nominal infinitive" hypothesis does not justify a phonological floating tone suffix on a noun like 'horn'. The contrast between "strong" and "weak" pronouns is widespread in the Benua-Kwa family (cf. Ọyèlárăn 1970; Manfredi 1987), and the prosody of the object pronoun in (33b) makes it plausibly a strong metrical constituent. For concreteness, I will represent the strong pronoun as a Kase Phrase, headed by an X^0 category (n.b. not a syntaxtic affix) which is metrically strong:

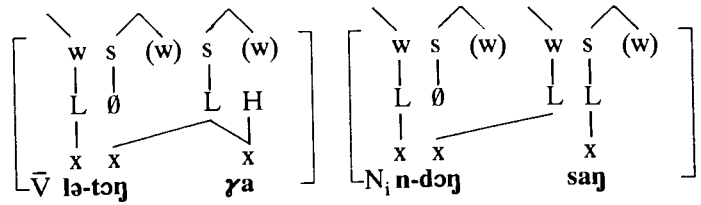
(35)



l ə-tɔŋ **ɣa** **n-dɔŋ** **saŋ**
'to-call' K^0 'me' 'horn' cl- 'bird'

The representations in (74) yield the correct phonetic outputs with two additional assumptions. At the accentual level, the OCP merges [$_s$ L] [$_s$ H] ⟶ [$_s$ LH], because the output is a well-formed configuration in this language, and the input is not, cf. (18a, 25c) above. At the timing level, the tonal prefix of the dependent category flops onto the final timing unit of its governing category, causing the already associated H tone to delink, creating a total downstep (i.e. [$_s$ Ø]). The output is given in (36):

(36)



My claim is that the apparent leftward tone flop in (36) is the consequence of bringing the governee into the prosodic domain of its governing category. I will portray this process informally as in (37a). Other data exemplify the reassociation in (37b). The two domain changes are not contradictory.

(37) *Prosodic Cliticization*

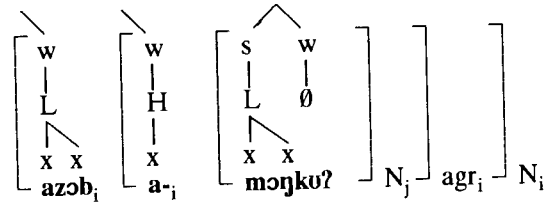
a. *Domain Allocation* — An unassociated element acquires as its association domain the adjacent timing unit of its governing category.

b. *Domain Expansion* — The association domain of the governing category expands to include one timing unit of the governee.

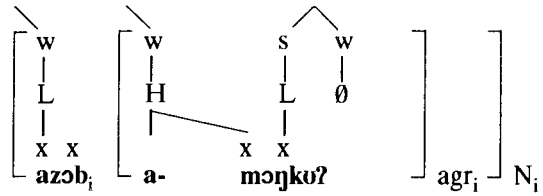
In the rest of this section, I show that (37) explains the phonetic alternations in the associative construction. The problem is to account for all possible tonal/metrical permutations of the structure in (27), where each noun ranges over the four patterns in (30–31), and the clitic is either of the elements in (28). Of the (4 x 4 x 2 =) 32 possibilities, 'bird horn' in (32) is one; I will consider four others. The example 'rooster song' combines a bisyllabic head noun of the prosodic shape [$_w$ L] with a bisyllabic [$_s$ L] dependent noun, linked by the class 7 (**á-**) prefix. Prosodic cliticization (38b) occurs in both cycles; in the outer cycle (38c), the reality of this process is attested not just by tone but by the forced spread of vowel features.

(38) 'rooster song'

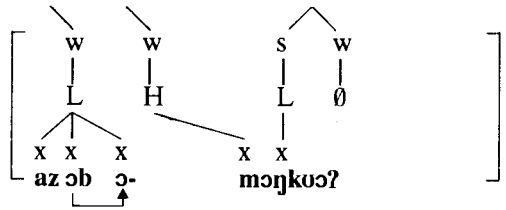
a.



b.



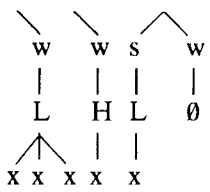
c.



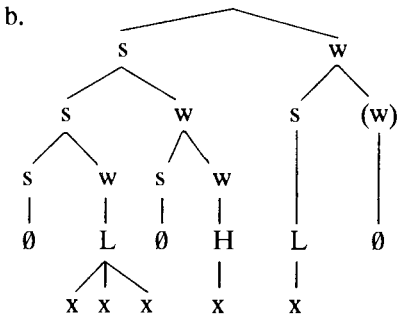
(38) shows three changes from UR: one on each level of representation, except on the tonal level: there are exactly zero tone rules involved, if *tone rule* means a stipulation which affects the tonal tier. On the metrical level, (38a) shows that the H tone prefix occupies a weak position, in accordance with (32). On the timing level, (38b) and (38c) show, in successive-cyclic fashion, the effect of prosodic cliticization (37b). The claim that this process is prosodically driven is supported by the fact that it is mirrored on the segmental level, by vowel assimilation. This parallelism of tonal and segmental reassociation under syntactic government is not accidental, as would be claimed by separate tone and vowel harmony rule. All other aspects of the representation, notably the tones, remain stable, subject to the OCP.

Phonetic interpretation requires that the three domains in (39a) are metrically connected. This yields the superstructure in (39b), equivalent to the pitch notated by Hyman as in (39c):

(39) a.



b.



c. [àzɔ̀bɔ̂ mɔ̀ŋˈkʊ̀ɔ̀?]

In (39a), well-formedness (cf. 21b) requires the projection of empty strong positions. Since a [$_w$ L] position directly precedes [$_w$ H], a [$_s$ Ø] position is interpolated between them as in (53), yielding a total downstep in (39b). Empty metrical positions cannot occur in lexical items; their appearance in phrasal contexts is forced by the conjunction of (21) and (22). The rest of the Tadadjeu-Hyman data follow in the same way. The derivations in (81–83) are evidence for Bamba's (1984) proposal that the OCP respects prosodic structure. This can be formulated as in (40a), which can be viewed as a special case of (40b):

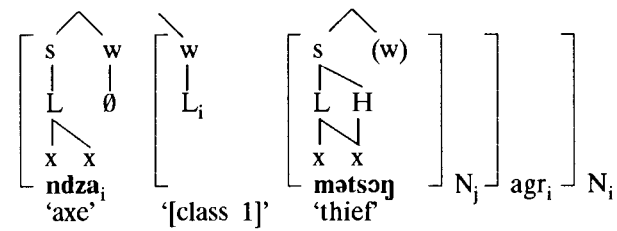
(40) a. The OCP requires both categorial identity and strict locality (metrical adjacency).
b. *Structure-preservation*:
Metrical governors are conserved.

In (42c), two L tones separated by a [$_w$ Ø] do not trigger the OCP. Identical tones in successive [s] positions are not metrically adjacent, but identical tones in adjacent branches of different feet are: [$_w$ L], [s L] ⟶ [$_s$ L] in (42d) and [$_w$ H], [$_s$ H] ⟶ [$_s$ H] in (44d). In (43c), [$_s$ H], [$_w$ H] ⟶ [$_s$ H]. (40) wrongly predicts the merger of [$_w$ L], [$_s$ L] in the first cycle of (42). This merger does in fact occur, but only after the docking of [$_w$ L] in (42c). My proposal is (41):

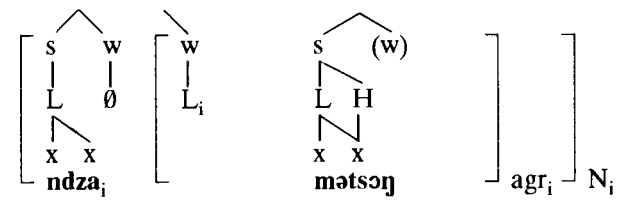
(41) The OCP affects only pronounceable elements (those with non-null association domain).

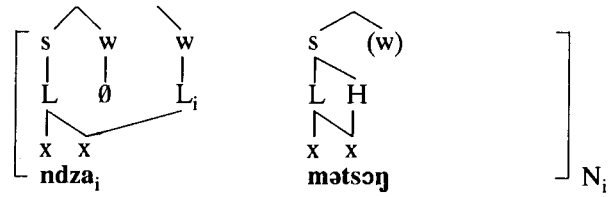
With these assumptions, the remaining derivations yield Hyman's cited phonetic outputs.

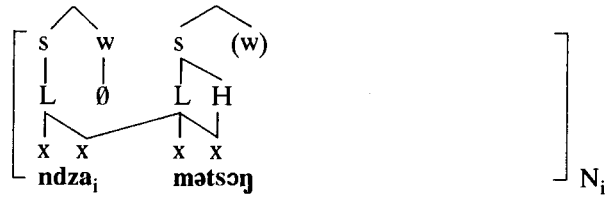
(42) a.



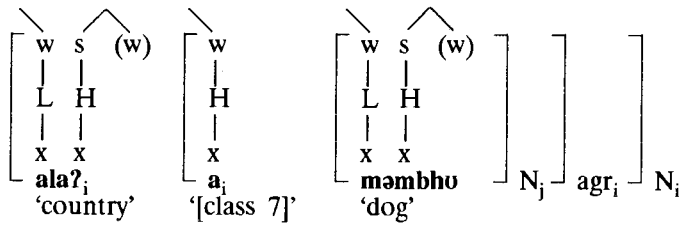
b.

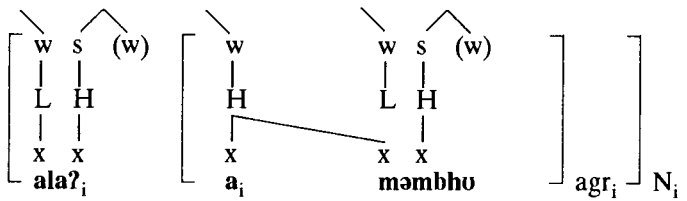


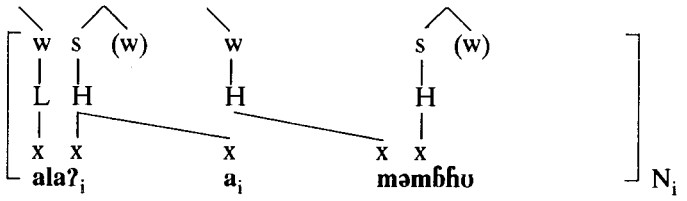
c. 

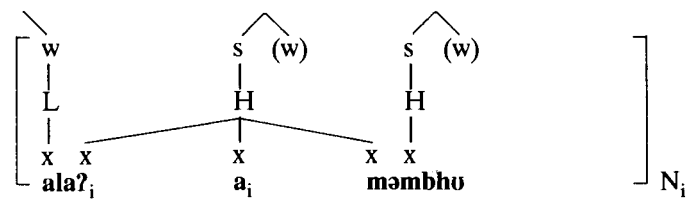
d. 

e. [**ǹdzà^{l}à màtsɔ̌ŋ**] 'thieves' axe'

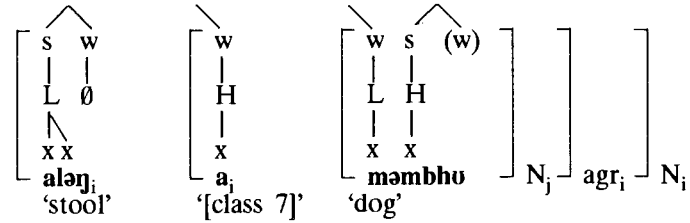
(43) a. 

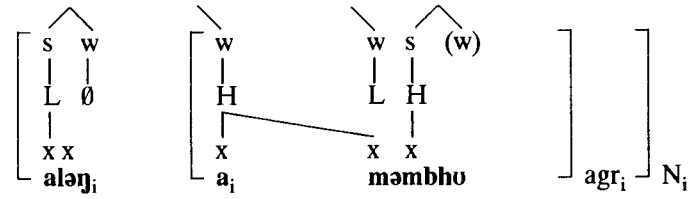
b. 

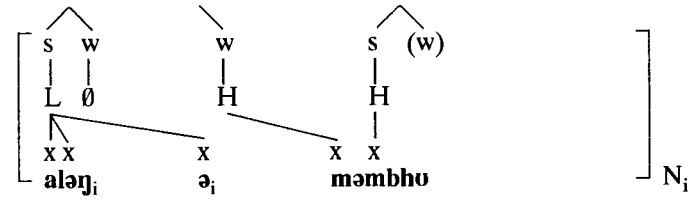
c. 

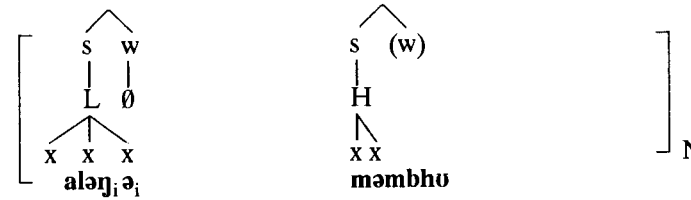
d. 

e. [**àlá?ámám^{l}bhú**] 'dog country'

(44) a. 

b. 

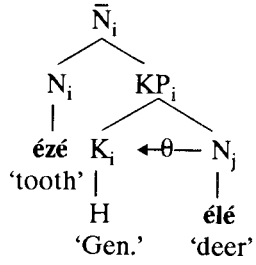
c. 

d. 

e. [**àlàŋ ə ¡mámbhú**] 'dog stool'

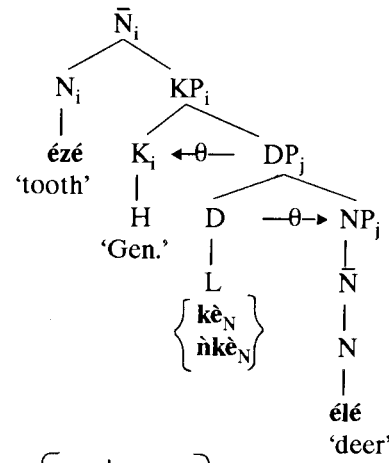
Ìgbo[15] has both an "associative" construction and a related form, first described in Green and Ígwè (1963), which has been dubbed "specific" insofar as the dependent noun bears the independent referential value of a specific entity. In the specific form, if the dependent noun is personal, its thematic relationship to the head noun is possessor. I represent the two constructions as in (45):

(45)a. *associative*



[**ézéé!lé**]
'a/the deer's tooth'

b. *specific/possessive*



{ [**ézé!élé**]
[**ézékèé!lé**]
[**ézéǹkèé!lé**] }
'the tooth of the (specific) deer'

Over the past three decades, most analyses of Ìgbo attributing some autonomy to tonal representation (Welmers 1963, 1970; Voorhoeve et al. 1968; Williams 1971; Hyman 1976; Goldsmith 1976; Éménanjọ 1978; Clark 1982, 1989; Williamson 1986; Ìhiọ́nú 1988) have held that the associative morpheme is a H tone. Two problems remain. First, there has yet no been non-arbitrary account of the tonal effects of this morpheme, which may occur on either noun, both or neither, depending on their inherent tonality and internal word-structure. Second, as is

15 Within the Ìgbo-speaking area, there is parametric varition with respect to (25b); as indicated in (8), H tone spreads automatically onto L tone in western dialects. There is also metrical variation, most evident in the extreme eastern forms of the language spoken in the Cross River basin. In this section, I will stick to the standard language. A reminder: in this section only, tone marking is not orthographic: every syllable bears a tone mark, either H or L, and downstep is indicated [!].

glaringly apparent in a licensing framework like government-binding theory, there is the fundamental question of how the H tone gets there in the first place.

Take the latter problem first. As with the associative construction in ɣɔmalá?-Yamba, it is not that the associative morpheme needs to be licensed; rather, how does this morpheme license the dependent noun? In other words, what is the syntactic category of the associative morpheme? The proposal given in (27) for ɣɔmalá?-Yamba cannot be maintained for Ìgbo, because Ìgbo noun class morphology is purely vestigial, and the Ìgbo associative morpheme does not display any agreement alternations—unlike the ɣɔmalá?-Yamba morpheme, cf. (28). An alternative proposal is given in (45a): the Ìgbo associative morpheme is a K^0 (Kase) element which governs its complement, the dependent noun, in a KP (Kase Phrase), cf. Fukui (1986). Recall from (25c) that every H tone in Ìgbo projects a strong metrical position, so that the syntactic representation of the K^0 morpheme is [$_s$ H]. The automatic nature of the relationship between H tone and [s] position means that, in a language for which the setting of the parameter in (25c) is {no}, there is no informational loss if a morpheme composed of a single H tone element has no metrical structure in the lexicon.

The KP hypothesis is contentful to the extent that it has consequences for the rest of the grammar. In fact, it captures an important syntactic generalization. As pointed out in different ways by Voorhoeve et al. (1969) and Williams (1971), the noun complement of a perfective verb is also licensed by a H tone morpheme. If Ìgbo perfective verbs are intransitive (a proposal which there is no space here to discuss), then every instance of the H tone morpheme spells out inherent (i.e. genitive) Kase. Although Williams (1971:481) explicitly discounts the idea of unifying the two morphemes, this conclusion is forced by Lieber's constraint that homophonous, distinct lexical entries, are possible in a morpheme-based framework just if they

> share only phonological representation, [and] have neither category, nor semantic representation, nor any argument structure or diacritics in common. (1981:179)

The two H tone morphemes share the categorial property of selecting a noun complement, and are both right-branching; this forces the learner to assign them to an identical lexical entry.[16]

16 At a deeper level, the H tone, like English *-en* (Baker, Johnson and Roberts 1989), has the properties of a clitic: it spells out an internal argument position and absorbs structural Case. It may not be accidental that both English *-en* and Ìgbo [$_s$ H] are detransitivizing as well as aspectually perfective.

Thematically, there is no difference between the associative constructions of Ìgbo and ɣɔmalá?-Yamba—or, for that matter, with the Semitic construct state (Borer 1987, 1989). In all, the dependent noun has no independent referential value, and the semantic range of the construction accordingly includes idiosyncratic (i.e. lexical) compounds. I propose that the K^0, inherently nonreferential, inherits the referential index of its governor, so that the "autonymous" θ-marking of N_i by N_j, is mediated by K^0_i.

(45b) in turn differs from (45a) in the referential value of the dependent noun. The most straightforward way to represent this, following Abney (1987), is to say that the complement of K^0 is a DP, where the D is spelled out either as a tonal morpheme or as the possessional noun **(ǹ)kè** 'portion; the one of' (from the verb **-kè** 'allocate, divide'). Most determiners in the language follow the NP, but the prenominal position of **(ǹ)kè** is made more plausible by the fact that **ǹkè** is itself a noun, so that its complement is expected on the right.

Beginning with the associative construction, the tone alternations exhibit phenomena which are closely parallel to those seen in ɣɔmalá?-Yamba, in particular the effects of prosodic cliticization as in (37). The effects of one further constraint are notable in the data:

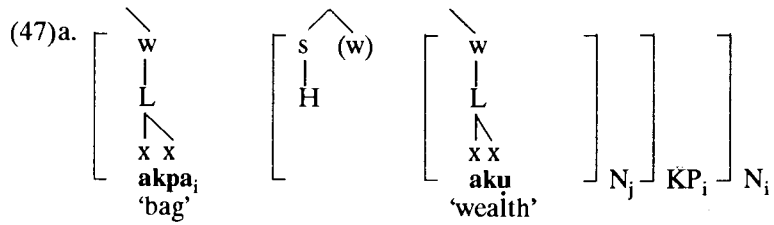
(46) *Metrical Projection Constraint*
A metrical constituent must be linked to (a) or (b):
a. a timing unit (i.e. via a nonzero tone);
b. a zero tone (if the language allows zero tones).

In a pure partial downstep language like Ìgbo, since zero tones are not licensed, cf. (25c), the relevant case is (46a). (46a) is vacuously satisfied by the representation of a purely tonal morpheme in the lexicon, since metrical structure is redundant for such a morpheme and no constituent can be said to exist. In a language such as ɣɔmalá?-Yamba, in which tones are freely distributed in metrical positions (subject to the various independent constraints discussed in section 1), (46) also rules out the presence in the lexicon of metrical structure on tonal morphemes composed of a single tone element. It is thus interesting to note the existence of a generalization such as (32), which permits the metrical structure of these elements to be determined post-lexically on a morphological basis in such a language.

Postlexically, (46) has consequences for the association domain of the K° morpheme. Contrast two examples. In (47), both nouns bear L tone throughout. KP is governed by N_i, and K^0 is not governed by N_j, so (37) predicts that the [$_s$ H] morpheme cliticizes to its left; this in fact occurs, cf. the outer cycle (47c). No tone association is required on the inner

cycle (47b): the associative morpheme satisfies (46a) by linking through its [w] position to the already associated initial L tone of N_j.

(47)a.



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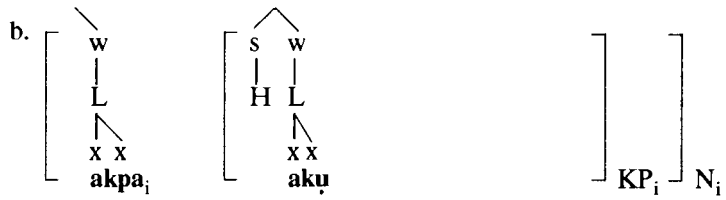

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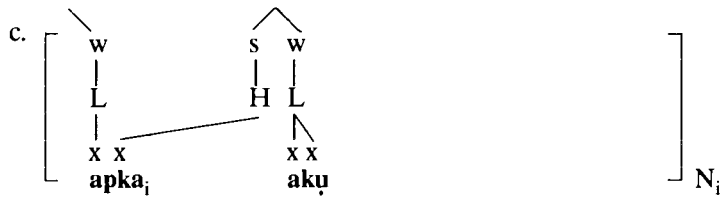
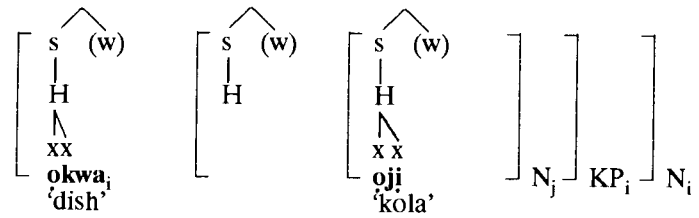
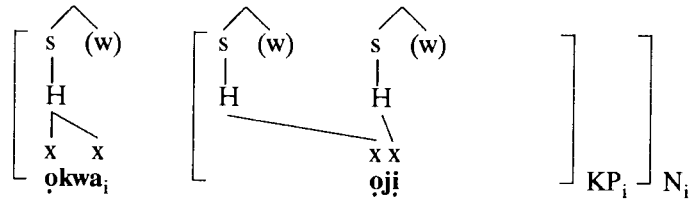


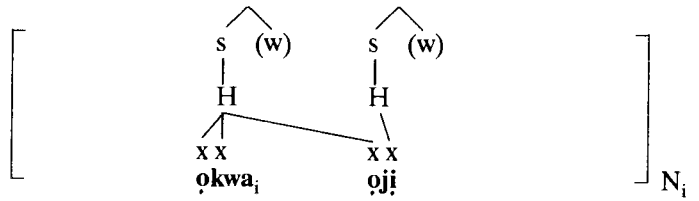
d.[**àkpáàkù**] 'bag of riches'

Now consider an example in which both nouns bear H tone throughout. In (48), cliticization occurs in the inner cycle (48b), causing a downstep between the two skeletal points. There is no other way for the associative morpheme to satisfy the metrical WFC (46a).[17]

17 Unlike what occurs in ɣɔmalá?-Yamba, vowel assimilation in Ìgbo is regressive, so the flop of vowel features seen in (87c) says nothing about prosodic government: it does not indicate that N_j governs N_i. The cross-linguistic difference in assimilation is more plausibly related to the difference in syllable structure; there are essentially no closed syllables in Ìgbo.

(48)a. 

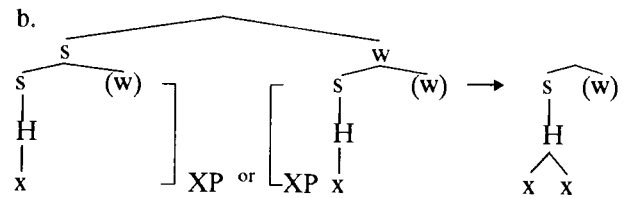
b. 

c. 

d.[ọ́kwọ́ọ́ʲjí] 'kola dish'

The absence of downstep between N_i and KP is due to an independent fact about Ìgbo (and other pure partial downstep languages, but not, e.g., Kishambaa, cf. Odden 1982): consecutive words respectively ending and beginning with H tone are not in general separated by downstep. This can be formulated as a parametric condition on prosodic domains, cf. (49a). Its effect is sketched in (49b); examples are given in (49c); in (49d), no violation occurs.

(49) a. *Prosodic Rhythm Parameter*
Timing units immediately separated by a maximal projection (XP) can be metrically distinct iff they are tonally distinct: {on}, {off}

b. 

c. [N̄ **ónyé** [AP **ọ́má**]] [**ónyọ́ọ́má**] *[**ónyọ́ʲọ́má**]
person good
'good person'

[V̄ **í-ʲtá** [NP **ọ́jí**]] [**íʲtọ́ọ́jí**] *[**íʲtọ́ʲọ́jí**]
to-chew kola
'to chew cola'

[D̄ [NP **ọ́jí**] **áhù**] [**ọ́jyááhù**] *[**ọ́jyáʲáhù**]
kola Det
'that kola'

d. [N̄ **óbì** [AP **ọ́má**]] [**óbyọ̀ọ́ma**]
heart good
'good heart'

[V̄ **í-chè** [NP **ọ́jí**]] [**íchọ̀ọ́jí**]
to-present kola
'to present cola'

[D̄ [NP **óbì**] **áhù**] [**ọ́byàáhù**]
heart Det
'that heart'

The alternations in (47–48) are the tonal effects of the associative morpheme, but a number of independent phenomena also occur in associative constructions. Notable among these is a process which Clark (1978) calls "smoothing": the initial L tone of an LH nominal complement delinks, creating a [ʲHH] contour, after H, cf. (50). The forms in (51) show that this change is unrelated to the associative morpheme. (51a) shows that no associative morpheme follows an infinitive, or else we would find a downstep before the second syllable of 'kola'; yet LH smoothing occurs in that context, cf. (51b):

(50)a. [**ọ́kwá** [´ [**ụ̀gbá**]]] **[ọ́kwụ́ꜜụ́gbá]**

dish K oil.bean
'oil-bean dish'

b. [**àkpà** [´ [**ụ̀gbá**]]] **[àkpụ́ꜜụ́gbá]**

dish K oil.bean
'bag of/for oil-bean'

(51)a. [**í-ꜜtá** [**ọ́jí**]] **[íꜜtọ́ꜜọ́jí]** ***[íꜜtọ́ꜜọ́jí]**

to-chew kola
'to chew cola'

b. [**í-ꜜtá** [**ụ̀gbá**]] **[íꜜtụ́ụ́gbá]**

to-chew oil.bean
'to chew oil.bean'

Finally, as Williamson succinctly observes, "[t]he tones of the Specific construction operate identically with the Associative if an initial H of N_2 is replaced by L" (1986:188). This replacement follows directly from the representation in (45b) with [$_w$ L] occupying the D position, given (46a). To satisfy metrical well-formedness, the L tone must take over the association domain of the initial tone of the dependent noun. (If the dependent noun is L-initial, the effect is vacuous, and the specific form is identical to the associative.)

4. Metrical tone classes

A number of Ìgbo dialects attest a third underlying tone class of monosyllabic verbs, in addition to the two tone classes (H and L) found in other dialects and in standard Ìgbo. Williamson (1983b) shows that the lexical membership of the three classes is consistent across Igboid in all those dialects which have them; and in dialects with just two classes, all potential members of the third class belong to the H class. Although three classes can be derived mechanically with floating tones, this would imply at least four logical possibilities, but only three are

ever attested. The metrical analysis developed above suggests a more constrained analysis. [$_s$ L] being ruled out independently by (25a), L cannot be a metrical governor. The three remaining possibilities are [$_w$ L] and [$_s$ H] and [$_w$ H]; the third of these, while possible, is marked and merges with one or the other of the first two, depending on the context. In this section, I will account for data from the literature on Mbàisén and Ọ̀gbakịrị.[18]

In Mbàisén, as described by Swift et al. (1962), Nwáchukwu (1983a), the tonal behavior of the three verb classes combined with various derivational and inflectional morphemes is shown in (52). Each of the verbs 'fall', 'walk' and 'eat' represents a tone class. Although the phenomenon is inconsistently reflected in the literature, Mbàisén (among other dialects) has phonetic lowering of sentence-final downstepped H. In (52), the forms in square brackets give the lowered pronunciation.[19]

(52)	'fall'	'walk (to)'		'eat'	
a.	*imperative*				
	dḥàá	**jḥèé**		**ríe**	
	indicative (3sg. subject)				
	ọ́ dḥàra	**ó jḥère**		**ó ríri**	**[ó rìrì # #]**
b.	*participle*				
	ádḥà	**èjḥé**		**èrí**	
	infinitive				
	ídḥà	**íjḥé**	**[íjḥé # #]**	**írí**	**[írì # #]**
	negative imperative				
	ádḥàla	**éjḥéle**	**[éjḥèlè # #]**	**éríle**	**[érìlè # #]**
	negative indicative (lexical subject)				
	ádḥàghị	**éjḥéghi**	**[éjḥèlè # #]**	**éríghi**	**[érìghì # #]**
	negative indicative (3sg. subject)				
	ọ́ dḥághị	**ò jḥéghí**	**[ò jḥéghì # #]**	**ò ríghí**	**[ò ríghì # #]**
c.	*gerund*				
	ọ̀dḥidḥa	**òjḥighé**		**òríri**	

18 Émènanjọ (1981) describes three tone classes of monosyllabic verbs in Òwerẹ́, whose tonal behavior is closely similar to, but not identical to, that found in Mbàisén.

19 Forms in square brackets have phonetic, not orthographic tone marking, i.e. every syllable bears either [´] or [`], and downstep is marked by [ꜜ]. For a part of Èzínàíhìte Mbàisén, P.A. Nwáchukwu (p.c.) notes the occurrence of tonal variation in the 'fall' class, which while important goes beyond the scope of the present discussion.

The first set of forms (52a) shows a two-way split in tonal behavior. In the imperative, which is formed with a H tone suffix, the root is pronounced low in both the 'fall' and 'walk' classes, but high in the 'eat' class. In the indicative, formed with the toneless **-rV** suffix, the same split is found.[20] Sentence-finally, where the downstepped H in the indicative of the 'eat' class is subject to phonetic lowering, the three classes are pronounced the same.

The second set of forms (52b) shows a different two-way split. Except for the 3sg indicative negative, the 'fall' class has L tone on the root, while in both the 'walk' class and the 'eat' class the root has H. In the 3sg indicative negative, the expected prefix H tone is displaced onto the root, and the expected root tone (L for 'fall', H for 'walk' and 'eat') is displaced onto the negative suffix. As in (52a), a sentence-final downstepped H is phonetically lowered, superficially merging the three classes in that context.

In the gerund (52c), which is formed by reduplicating the stem consonant plus a high vowel, the three classes are phonetically distinct. The tone of the gerund can be described as follows: the root in (52c) bears the same tone that the root has in (52b), while the high vowel infix of (52c) bears the same tone as the root in (52a).[21]

The analysis now proceeds. First consider the fact that, in sentence-final position in Mbàisén, a downstepped H tone is pronounced L. In metrical formalism, such a H tone would be represented as weak: $[_{w}$ H]. Weakened H, while not generally possible in a partial downstep system, is strictly speaking not ruled out by the parameters in (25). Rather, it is possible only in final contexts; nonfinally, it leads to ill-formedness as shown in (15).

Nevertheless, the weakening of H in final position is not found in all partial downstep systems. In keeping with the cognitive approach to phonology, it can be expressed as a parameter, where parametric formulation is constrained to be maximally concrete and general, and minimally stipulative and arbitrary. One way to account for the occurrence of H weakening effect is by a domain condition like (53):

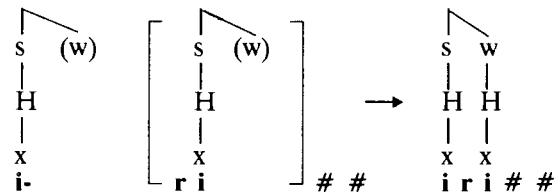
(53) *Minimal Foot Parameter*
A minimal prosodic domain contains
both a governor and a governee: {on}, {off}

20 Indicative is Émènanjo's term for the *-rV* verb-form, dubbed "factative" by Welmers and Welmers (1968). This suffix is discussed by Winston (1973) and Nwáchukwu (1976b).
21 Émènanjo (1975b) and Williamson (1984) describe the gerund in detail.

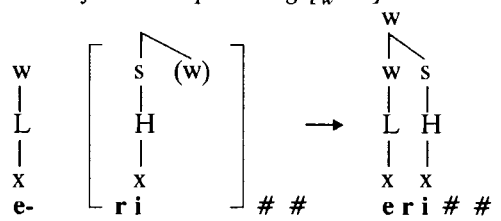
The observation is that a sentence-final H, if metrically strong, thereby violates (53), since there is no subsequent tonal material for it to govern. A paraphrase of the parameter is therefore as follows: "You {can/can't} end a sentence with a [s] position."

To satisfy (53), a sentence-final H must be incorporated in the preceding [w] position. There are two possibilities. If the penultimate tone is also H (i.e. if the final H is downstepped), then there is an unoccupied, governed [w] position which is available for the final H. If the penultimate tone is L, then the sentence-final H must adjoin to it. These two possibilities are shown in (54), which represents the sentence-final pronunciation of the infinitive and participle of 'eat'. In each case, the left side of the arrow violates (53), while the right side satisfies it.

(54) *Final H incorporated into preceding $[_{w}$ ∅]*

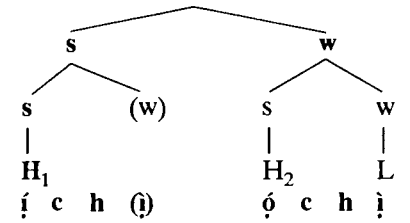


Final H adjoined to preceding $[_{w}$ L]



By definition, a nonfinal H tone cannot violate (53), because there is always a subsequent [w] position. In other words, the licensing of nonfinal empty [w] position is unexceptional in partial downstep systems. This can be seen in (55). In the example, parentheses indicate phonetic elision of a rime along with its L tone. Despite the loss of its immediate governee, the tone labeled H_1 does not violate (53), because its metrical government domain extends along the path indicated in boldface, to include a governee.

(55)

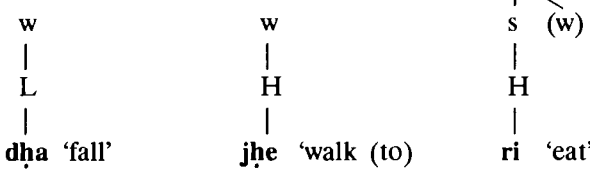


[ích¹óchì] 'to laugh'

The above discussion of (53–54) shows that [$_w$ H] is possible in Mbàisén, in at least one (fairly restricted) context. [$_w$ L] and [$_s$ H], by contrast, are freely available in any partial downstep system, apart from the parametric occurrence of minor restrictions like (53). The fourth logical possibility, [$_s$ L], is ruled out absolutely for all partial downstep systems, including all dialects of Ìgbo, by the metrical government parameter (25a).

Since [$_w$ H], while marked, is not ruled out in principle in Mbàisén, one can ask if it arises anywhere else, other than in sentence-final position after H. Another potential instance of [w H] in Mbàisén is the third lexical tone class. Accordingly, a metrical analysis of the three lexical tone classes is as follows:

(56)

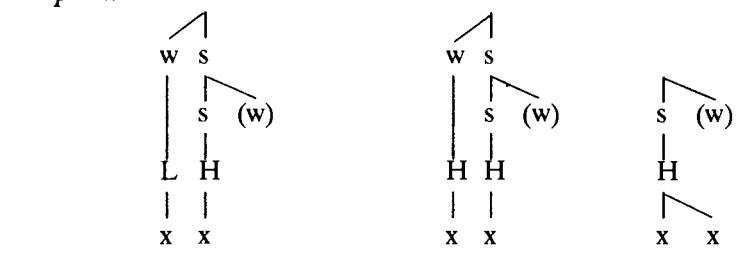


[$_w$ H] is formally possible for a monosyllabic lexical item, since prosodic domains are not defined in such a context; but, it is marked, because H is the metrical governor in a partial downstep language. This markedness explains why in dialects like Ònicha which have just two tone classes of monosyllabic verbs, the 'walk' class is merged with the 'eat' class, not with the 'fall' class. The metrical account of the third class treats it as a species of H rather than of L, and dialects which lack the third class show that this is the correct generalization.[22]

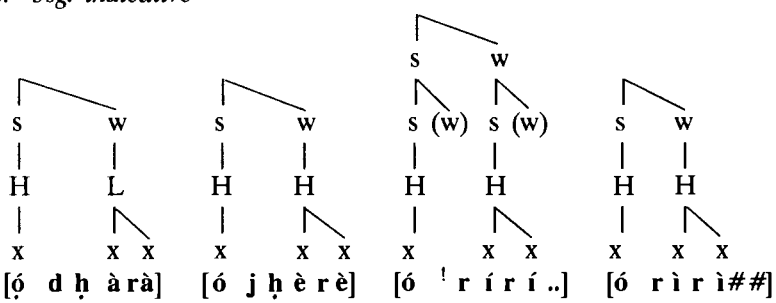
22 Nnéèwi, which is geographically between Ònicha and Mbàisén, has a vestigial third tone class. In Igboid there are the three verbs 'to be', which in Nnéèwi have the following shapes: **nò** 'be at', **dú** 'be describable as', **wú** '[copula]'. Émènanjo (1981:257) reports a three-way tonal contrast among these verbs in the 3sg indicative negative: **ó nòho, ò dúhò, ó wúho** (orthographic tonemarking).

Consider again the forms in (52a). In Mbàisén, with either a H tone suffix (as in the imperative) or no tonal suffix (as in the indicative) verbs of the 'fall' and 'eat' classes retain their inherent tone, respectively L and H. But in the same context, a verb of the 'walk' class is phonetically low. If 'walk' verbs are underlyingly [$_w$ H], this lowering can be compared to the sentence final lowering of [$_w$ H], characteristic of Mbàisén. In other words, the lowering of the 'walk' class verbs roots in the imperative and indicative might be viewed as a second consequence of the well-formedness parameter in (53), independent of the fact of phrase-final lowering which suggested it in the first place. To examine that possibility, consider the metrical representations of the indicative and imperative, given in (57).

(57) a. *Imperative*



b. *3sg. indicative*



In the imperative (57a), both 'fall' and 'walk' begin with a [w] position, while 'eat' begins with a [s] position. But the parameter in (53) rules out a stray initial [w]. The simplest way for an initial [w] to satisfy (53) is for it to adjoin to the following [s]. In this way, the metrical representations in (56) and the independently motivated parameter in (53) account for the fact that the 'fall' and 'walk' classes pattern together in the imperative.

In the 3sg. indicative (57b), the clitic subject bears H tone, which metrically governs the prosodic domain of the verb. The tonal difference between the verb classes arises because the two classes which are metrically [w] (i.e. 'fall' and 'walk') form the immediate sister to the [s] position of the subject, while the class which is metrically [s] (i.e. 'eat') must thereby constitute a separate domain, i.e., a downstep intervenes between the clitic subject and the verb. As noted, this downstep is lost sentence-finally, as already discussed.

In the forms in (52b), 'walk' and 'eat' pattern tonally together, and it is 'fall' that is the odd one out. Given the representations in (56), this means that the metrical distinction between [$_w$ H] and [$_s$ H] is not crucial in these forms, although (57) shows that it is crucial in the forms in (52a). This difference can only be understood in terms of the different affixes involved in the two sets of forms. The forms in (52b) involve suffixes, one toneless and one composed of H tone. While some of the forms in (52b) involve toneless suffixes, all of them involve prefixes.

In the participle, the prefix tone is opposite (or 'polar') in category (H or L) to that of the root. (This statement excludes the 'obligative' participle, which Émènanjọ 1981 shows to be a true nominal.) The other forms in (52b) all involve a prefix which bears H tone; this is true even for the 3sg indicative negative, once it is seen that the prefix tone is displaced onto the root in this form. The negative forms all have a toneless suffix, either **ghị/ghi** or **-la/le**.

The participle, which roughly translates English **-ing**, is fully productive and regular. However, unlike the English V-**ing** and the Ìgbo infinitive and gerund, it is not a free form.[23] As observed by Green and Ígwè (1963:170f.), a participle is always the complement of an auxiliary verb (although, as Émènanjọ 1981 notes, in western dialects the main verb complement of some auxiliaries is prefixless). This observation offers a way to understand the polar tone of the participle prefix, in contrast to the inherent tone of the prefixes of the other derivatives (the infinitive prefix bears H tone, the gerund prefix bears L tone, etc.).

With a prosodic analysis of tone, as developed above, and on the hypothesis that the participle prefix is underlyingly toneless, then, given the fact that the participle is not a free form, it follows that the surface tone of the participle prefix is not determined in isolation. Rather, it must be determined in its minimal prosodic domain, which includes the

23 Accordingly, Nwáchukwu (1976a) rightly rejects the term *participle*—which has acquired the force of tradition in Ìgbo grammar, possibly because the form often translates English *-ing*.

syntactic governor. This is so because a prosodic domain requires a syntactic constituent. Although the last statement is not universally subscribed to by phonological theorists (e.g. Nespor and Vogel 1986), it may be considered the null hypothesis, and is adopted as such by Giegerich (1985). This line of reasoning at any rate offers a reason why it is just the participle, i.e. the one verbal derivative which is not a free form, which exhibits the phenomenon of tone polarity.[24]

Accordingly, the tone polarity of the participle prefix can be understood as follows. It has been observed that the so-called participle always complements a finite auxiliary. And in Ìgbo, a finite auxiliary always appears in the factative form; this fact is important because, in Ìgbo, an auxiliary verb can have no tonal suffix.[25] And if, by hypothesis, the participle prefix is toneless, this means the root tone of the Aux is always adjacent to the root tone of the participle. Now the Aux syntactically governs its complement, the participle. It would seem reasonable, in this circumstance, to require that the Aux should prosodically govern the root of the participle. It remains to consider how such a requirement might be met, for the three verb classes, to explain why the participle prefix must bear the tone opposite to that of the root.

If the verb root of the participle is [$_w$ L], the prefix is H. If the prefix were L, then the OCP would merge the prefix and the root into the domain of a single tone. But this would prevent the Aux from prosodically governing the verb root of the participle, since the participle prefix now shares the prosodic constituent of the root. The only remaining possibility, which guarantees that the participle root has its own prosodic constituent, is that the participle prefix must bear H tone.

If the verb root of the participle is [$_w$ H], the prefix is L. If the prefix were H, it might be [$_w$ H] or [$_s$ H]. If the prefix were [$_w$ H], the OCP would merge its tone with that of the root, blocking prosodic government by the Aux as in the preceding paragraph. And if the prefix were [$_s$ H], this itself would prosodically govern the root, forming a minimality barrier to government by the Aux. The only remaining

24 In fact, the literature describes another verbal derivative which is not a free form: the bound verb complement (BVC). This terminology does not challenge the prosodic generalization just stated, however, since the BVC is homophonous with the participle, i.e. the BVC prefix also exhibits tone polarity. Indeed, as remarked in the previous footnote, Nwáchukwu (1976a) already described the Ìgbo "participle" as a bound verb. One reason that the participle and the BVC may have received different names is that they can cooccur in a single predicate; but in a syntactic framework which allows for head movement, the BVC can be thought of as a resumptive lexicalization of the verb trace.

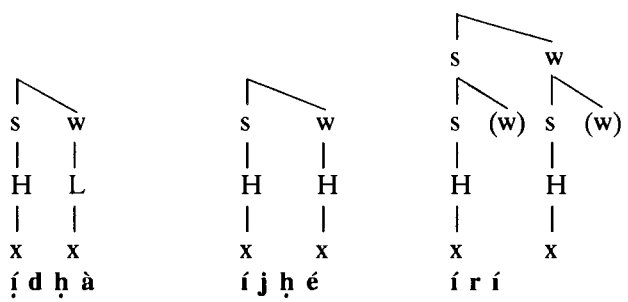
25 Auxes are stative (i.e. non-eventive) verbs, and like some stative main verbs they do not require the **-rV** suffix unless they denote past time.

possibility, which guarantees that the participle root has its own prosodic constituent, is that the participle prefix must bear L tone.

If the verb root of the participle is [$_s$ H], the prefix is L. If the prefix were H, it might be [$_w$ H] or [$_s$ H]. If the prefix were [$_w$ H], the OCP would merge its tone with that of the root, blocking prosodic government by the Aux as before. If the prefix were [$_s$ H], the OCP would also merge its tone with that of the root, blocking prosodic government by the Aux. The only remaining possibility, which guarantees that the participle root has its own prosodic constituent, is that the participle prefix must bear L tone.

The above reasoning is frankly speculative. If it is conceptually flawed, there is a phonological approach available in a system like Clark's (1989), which employs the mechanism of default H-tone insertion. However, a purely phonological approach can never explain why the phenomenon of tone polarity occurs just in a syntactically bound form. For the remaining forms in (52b), the H prefix directly licenses the lexical tone of the root, as in these infinitive forms, all of which satisfy (53) without further comment:

(58)



In sentence-final position, the phonetic effect of (53), as represented for 'to eat' in (54), is correctly predicted for 'to walk'. If, on the other hand, the infinitive is non-final, the pitch of the final syllable will remain downstepped H, for both 'to walk' and 'to eat'.

In the 3sg. negative indicative, a prefix H tone displaces the stem tone, which in turn surfaces on the suffix; this can be captured by any autosegmental analysis. As in other Kwa languages, this rightward tonal displacement is triggered by the clitic subject (cf. Amáyó 1981).

The three distinct tonal shapes of the gerunds in (52c) can be predicted if the reduplication process has a metrical formulation, viz: reduplication copies tonal material iff it is metrically strong; otherwise, the L tone of the prefix spreads onto the reduplicated syllable.

The lexical tonal classes in Ọ̀gbakịrị̀ are similar to those of Mbàisén; what differs are the individual verb affixes and the phonetic outputs. In

Ọ̀gbakịrị̀, the three classes are phonetically distinct in all contexts. Wórùkwó (1983) cites four forms of the infinitive: with null complement, with a bound verb complement that adds emphasis (hence the gloss 'really'), with a lexical complement (here the noun **wíri** 'food'), and with both kinds of complement.[26]

(59) Ọ̀gbakịrị̀

ékèé	'to divide'
ékèé ekèé	'to really divide'
ékèé wíri	'to divide food'
ékèé wíri èkeé	'to really divide food'
èsîì	'to boil'
èsí esîì	'to really boil'
èsí wíri	'to boil food'
èsí wíri esiì	'to really boil food'
èrí	'to eat'
èrí èrí	'to really eat'
èrí wíri	'to eat food'
èrí wíri eri	'to really eat food'

The behavior of these three tone classes follows from the same underlying forms posited for Mbàisén in (56) above, assuming a domain condition something like (61):

(60)

w	w	s	(ẇ)
|	|	|	
L	H	H	
|	|	|	
ke	**si**	**ri**	
'divide, allocate'	'boil (in a pot)'	'eat, consume'	

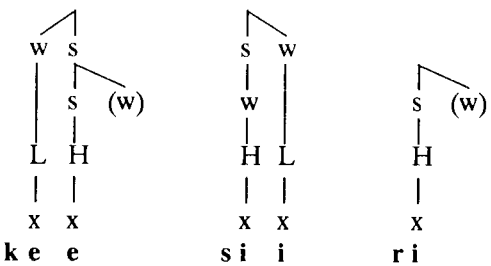
(61) *Minimal Base Parameter*
A derivational base prosodically governs its affixes: {on}, {off}

26 Any lexical complement must precede the bound verb complement if any. The same restriction holds in Mbàisén. Cf. Émènanjo (1975a, 1984); Nwáchukwu (1985, 1987); Íhiọ́nú (1989).

(61) requires that, in derived forms, the base contains a metrical governor. The 'eat' class of verbs, with an underlying [$_s$ H], satisfies (61) with no further comment. For the 'divide' class, with an underlying [$_w$ L], the minimal way to satisfy (61) is by suffixing a [$_s$ H], to which the root [$_w$ L] adjoins. The most interesting case is the 'boil' class, with its marked, underlying [$_w$ H]. The question is what additional structure will give a metrical governor.

If phonology respects structure preservation, there is no possibility of changing the tone or metrical strength of the root. This leaves two possibilities: suffix [$_s$ H] or [$_w$ L]. If [$_s$ H] is suffixed, the result is a sequence of [$_w$ H] [$_s$ H]. But this still does not satisfy (61), because this [$_s$ H] would not be adjacent to a prefix, and hence could not govern it. The other possibility is to suffix [$_w$ L]. Discussion of ɣomalá?-Yamba showed that [$_w$ L] is the only element which can be governed by [$_w$ H]. Accordingly, as metrical governor of [$_w$ L], [$_w$ H] can project a higher [s] position, satisfying (61). The lexical bases of the three tone classes are given in (62).

(62) *bases*



5. Prosodic typology

How does the prosodic typology of Benue-Kwa, as sketched above, relate to other languages? Before Bamba proposed that tone was sensitive to metrical structure, metrical formalism was restricted to the analysis of stress languages. In autosegmental theory, pitch accent languages like Japanese and some Benue-Congo languages were represented by means of accentual diacritics on tone melodies (cf. Haraguchi 1975; Clements and Goldsmith 1983).

There is a typological fact about metrical structure which suggests that Bamba is correct. Informally, "tone languages" seem to have one of two typological properties: either their basic syllable structure is CV (as in the Kwa languages), or their basic word structure is monosyllabic (as in Chinese). In a functional sense, this means that tone languages do

not "need" metrical structure to attach to syllabic constituents, either because all syllables have nonbranching rimes (i.e. are monomoraic) as in Kwa, or because all words are prosodically nonbranching (as in Chinese). In all these languages, metrical structure is "available" to attach to tones.

"Stress" languages, on the other hand, have both of the opposite properties: a wide variety of syllable types (e.g. CV, CVC, CVV, and possibly others) and polysyllabic words. In all these languages, that is, metrical structure is unavailable to attach to tones. But, as argued by Jibril (1984), there is no reason to suppose that "stress" languages lack tone features. It would be a strange world indeed if some human languages possessed phonological features (or elements) which were unknown in other human languages. It is more reasonable to suppose that "stress" languages have tone elements, but since these elements cannot attach to metrical structures, the result is what has been called intonation, i.e. "semantic" control of pitch. Conversely, it would be strange to think that "tone" languages were simply deprived of metrical structure. What would it mean to say that a speaker of a tone language did not "possess" metrical structure as part of her knowledge of language? How about those people who are bilingual in a "tone" language and a "stress" language?

The alternative to this conceptual nightmare is the position adopted by Kaye, Lowenstamm and Vergnaud (1985, 1987), among others, that there is a universal inventory of phonological elements, among which are numbered tones, and a universal "syntax" of these elements, including the principles underlying syllable structure and metrical structure. What differs from one language to another is not the inventory of these elements and principles, but the parameters which govern their interrelationship. Accordingly, I propose the following parameter to account for the difference between "stress" languages and "tone" languages, consistent with the metrical analysis of Benue-Kwa tone as presented in this chapter:

(63) *Prosodic Linking Parameter*
The units which project metrical structure [redacted] are:
{tones}, {rimes}

In the formulation of (63), the choice of "rimes" instead of "syllables" reflects the consensus that syllable onsets are metrically irrelevant.

Obviously, a parameter like (63) is only the beginning. A serious prosodic typology would have to account for the phenomena like pitch accent, stress timing vs. syllable timing etc. But the limitations of (63) should not obscure its basic claim: that phonological typology can be explanatory, i.e. cognitively based.

6. Prosody and syntax

> *Wherever notions like the foot or the phonological phrase are of interest in the formalization of phonological processes, they turn out either to be relationally defined or to coincide with syntactic structure.*
>
> — Giegerich (1985:10)

The above analyses of a range of nominal and verbal constructions in Yɔmalá-Yamba and Ìgbo lack the arbitrariness of earlier proposals. In my analyses, rules are eliminated, representations are constrained by universal principles, and language particular phenomena are captured in a small handful of parameters with independent empirical content. In implementing these cognitive goals, it has been necessary to make a number of proposals concerning the relationship between tonal and metrical elements. The role of metrical structure is central in determining tone association domain, and syntax is clearly relevant in this connection. In retrospect, it is not surprising that tonologists could not explain the "associative construction", since they had never proposed a syntax for the "associative marker".

In recognition of the syntactic nature of tone domains, I have called the metrical effects of syntax on tone association *prosodic.* Many rule-based accounts of tone languages also posit prosodic domains, but here Occam's rasor comes in. An analysis with both rules and prosody is less explanatory than one with just prosody.

At another remove, there is the question of where prosody comes from. Nespor and Vogel (1986) claim that prosodic domains are a form of representation *sui generis,* while Clark (1989) has argued that prosodic domains are none other than syntactic phrases. I agree with Clark on this point. Where I differ with Clark is in the nature of the relationship between tone and syntax: for her, syntax directly triggers the application of tone rules, whereas I have shown that many tone rules express–in a completely stipulatory way–the mediating effect of metrical structure, which has a principled basis. However, Clark and I agree that there is no need to construct a special, prosodic level of representation, in the manner of Nespor and Vogel, to account for tone association. Surveying metrical phonology in stress languages, Giegerich also reaches a negative conclusion regarding the existence of prosodic structure as an autonomous derivational level.

The strands of the overall argument converge in the phenomenon of prosodic cliticization (37) and in the kind of prosodic OCP effect in (49a). I have called the latter effect rhythmic in homage to Liberman and Prince; it requires a certain degree of prosodic contrast at a major constituent boundary. Since tone projects metrical structure, it is the metrical structure which adjusts. In both phenomena, it is necessary to state a direct relationship between syntax and metrical structure. Something would be lost in attributing prosodic effects like (37) and (49) to the mediation of a special prosodic constituent structure.

In postulating the *simultaneous* presence of different subtypes of the government relation (phrasal, metrical, tonal, syllabic...), phonology becomes an important source of syntactic information, just as syntax can be seen to condition phonological processes.

References

Abney, Steven P. 1987. "The English Noun Phrase in its Sentential Aspect. Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge.

Akinlabí, Akinbìyí. 1982. "The Phonological Nature of Yorùbá Tone." Paper presented at the 3rd Annual Conference of the Linguistic Association of Nigeria, Ilọrin.

———. 1985. "Tonal Underspecification and Yorùbá Tone." Ph.D. dissertation, University of Ìbàdàn.

Akinlabí, Akinbìyí and Yétúndé Lánírán. 1988. "Tone and Intonation of Declarative Sentences in Yorùbá." Paper presented to 19th Conference on African Linguistics, 15–17 November, Boston University.

Ámáyó, Áírẹ́n. 1976. "A Generative Phonology of Ẹdo (Bini)." Ph.D. dissertation, University of Ìbàdàn.

———. 1981. "Tone Rules and Derivational History in Ẹdo Phonology." *Kiabàrà* 4, 81–96.

Armstrong, Robert G. 1968. "Yala (Ikom): a 'Terraced-Level' Language with Three Tones." *Journal of West African Languages* 5, 49–58.

Awóbùlúyì, Ọládélé. 1964. "The Phonology and Morphophonemics of Yorùbá." Ph.D. dissertation, Columbia University.

Baker, Mark C. 1985. "Incorporation: a Theory of Grammatical Function Changing." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge. Published, Chicago: University of Chicago Press, 1988.

Baker, Mark. C., Kyle Johnson and Ian Roberts. 1989. "Passive Arguments Raised." *Linguistic Inquiry* 20, 219–51.

Bamba, Moussa. 1984. "Etudes phonologiques du Mahou." Master's thesis, Université du Québec à Montréal.

———. 1988. "A Theory of Tone-Accent Interaction: Evidence from Manding Languages." Ms., Université du Québec à Montréal.

———. 1989. "On Downstep in the Tonal System of Ojene Jula." In *Current Approaches to African Linguistics.* Vol. 7, edited by John Hutchison and Victor Manfredi, 1–14. Dordrecht: Foris Publications.

Bendor-Samuel, John T., editor. 1989. *The Niger-Congo Languages.* Lanham, Maryland: American Universities Press for Wycliffe Bible Translators/Summer Institute of Linguistics.

Borer, Hagit. 1983. "Parametric Syntax." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge. Published, Dordrecht: Foris Publications, 1984.

———. 1987. "Parallel Morphology." Paper presented at the Lexicon Project, MIT Center for Cognitive Science, Cambridge.
———. 1989. "The Syntax of Lexical Insertion." Paper presented at the Department of Linguistics, University of Massachusetts, Amherst, 31 March.
Capo, Hounkpati B.C. 1985. "Prelude to the Relationship between Gbè and Yoruboid, *Journal of the Linguistic Association of Nigeria* 3, 99–103.
Charette, Monik. 1988. "Some Constraints on Governing Relation in Phonology." Ph.D. dissertation, McGill University, Montreal.
———. 1990. "License to Govern." *Phonology* 7, 233–54.
Chomsky, Noam A. 1981. *Lectures on Government and Binding.* Dordrecht: Foris Publications.
Clark, Mary M. 1978. "A Dynamic Theory of Tone with Special Reference to the Tonal System of Ìgbo." Ph.D. dissertation, University of Massachusetts, Amherst. Distributed by the Indiana University Linguistics Club, Bloomington.
———. 1982. "On the Syntactic Distribution of the Associative Particle in Ìgbo: Implications for the Structure of the NP." Ms., University of New Hampshire, Durham.
———. 1989. *The Tonal System of Ìgbo.* Dordrecht: Foris Publications.
Clements, George N. 1979. "The Description of Terraced-Level Tone Languages." *Language* 55, 536–58.
———. 1981. "The Hierarchical Representation of Tone Features." *Harvard Studies in Phonology* 2, 50–108. Also in *Current Approaches to African Linguistics.* Vol. 1, edited by Ivan R. Dihoff, 145–76. Dordrecht: Foris Publications, 1983.
———. 1984. "Principles of Tone Assignment in Kikuyu." In *Autosegmental Studies in Bantu Tone*, edited by George N. Clements and John Goldsmith, 281–339. Dordrecht: Foris Publications.
Clements, George N. and Kevin Ford. 1978. "On the Phonological Status of Downstep in Kikuyu." In *Phonology in the 1980's*, edited by Didier L. Goyvaerts, 309–57. Ghent: Story-Scientia.
———. 1979. "Kikuyu Tone Shift and its Synchronic Consequences." *Linguistic Inquiry* 10, 179–210.
Courtenay, Karen. 1968. "A Generative Phonology of Yorùbá." Ph.D. dissertation, University of California, Los Angeles.
Éménanjọ, E.Nwánọ̀lúọ. 1971. "Aspects of the Phonology and Morphophonemics of Ọnịcha." Master's thesis, University of Ìbàdàn.
———. 1975a. "Aspects of the Ìgbo verb." In *Ìgbo Language and Culture*, edited by F.Chídòzíe Ọgbàlú and E.Nwánọ̀lúọ Éménanjọ, 160–73. Ìbàdàn: Oxford University Press.
———. 1975b. "The Ìgbo Verbal: a Descriptive Analysis." Master's thesis, University of Ìbàdàn.
———. 1978. *Elements of Modern Ìgbo Grammar.* Ìbàdàn: Oxford University Press.
———. 1981. "Auxiliaries in Ìgbo Syntax." Ph.D. dissertation, University of Ìbàdàn. [Distributed by the Indiana Univertsity Linguistics Club, Bloomington, 1984. Page references to this work are to the unpublished version.]
———. 1984. "Ìgbo Verbs: Transitivity or Complementation?." Paper presented at the 5th Annual Conference of the Linguistic Association of Nigeria, Nsúká, submitted to *Studies in African Linguistics.*
Fassi-Fehri, Abdelkader. 1987. "Generalized IP Structure, Case and VS word order." In *Actes du Premier Colloque International de la Société de Linguistique du Maroc*, 189–221.
Fromkin, Victoria. 1976. "A Note on Tone and the Abstractness Controversy." *Studies in African Linguistics.* Supplement 6, 47–62.
———. (ed.) 1978. *Tone: A Linguistic Aurvey.* New York: Academic Press.
Fujimura, Osamu. (ed.) 1974. *Three Dimensions of Linguistic Theory.* Tokyo: TEC.

Fukui, Naoki. 1986. "A Theory of Category Projection and its Application." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge.
Giegerich, Heinz J. 1985. *Metrical Phonology and Phonological Structure.* Cambridge: Cambridge University Press.
Goldsmith, John. 1976. "Autosegmental Phonology." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge. [Distributed by the Indiana University Linguistics Club, Bloomington. Published, New York: Garland, 1979.]
———. 1981a. "The Structures of Questions in Ìgbo." *Linguistic Analysis* 7, 367–93.
———. 1981b. "Complementizers and Root Sentences." *Linguistic Inquiry* 12, 541–74.
———. 1990. "The fallen angels." Ms., Department of Linguistics, University of Chicago.
Green, Margaret M. and G.Égembà Ìgwè. 1963. *A Descriptive Grammar of Ìgbo.* Berlin: Akademie.
Greenberg, Joseph H. 1963. *The Languages of Africa.* Bloomington: Indiana University Press.
Halle, Morris and Jean-Roger Vergnaud. 1982. "On the Framework of Autosegmental Phonology." In *The Structure of Phonological Representations*, edited by Harry van der Hulst and Norval Smith, 65–82. Also in *Proceedings of NELS 12*, edited by James Pustejovsky and Peter Sells, 97–115. Amherst, Mass.: GLSA.
Haraguchi, Shosuke. 1975. "The Tone Pattern of Japanese" Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge.
Hayes, Bruce. 1986. "Inalterability in CV Phonology." *Language* 62, 321–51.
Higginbotham, James. 1985. "On Semantics." *Linguistic Inquiry* 16, 547–93.
Huang, C.-T. James. 1980. "The Metrical Structure of Terraced-level tones." In *Proceedings of NELS 10*, 257–70. Amherts, Mass.: GLSA.
Hyman, Larry M. 1972. "A Phonological Study of Fe?fe? Bamiléké." Supplement 4 to *Studies in African Linguistics.*
———. 1976. "The Great Ìgbo Tone Shift." In *Proceedings of the Third Conference on African Linguistics*, edited by Erhard Voeltz, 111–25. Bloomington: Indiana University Press.
———. 1978. "Historical Tonology." In *Tone: a Linguistic Survey*, edited by Victoria Fromkin, 257–69.
———. 1985. "Word Domains and Downstep in Bamiléké-Dschang." *Phonology Yearbook* 2, 47–83.
Hyman, Larry M. and Russell Schuh. 1974. "Universals of Tone Rules: Evidence from West Africa." *Linguistic Inquiry* 5, 81–115.
Hyman, Larry M. and Maurice Tadadjeu. 1976. "Floating Tones in Mbam-Nkam." In *Studies in Bantu Tonology*, edited by Larry M. Hyman, 57–111. Southern California Occasional Papers in Linguistics 3. Los Angeles: University of Southern California.
Ihìọ́nú, P.Úzọ̀dínmá. 1988. "Tone and Specificity in Ìgbo." Paper presented to the Workshop on Tone, Accent and Locality in Niger-Congo, University of Massachusetts, Amherst, 14 November.
———. 1989. "The OV Syntax of Ìgbo." Paper Presented at the 3nd Niger-Congo Syntax and Semantics Workshop, Massachusetts Institute of Technology, Cambridge, 24 January.
Inkelas, Sharon, William Leben and Mark Cobler 1987. "The Phonology of Intonation in Hausa." In *Proceedings of NELS 18*, edited by James Blevins and Juli Carter, 327–42. Amherst, Mass.: GLSA.
Kamany, Honoré. 1988. "La structure syllabique du bamiléké." Master's thesis, Université du Québec à Montréal.
Kaye, Jonathan D. 1987. "Is There a Projection Principle in Phonology?" Paper presented at the 18th Conference on African Linguistics, Université du Québec à Montréal.
———. 1989. *Phonology: a Cognitive View.* Hillsdale (New Jersey): Lawrence Erlbaum.
Kaye, Jonathan D., Jean Lowenstamm and Jean-Roger Vergnaud. 1985. "The Internal Structure of Phonological Elements: a Theory of Charm and Government." *Phonology Yearbook* 2, 305–28.

Kaye, Jonathan D., Jean Lowenstamm and Jean-Roger Vergnaud. 1987. "Constituent Structure and Government in Phonology." *Phonology* 7, 193–232.
Kayne, Richard. 1984. *Connectedness and Binary Branching.* Dordrecht: Foris Publications.
Kiparsky, Paul V. 1974. "Phonological Representations." In *Three dimensions of Linguistic Theory*, edited by Osamu Fujimura, 5–86. Tokyo: TEC.
Koster, Jan. 1986. *Domains and Dynasties.* Dordrecht: Foris Publications.
Lánfran, Yétúndé. 1991. "Intonation in Tone Languages: the Yorùbá Example." Ph.D. dissertation, Cornell University, Ithaka, NY.
Leben, William R. 1973. "Suprasegmental Phonology." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge. Published, New York: Garland Press.
Lieber, Rochelle. 1980. "On the Organization of the Lexicon." Ph.D. dissertation, Massachusetts Institue of Technology, Cambridge. [Distributed by the Indiana University Linguistics Club, Bloomington.]
Liberman, Mark Y. and Allan Prince. 1977. "On Stress and Linguistic Rhythm." *Linguistic Inquiry* 8, 249–336.
———. 1981. "Morphological Conversion within a Restrictive Theory of the Lexicon." In *The Scope of Lexical Rules*, edited by Teun Hoekstra, Harry van der Hulst, and Michael Moortgat, 161–200. Dordrecht: Foris Publications.
Manfredi, Victor. 1979. "Morphologization of Downstep in Ìgbo Dialects." Bachelor's thesis, Harvard University.
———. 1983a. "Surface Generalizations about Ìgbo Tone-bearing Units: Towards a Restriction on the Concept 'Tone Rule'." Paper presented at the 14th Conference on African Linguistics, Madison.
———. 1983b. "Èdo High-spreading and Ìgbo Downstep in Light of Each Other." Paper presented at the 4th Conference of the Linguistic Association of Nigeria, Benin-City.
———. 1984. "Abstractess and Ìgbo Verb Tọne." Paper presented at the 5th Conference of the Linguistic Association of Nigeria, Nsụkà
———. 1987. "Antilogophoricity as Domain Extension in Ìgbo and Yorùbá." In *Niger-Congo Syntax and Semantics*. Vol. 1, edited by Victor Manfredi, 97–117. Privately Published.
Meier, Paul, Ingé Meier and John Bendor-Samuel. 1975. *A Grammar of Izii, an Ìgbo Language*. Normal, Okla.: Summer Institute of Linguistics/Wycliffe Bible Translators.
Nespor, Marina and Irene Vogel. 1986. *Prosodic Phonology.* Dordrecht: Foris Publications.
Nikiema, Emmanuel. 1988. "Onset-to-rime Government." Ms., Université du Québec à Montréal.
Nwáchukwu, P.Ákụjuobì. 1966. "The Verb System of Èzínàíhìte West Dialect of Mbàisén in weré." Long Essay, University of Ìbàdàn.
———. 1976a. "Noun Phrase Sentential Complementation in Ìgbo." Ph.D. dissertation, University of London.
———. 1976b. "Stativity, Ergativity and the **-rV** Suffixes in Ìgbo." *African Languages/ Langues africaines* 2, 119–42.
———. 1983. "Towards a Classification of Ìgbo verbs." In *Readings on the Igbo Verb*. Pilot edition, edited by P.Ákụjuobì. Nwáchukwu, 17–42. Ọnịcha: Africana-Far Eastern Publishers, for the Ìgbo Language Association.
———. 1985. "Inherent Complement Verbs in Ìgbo." *Journal of the Linguistic Association of Nigeria* 3, 61–74.
———. 1987. *The Argument Structure of Ìgbo Verbs*. Lexicon Project Working Papers 18. Cambridge: MIT Center for Cognitive Science.
Odden, David. 1982. "Tonal Phenomena in Kishambaa." *Studies in African Linguistics* 13, 177–208.
———. 1986. "On the Role of the Obligatory Contour Principle in Phonological Theory." *Language* 62, 353–83.
Oyèlárán, Olásopé O. 1970. "A Phonology of Yorùbá." Ph.D. dissertation, Stanford University.

Prunet, Jean-François. 1986. "Spreading and Locality Domains in Phonology." Ph.D. dissertation, McGill University, Montreal.
Pulleyblank, Douglas. 1983. "Tone in Lexical Phonology." Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge. Published, Dordrecht: Reidel.
Ritter, Betsy. 1988. "A Head Movement Approach to Construct State Noun Phrases." *Linguistics* 26, 909–29.
Roberts, Ian. 1985. "Agreement Parameters and the Development of English Modal Auxiliaries." *Natural Language and Linguistic Theory* 3, 21–58.
Schachter, Paul. 1969. "Natural Assimilation Rules in Akan." *International Journal of American Linguistics* 35, 342–55.
Schachter, Paul and Victoria Fromkin. 1968. *A Phonology of Akan.* Working Papers in Phonetics 9. University of California, Los Angeles.
Schadeberg, Thilo C. 1986. "The Lexicostatistic Base of Bennett and Sterk's Reclassification of Niger-Congo with Particular Reference to the Cohesion of Bantu." *Studies in African Linguistics* 17, 69–83.
Stewart, John M. 1965. "The Typology of the Twi Tone System." Preprint from the *Bulletin of the Institute of African Studies (Legon),* 1, 1–27.
———. 1971. "Niger-Congo: Kwa." In *Current Trends in Linguistics*. Vol. 7, *Linguistics in Sub-Saharan Africa*, edited by Thomas Sebeok, 179–212. The Hague: Mouton.
———. 1981. "Key Lowering (Downstep/Downglide) in Dschang." *Journal of African Languages and Linguistics* 3, 113–38.
———. 1983. "Downstep and Floating Low Tones in Adiukru." *Journal of African Languages and Linguistics* 5, 57–78.
Swift, Lloyd B., A. Áhághotù and E. Ùgójị [Ugorji]. 1962. *Ìgbo Basic Course.* Washington: Foreign Service Institute.
Tadadjeu, Maurice. 1974. "Floating tones, shifting rules and downstep in Dschang Bamiléké." In Supplement 5 to *Studies in African Linguistics* 283–90.
Travis, Lisa. 1988. *The Syntax of Adverbs*. McGill Working Papers in Linguistics Special issue on Comparative Germanic Syntax, edited by Denise Fekete and Zofia Laubitz, 280–310. McGill University, Montreal.
Ụwaláàka, Marry A.-A. 1982. "Igbo 'Consecutivization' Revisited." *Journal of the Linguistic Association of Nigeria* 1, 63–72.
Voorhoeve, Jan. 1971. *Tone Systems: the Theme Underlying the Variations* [trans. by F. Heny]. Leiden: Brill.
Voorhoeve, J., A.E. Meussen and K.F. de Blois. 1969. "New Proposals for the Description of the Ìgbo Completive Phrase." *Journal of West African Languages* 6, 79–84.
Welmers, William. E. 1963. "Associative **a** and **ka** in Niger-Congo." *Language* 39, 432–47.
———. 1970 "Ìgbo Tonology." *Studies in African Linguistics* 1, 255–78. [Reprinted in William E. Welmers. *African Language Structures*. Berkeley: University of California Press, 1973.]
Welmers, William. E. and Beatrice F. Welmers. 1968. *Ìgbo: a Learner's Manual.* Los Angeles: University of California at Los Angeles.
Williams, Edwin S. 1976. "Underlying Tone in Margi and Ìgbo." Linguistic Inquiry 7, 462–84.
Williamson, Kay R.M. 1970. "Some Alternative Proposals for the Ìgbo Completive Phrase." *Research Notes* (Ìbàdàn) 3, 83–90.
———. 1984. "Introduction." In *Ìgbo-English Dictionary* [2nd edition]. Benin City: Ethiope.
———. 1986. "The Ìgbo Associative and Specific Constructions." In *The Phonological representation of Suprasegmentals*, edited by Koen Bogers, Harry van der Hulst and Maarten Mous, 195–208. Dordrecht: Foris Publications.
———. 1989. "Niger-Congo Overview." In *The Niger-Congo Languages*, edited by John T. Bendor-Samuel, 3–45. Lanham, Maryland: American Universities Press for Wycliff Bible Translators and the Summer Institute of Linguistics.

Winston, Denis. 1973. "Polarity, Mood and Aspect in Ọhụ́hụn Ìgbo Verbs." *African Language Studies* 14, 119–78.
Wórùkwó, Glory. 1983. "The Verbal System of Ìkwẹ́rẹ." Bachelor's thesis, University of Port Harcourt.

Dschang and Ebrie as Akan-type Total Downstep Languages

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1. INTRODUCTION*

Meeussen (1970:270) coined the term "total downstep" some twenty years ago: "There seems to be a phenomenon which could be called 'total downstep', in which a high is not lowered just a little, but all the way to the next lower register." In this paper I distinguish between overt total downstep languages, which are immediately recognizable as such by Meeussen's criterion, and covert total downstep languages such as Akan, which Meeussen does not recognize as total downstep languages but which meet his criterion as soon as they are treated as having automatic downstep in the context [H_L] rather than in the context [L_H]: in the overt total downstep languages the [H!H] drop is patently the same size as the [HL] drop, but in languages such as Akan there is no [HL] drop as [H!L] occurs to the exclusion of [HL], and the [H!L] drop is, as one would expect, twice the size of the [H!H] drop.

Today's best-known and best-documented example of an overt total downstep language, and the one with which I shall be mainly concerned here, is Kikuyu, which Meeussen does not mention: recognition of downstep in Kikuyu came only with the work of Ford in the early 1970s, and the present pre-eminence of Kikuyu on the tonological scene only with Ford's subsequent collaboration with Clements. For references, and more on the history of Kikuyu tonology, see Clements (1984:281–2).

Clements (1983:166–7) endorses Meeussen's "total downstep", and goes on to posit a major typological division between "total" downstep languages such as Kikuyu and "partial" downstep languages such as Igbo and Akan: "The essential characteristic of languages with 'total' downstep is that pitch contours are much more narrowly specified than in 'partial' downstep systems. In particular, an adequate theory of 'total' downstep must account for the fact that all other factors being equal, there is *never* a systematic pitch difference between the sequences H-L and H-!H,

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