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Professor Akinbiyi Akinlabi

A toneless theory of 2-and-a-half tonemes in Gbè

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ABSTRACT: Akinlabi (1985) pioneered a path away from treating tones as primes of natural language. By reanalyzing surface **M** as "underlyingly toneless" he trimmed the synchronic inventory of Yorùbá from ternary **H.M.L** to binary **H.L**, tuning up Galilean elegance, toning down exotic typology, capturing synchronic generalizations and clarifying diachronic developments (cf. Bámgbosé 1965, Oyèlárán 1970, Maddieson 1974a, Stahlke 1974). Further progress of tonal underspecification was stalled by technical blips of derivational rules and output filters (Pulleyblank 1983; 2004) but the proposal was vindicated belatedly, when top tonologists came to reject "universal tone features" in favor of "monodimensional... scales... interpreted in the phonetics" (Clements & al. 2010, 20, cf. Hyman 2010). The prospect of obtaining tones without tonology flows from the conjunction of two well-supported, independent hypotheses. (i) Underlying pitch-accent (McCawley 1970) opens the possibility that "metrical structures alone would be sufficient for pitch interpretation" (Clements 1990, 61, cf. Clements & Ford 1979, 198) and permits "a non-tonal analysis of tonal mapping" (Köhnlein 2016, cf. Clark 1978, Bamba 1991, Manfredi 1995, Idsardi & Purnell 1997, Akinlabi & Liberman 2001, Kimenyi 2002, Dilley 2005). (ii) Cyclic spellout at PF entails default constituent prominence alias "nuclear stress" (Chomsky & Halle 1968, Bresnan 1971, Cinque 1993, Kahnemuyipour 2004, Zwart 2004, Wagner 2005, Zubizarreta & Vergnaud 2006, Sato 2009), allowing morphosyntactic, "floating" tones to be demystified as phrasal accents (Manfredi 2008, 2018, *in press*). The Gbè M~L alternation falls out neatly. In Gbè, iambic [w s] footing is diagnosed from the systematic absence of trochaic [s w] cues like nonautomatic downstep and initial L raising (Manfredi 2003), by a Westafrican (quantity insensitive) version of the iambic-trochaic law that holds in languages with moraic (quantity sensitive) stress (Allen 1975, 78, Hayes 1985, 438, Ramus & al. 1999). Foot-initial w, denoting a sternohyoid laryngeal gesture, maps to the CV skeleton at the "beginning of the word" i.e. the DP phase (Lowenstamm 1999, Scheer 2012) where it's checked by a sonorant onset if any and otherwise governs the initial vowel if any plus the following rime in case the onset is a voiced obstruent—inherently transparent to sternohyoid articulation. When mapped to a vowel, the same gesture yields low perceived pitch/F₀ (Halle & Stevens 1971, Nissenbaum & al. 2002). The distribution of audible **H** is much simpler: lexically prelinked s denotes a cricothyroid gesture and yields a high F₀ correlate. In this way, Gbè's core tonal data (Ansre 1961, Stahlke 1971) reduce to automatic c-language performance, without rule-based reference to taxonomic tones.

Typo corrected in .pdf: "sternohyroid" > *sternohyoid* (thrice)

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A Toneless Theory of 2-and-a-Half Tonemes in Gbè*

Victor Manfredi

Abstract Akinlabi (1985) pioneered a path away from treating tones as primes of natural language. By reanalyzing surface **M** as “underlyingly toneless” he trimmed the synchronic inventory of Yorùbá from ternary **H,M,L** to binary **H,L**, tuning up Galilean elegance, toning down exotic typology, capturing synchronic generalizations and clarifying diachronic developments (cf. Bámgbósé 1965, Oyèláràn 1970, Maddieson 1974a, Stahlke 1974). Further progress of tonal underspecification was stalled by technical blips of derivational rules and output filters (Pulleyblank 1983; 2004) but the proposal was vindicated belatedly, when top tonologists came to reject “universal tone features” in favor of “monodimensional... scales... interpreted in the phonetics” (Clements & al. 2010, 20, cf. Hyman 2010). The prospect of obtaining tones without tonology flows from the conjunction of two well-supported, independent hypotheses. (i) Underlying pitch-accent (McCawley 1970) opens the possibility that “metrical structures alone would be sufficient for pitch interpretation” (Clements 1990, 61, cf. Clements & Ford 1979, 198) and permits “a non-tonal analysis of tonal mapping” (Köhnlein 2016, cf. Clark 1978, Bamba 1991, Manfredi 1995, Idsardi & Purnell 1997, Akinlabi & Liberman 2001, Kimenyi 2002, Dilley 2005). (ii) Cyclic spellout at PF entails default constituent prominence alias “nuclear stress” (Chomsky & Halle 1968, Bresnan 1971, Cinque 1993, Kahnemuyipour 2004, Zwart 2004, Wagner 2005, Zubizarreta & Vergnaud 2006, Sato 2009), allowing morphosyntactic, “floating” tones to be demystified as phrasal accents (Manfredi 2008, 2018, *in press*). The Gbè **M~L** alternation falls out neatly. In Gbè, iambic [*vs*] footing is diagnosed from the systematic absence of trochaic [*sw*] cues like nonautomatic downstep and initial **L** raising (Manfredi 2003), by a Westafrican (quantity insensitive) version of the iambic-trochaic law that holds in languages with moraic (quantity sensitive) stress (Allen 1975, 78, Hayes 1985, 438, Ramus & al. 1999). Foot-initial *w*, denoting a sternohyoid laryngeal gesture, maps to the CV skeleton at the “beginning of the word” i.e. the DP phase (Lowenstamm 1999, Scheer 2012) where it’s checked by a sonorant onset if any and otherwise governs the initial vowel if any plus the following rime in case the onset is a voiced obstruent—inherently transparent to sternohyoid articulation. When mapped to a vowel, the same gesture yields low perceived pitch/ F_0 (Halle & Stevens 1971, Nissenbaum & al. 2002). The distribution of audible **H** is much simpler: lexically prelinked *s* denotes a cricothyroid gesture and yields a high F_0 correlate. In this way, Gbè’s core tonal data (Ansre 1961, Stahlke 1971) reduce to automatic e-language performance, without rule-based reference to taxonomic tones.

1. Destroying the tone in order to save it

[O]ne group of language learners in Africa asked a trained linguist to come and try to “get rid of tone” in the local language. (Welmers 1973, 77)

In its half century of existence, phonemic tone notation has missed many chances to upgrade from raw data to descriptive adequacy. In Yorùbá, to capture distributional asymmetries with respect to **H** and **L** (Bámgbósé 1965, Oyèláràn 1970), Akinlabi (1985) proposed to eliminate the **M** toneme, but tonal underspecification fell out of mainstream favor due to technical glitches: it blurs autosegmental geometry and needs *ad hoc* scales of markedness in order to be emulated by output filter procedures (Pulleyblank 1983, 142; 2004, 417f.). Full specification fares no better: early hopes to find Greenbergian “universals of tone rules” (Hyman & Schuh 1974) crashed on the fact that “observed patterns of [tone] alternation... are typically random and arbitrary” (Clements & al. 2010, 20). In sum, specified tones are both too abstract, and at the same time not abstract enough, to express linguistically significant generalizations.

How did tonology get bogged down in this quagmire?¹ Minimal lexical contrasts of perceived pitch (F_0), first notated in colonial research (Jones & Woo 1912, Jones & Plaatje 1916), were codified as “tonemes” by a mid-century middle-American behaviorist who trained an anticommunist missionary brigade (Pike 1948, cf. Calvet 1981). Retooled as generative “autosegments” (Goldsmith 1976) in Building 20, MIT’s “magical incubator” of Cold War spinoffs (Penfield 1997), tonemes should have been summarily dismissed by the critique of inductive discovery procedures (Halle 1959, Chomsky 1964). Instead, the more coherent alternative of pitch accent (McCawley 1965, 1970, 1978, Clark 1978) was shunned beyond the pale (Clements & Goldsmith 1980, Poser 1984, Hyman 2009), conveniently enough, avoiding arduous reanalysis of decades worth of impressionistic tonal data compiled by legions of semiamateur Bible scribes (cf. Williamson 2002, Epps & Ladley 2009). To further compound the formal inconsistencies, tones and accents were blended together nonrestrictively, whether in ToBI transcription (Pierrehumbert 1980, Goldsmith 1978, Breen & al. 2012) recapping Pike (1945) or in the parallel representational tiers of “laboratory phonology” (Clements 1990, Ladd 1996).

But the toneme has worse faults than nontrivial redundancy (Dilley 2005). Belying rapid coverage of the nonwestern world, better studied languages yielded diminishing returns. In Japanese, “sparse tone” needs nonlinear, “context-dependent” interpolation (Pierrehumbert & Beckman 1988, 34, 52f., cf. Haraguchi 1988, 134-38, Akinlabi & Liberman 2001, 16f.). In Kinande-Luyiira, binary **H/L** contrasts of nominal roots are unrecoverable without invoking ‘global’ rules, diacritic ternary **H/L/Ø** oppositions or

indeed both at once (Hyman & Valinande 1985, Mutaka & al. 2008, Jones 2014). In Gbè, the semi-complementarity of **M** and **L** has spawned an inconclusive literature (Welmers & Ansre 1960, Ansre 1961, Rouget 1963, Sprigge 1967, Smith 1968, Stahlke 1971, Hyman 1973, Clements 1977, 1978, Fréchet 1994). Reviewing assorted quandaries of this kind, Clements & al. reluctantly abandon “universal tone features” in favor of “monodimensional... scales... interpreted in the phonetics” (2010, 20*f.*, citing Láníran & Clements 2003, cf. Hyman 2010). Repeating the history of the Vietnam War, tonal phonologists are obliged ‘to destroy the town [sc. tone] in order to save it’ (cf. Arnett 1968) and then withdraw, declaring *Peace with Honor*.²

Tonology’s unceremonious retreat invites a less adventurist approach from firmer premises like the following. (i) In languages that lack moraic contrasts of syllable weight, metrical features are available to encode pitch contrasts by lexical prelinking (Haraguchi 1988, Manfredi 1991, 93, Pöchtrager 2006, Köhnlein 2016). The device of underlying foot structure adds no cost, assuming that lexical ‘words’ are not X^0 atoms (heads) but contain branching phrasal constituents (Kaye 1988, Hale & Keyser 1993). (ii) Nonlexical pitch excursions, traditionally blamed on ghostly interventions by morphosyntactic ‘floating’ tones, straightforwardly default PF prominence assigned by cyclic spellout under derivation-by-phase (Chomsky 2001, cf. Chomsky & Halle 1968, Bresnan 1971, Cinque 1993, Zwart 2004, Kahnemuyipour 2004, Wagner 2005, Zubizarreta & Vergnaud 2006, Sato 2009, Richards 2010). The only objection to such a procedure is a methodological ban on audible syntactic boundaries (Selkirk 1984, Nespor & Vogel 1976), a “fatalistic and slightly empty” taboo “inherited from American structuralism” (Rotenberg 1974, 16, 73, cf. Scheer 2012). Analyses of Gbè, with tones (§2) and without (§3), can now be compared.

2. Tones in the Saussurean gulf

In Vietnamese and nearby languages, minimal lexical F_0 contrasts emerged from historic differences in consonant phonation (Haudricourt 1954, Matisoff 1973), and similar effects hold synchronically in Korean (Kim & Duanmu 2004). Some of these patterns may reduce to shared laryngeal gestures (Halle & Stevens 1971, 208*f.*, Kaye & al. 1990, 216, Cyran 2014, 9*f.*), but **M**~**L** alternations of the Gbè cluster of Benue-Kwa (Niger-Congo) go further to implicate categorial structures of morphosyntax.³

In Pecígè, a NW Èwè variety (Ansre 1961, cf. Westermann 1930, Capo 1991), a nominal stem takes either **L** or **LH** (a lexical choice) if the onset is a voiced obstruent, otherwise **M** or **H**. The initial vowel if any (another lexical choice) is always *a-* and its F_0 is similarly predictable: **M** before a sonorant, otherwise **L**, never **H**.⁴

	voiced obstruent onset	voiceless obstruent onset	sonorant onset
(1)a.	gà lá ‘the metal/money’ à-gò lá ‘the palm-tree/-fruit’	te lá ‘the yam’ à-si lá ‘the market’	nyi lá ‘the cow’ a-wu lá ‘the dress’
b.	vii ‘child’ à-vùù ‘dog’	fyá ‘axe’ à-ti ‘tree’	ɲɔ ‘worm’ a-nyi ‘bee’

Stahlke (1971) observes that three subcases of the **M**~**L** alternation converge on one syntactic slot. (i) The **L** that follows a stem-initial voiced obstruent is absent stem-internally, whether the nominal is opaque or transparently compounded:⁵

(2)	átádí ‘pepper’ *átádii	àdè-vú ‘hunting dog’ *àdè-vùù	nú-flè-ga ‘shopping money’ *nú-flè-gà
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(ii) A transitive non-**H** verbroot is pronounced **M** iff the direct object’s first onset is a sonorant, otherwise **L**, (3a). (iii) A pitch drop occurs between a transitive **H**-bearing verbroot and a consonant-initial direct object unless the onset is a voiced obstruent, falling to the same **M** or **L** that would begin a vowel-initial counterpart, (3b).⁶

(3)a.	flè gà lá ‘bought the metal’ flè à-gò ‘bought coconuts’	flè te lá ‘bought the yam’ flè fyá ‘bought an axe’	flè nyi lá ‘bought the cow’ flè a-wu lá ‘bought the dress’
b.	kpó gà lá ‘saw the metal’ kpó vii ‘saw a child’ kpó à-gò ‘saw coconuts’	kpó-ò te lá ‘saw the yam’ kpó-ò fyá ‘saw an axe’ kpó à-ti ‘saw a tree’	kpó-ò nyi lá ‘saw the cow’ kpó-ò ɲɔ ‘saw a worm’ kpó a-nyi ‘saw a bee’

Unifying these contexts, Stahlke posits a segmentally null (floating) **L** to the left of a consonant-initial nominal, triggering the same phonation rules that apply with an initial vowel. But what are these rules and why do they care about this position? A tonal framework necessarily assumes that phonation and tones can be distinguished analytically/*on a priori* grounds:

[C]onsonants affect tone but tone does not affect consonants. Thus...
consonants interfere with natural tonal assimilations.

(Hyman 1973, 171, emphasis original)

[C]onsonants interfere with natural tone rules...

(Hyman & Schuh 1974, 106).

If this claim is not circular, it’s a promise to demonstrate the existence of tone rules independent of phonation. But if such evidence is not eventually forthcoming, the only remaining possibility within the reach of standard generative phonology is to conclude that “tone behaves like a segmental feature” (Leben 1973, 126).

Currently however the choices look different. For “OT”⁷, formerly phonological distinctions dissolve in the welter of e-language output, a big-data manifold that “integrates linguistic change with phonetics, phonological

theory and sociolinguistics, resolutely rejecting even the least vestige of any Saussur[e]an gulf between them” (Kiparsky 2016, 464).

By contrast, an i-language perspective gives abstract analyses like Saussure’s (1879) decomposition of Indo-European ablaut into schwa plus a laryngeal on-/off-glide.⁸ The conceptual distance from Jakobsonian features is illustrated by Verner’s Law, a rule of Proto-Germanic that blocked voicing of an inherited voiceless spirant after an accented vowel.⁹ Generative phonology can express this as coarticulation, spreading a laryngeal feature from a vowel to a following continuant (Calabrese & Halle 1998, 59*f.*, Iverson & Salmons 2003).¹⁰ Treated as assimilation, Verner joins other apparent counterexamples to Hyman’s claim that “tone does not affect consonants” (cf. Maddieson 1974b, Poser 1981) but the progress is pyrrhic, because if tone-voicing causality is truly bidirectional *contra* Hyman, then the autonomy of tone *vis-a-vis* phonation is undermined. Instead, the Saussurean/i-language take on Verner denies that any assimilation is involved and instead treats intervocalic voicing as lenition:

The segmental properties do not play any role because the triggering factor is purely positional... It is therefore inconsistent to say that a process is an instance of lenition but in fact involves the transmission of some property from an item to another. (Scheer 2015, 228)

Then the crux of the matter is how to define “position” – the lenition context. If tones are phonemes not positions their relevance to Verner is less than clear, but if tones are positions they’re not paradigmatic phonemes, and tonology is out of business.

Handling tones as autonomous phonological units, Hyman infers a “tendency of **L-H** to become **M-H**” (1973, 168) but notices that this “natural rule” of “vertical tonal assimilation” is blocked in Gbè either by a preceding voiced obstruent, cf. *dà lá* (1a), or by an intervening nonsonorant regardless of voice, cf. *à-tí* (1b). In general:

L becomes **M** before a **H** if 1) any intervening consonant is a sonorant, and 2) the **L** syllable does not begin with a voiced obstruent. If there is no intervening consonant, i.e. there is an underlying **LH** (rising tone) sequence in the same syllable, this **LH** is modified to a **MH** rise unless the syllable which it is in begins with a voiced obstruent...

(Hyman 1973, 170)

The proximity of this rule—scarcely shorter than the paradigms to be explained—matches, point for point, an intricately stated mechanism of laryngeal interference:

[B]oth voiceless and voiced obstruents exert a lowering influence on preceding vowels... [whereas] voiceless obstruents have a raising effect

and voiced obstruents a lowering effect on the F₀ of following vowels.
(1973, 169, original italics)

For all its richness, the foregoing formula must be supplemented by “a rule of **L**-spreading that depends on consonant type” to ensure that *à-vùú* ‘dog’ contrasts prosodically with *à-tí* ‘tree’ (1b), and the new sub-domain must exclude sonorants, because the assumed underlying form of ‘bee’ is **à-nyí* sonorants like *ny* are normally a permissive context for “natural horizontal assimilation” (1973, 165*f.*).¹¹ But to add the anti-sonorant restriction guaranteeing the opaque outcome *a-nyí* (1b), application of horizontal **L**-spreading must be bled by vertical **L-H** raising: “tone spreading applies only to a *phonetic L-H* sequence” (1973, 172, original italics). And if this condition is not theory-internal (circular), it can only be justified on grammar-external grounds:¹²

Thus in Standard Èwè, tone spreading applies only to a *phonetic*... **L-H** sequence. It *has not yet reached* phonetic **M-H** sequences.
(1973, 170, second italics added)

Reducing extrinsic order to an uncompleted grammaticalization cline predicts that the opaque rule interaction will wither away someday, because “Bleeding order tends to be minimized” (Kiparsky 1968, 199). But even if this Godot does eventually arrive, the mystery will persist why both of the “natural” tone rules (**L**-spreading, **L-H** raising) should be restricted to a grammatical (non-“natural”) context—the same context that hosts an otherwise unmotivated pitch drop (3b). Nor does the treatment of **L**-raising as assimilation address the regular stem-medial appearance of **M** instead of **L** in compounds like *nú-fle-ga* (2), an environment with no raising trigger at hand. And the stem-medial absence of a supposedly natural phonation effect can’t be brushed off as a local quirk of Gbè, because the same synchronic limitation also holds in far-flung Tibetan, Korean and Wu Chinese (Duanmu 1992, Kim & Duanmu 2004, 62, 89).

In sum, saving the toneme by dumping the competence/performance distinction into Kiparsky’s “Saussurean gulf” doesn’t make any of these problems disappear. The remaining possibility is to throw the tonal baggage overboard instead. Consider how.

3. The remaining possibility

What matters seems to be... whether the tone is ‘level’, ‘above-level’ or ‘below-level’.
(Siertsema 1958, 583)

No low tone: L is not present in Yorùbá nuclei; what has hitherto been considered as the perception of [L] is in fact the perception of a prosodic constituent.
(Harrison 2000, 595)

In Hyman's account of Gbè consonant-tone effects reprised above, the extrinsic ordering of vertical before horizontal tone assimilation contradicts a declared doctrine of his own contemporaneous handbook:

In a stress language prominence is *syntagmatic*; in a tone language prominence is *paradigmatic*. (1975, 229, italics original)

Taken at face value, a syntagmatic rule like Hyman's "horizontal assimilation" should refer to non-tonal entities, such as Akinlabí & Liberman's (2001) "tonal complexes" which ascribe branching structure to both **H** and **L** to rescue Yorùbá's underspecified **M** from Pulleyblank's methodological critiques.¹³ Similar results can be had from less extraordinary metrical formats: headed trees (Liberman 1975, 49, Giegerich 1985, 3) alias "register tones" (Clements 1981), bracketed projections of the timing skeleton (Halle & Vergnaud 1987, Idsardi 1992) or "flat/lateral" CVCV strings respecting "interconstituent government" (Kaye & al. 1990, 210, Scheer 2004, 2013).¹⁴

Without some independent support, foot structure by any other name would be little more than a *pēs (deus) ex māchinā* descending to save tonology from itself. Fortunately, however, motivation is at hand. The following sample of West African languages divides by a cluster of cues diagnosing a [s w] trochaic type, with iambic [w s] as the unmarked default.

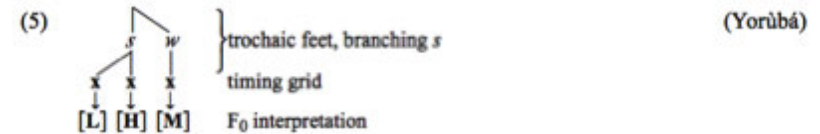
	Àkan ¹⁵	Hausa ¹⁶	Gbè ¹⁷	Yorùbá ¹⁸	Èdó ¹⁹	Ìgbo ²⁰
(4)a. automatic raising of phrase-initial L				+	+	+
b. automatic H -spreading onto L				+	+	(+)
c. some downsteps unrecoverable to latent L				(+)	+	+

The respective clustering of trochaic properties of primary language data, as compiled in (4), can be compared to the bootstrappable correlates of the so-called iambic-trochaic law in languages which—unlike Benue-Kwa—pronounce moraic (quantity sensitive) stress (Allen 1975, 78, Hayes 1985, 438, Ramus & al. 1999).²¹

As illustrated in the Appendix, initial **L** is much nearer in pitch to the following **H** in Èdó and Ìgbo than it is in Àkan, Hausa, Gbè or Yorùbá (4a).²² Yorùbá fails (4a) for independent reasons noted below, but trochaic footing of Yorùbá is still required by the cue of automatic **H**-spread (4b) assuming that "spreading does not cross metrical constituents" [sc feet] (Manfredi 1991, 71), treating **L** as a foot-initial adjunct, cf. (5). Yorùbá presents a second trochaic cue (4c) with cases of unrecoverably elided **L**.²³ (4c) rests on two premises: (i) tone terracing (alias ±automatic downstep) is a right-branching cascade (Manfredi 1979, Huang 1980, Clements 1981) and (ii) in a head/complement structure, the head is obligatory, the non-head optional. For iambic feet, a downstep caused by an empty [w] between two [s]

terminals would be anti-cyclic (Liberman 1975, 200), hence it follows as a theorem that only trochaic feet can encode underived downsteps.

Granting Yorùbá as trochaic, there are multiple reasons not to analyze Yorùbá **L** as metrically weak: not only does it spread to a local **H** (Ward 1952, 54) as noted above, it also replaces **M** in vowel elision (Bánṡgbósé 1965, 23) and raises a locally preceding **H** (Lání.ran 1992, 176f.). Given strong **H** and weak **M** and constrained to binary feet, the only solution for strong **L** is left-adjunction to the head of the foot:



The template in (5) fits two additional facts that lie beyond the reach of tonal analysis: the pitch excursion for **LH** is steeper than for **HL** (Manfredi 1995, 175) and stranded **L** systematically fails to parse before a complement phrase (Déchaine 2001).

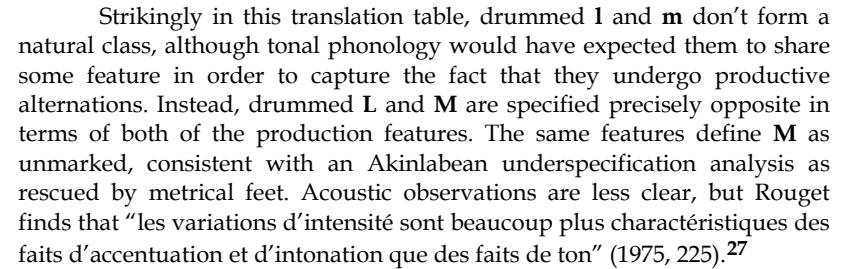
Although (4) refers just to F₀ restrictions, there's no reason to exclude phonation as evidence for footing. Encouragingly, Harris argues for trochaic feet in Ìbibio based not on pitch but on the distribution of root-initial onsets (2004, 120-28). His finding supports (4) if Èfik-Ibibio and Ìgbo are prosodically isomorphic (Green 1949).²⁴

Displaying neither the strong **L** cues of Yorùbá nor any of the trochaic cues in (4), Gbè is parsed by default in iambic feet [w s] corresponding respectively to **L** and **H** F₀ spans, leaving unfooted rimes with neutral F₀ alias **M**. Thus Gbè is not the prosodic mirror image of Yorùbá, and taxonomic **M** has different metrical status in the two languages—unfooted in Gbè, *w* in Yorùbá—despite its elsewhere distribution in both.



If Gbè is iambic, foot-initial *w* maps to the CV skeleton at "the beginning of the word" to spell out the DP phase at PF (Lowenstamm 1999, cf. Scheer 2012, 2014).²⁵ The left edge of the domain is the closed-class item identified by Stahlke: the traditional "noun prefix" which is underlyingly

	[place]	[manner]
(9)a. H	edge	blocked
b. M	edge	nonblocked
c. L	centre	blocked



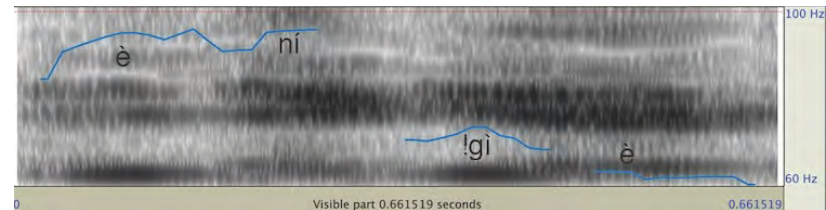
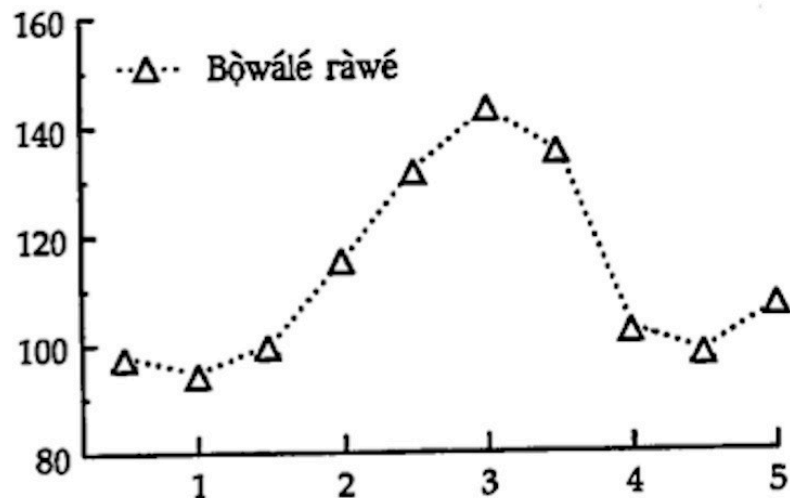
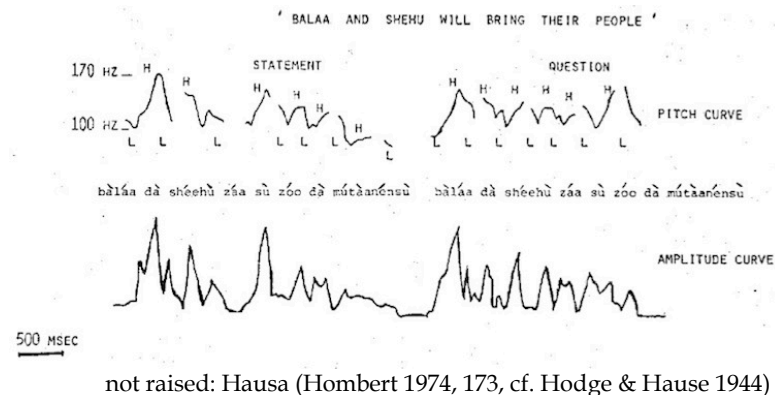
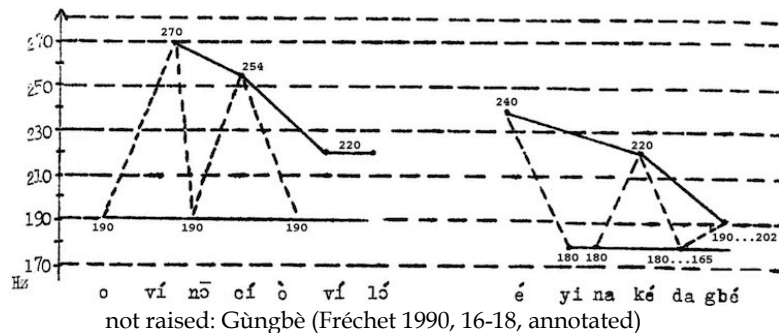
Appendix: comparing the relative pitch of initial L in LHL

- Scattergram for columns: X₁ — X₂
Os4 □ Os5
-
- F0 in Hz
- pā pā Kò fí Kà sá kyé ná ná Kwá bē ná Gyí má

not raised: Àkan (Dolphyne 1994, 5)

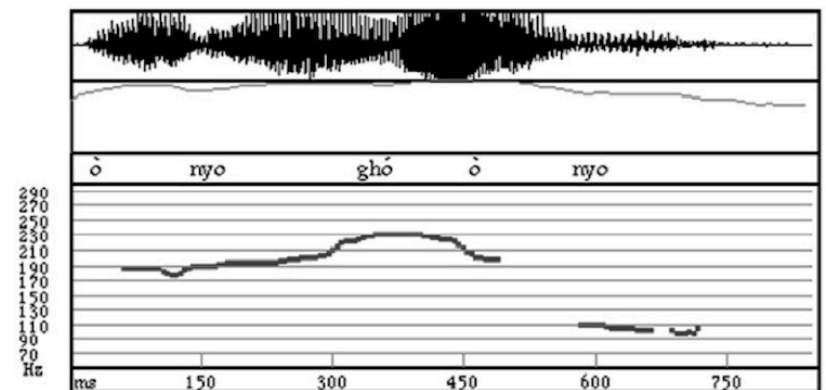
Rouget considers Gùngbè drummed surrogate speech as evidence for the “perception if not mental representation” of spoken pitch:

Unlike the Yorùbá *dùn-dún* tradition, where linguistic F₀ maps iconically to musical pitch (Adégbolá 2003), Gùngbè percussionists distinguish the three tonal outcomes of speech with three distinct attacks on the drumhead based on place and manner of articulation (Rouget 1964, 9*f.*, cf. 1965, 1975, 224).



raised: Èdó ènìgìè [LH! LL] 'lineage heads' (Éwuarè 2016, 0'38")
 N.b. downstep before L, derived from deleted L, blocks H>L spread (Ámayo 1983, 186)

onyoghonyo LLHL-Pitch PICT



References

- Aboh, E. [2004]. *The Morphosyntax of Complement-Head Sequences; clause structure & word order patterns in Kwa*. Oxford University Press.
- Abraham, R. [1958]. *Dictionary of Modern Yorùbá*. University of London Press.
- Adégbolá, T. [2003]. Probabilistically speaking; a quantitative exploration of Yorùbá speech surrogacy. *Proceedings of 4th World Congress of African Linguistics*, edited by A. Akinlabí & O. Adesolá, 363-73. Köppe, Köln.
- Àjàyí, J. [1960]. How Yorùbá was reduced to writing. *Odù [Ìbàdàn]* 8, 49-58.
- Ajibóyè, O. [2005]. *Topics on Yorùbá nominal expressions*. Dissertation, University of British Columbia, Vancouver.
- Akinlabí, A. [1985]. *Tonal underspecification & Yorùbá tone*. Dissertation, University of Ìbàdàn.
- Akinlabí, A. & M. Liberman. [2001]. Tonal complexes and tonal alignment. *NELS* 31, 1-20.

- Allen, G. [1978]. Speech rhythm, its relation to performance universals and articulatory timing. *Journal of Phonetics* 3, 75-86. [Not personally consulted; cited by Kager (1993)]
- Ámayo, A. [1981/1983]. Tone rules and derivational history in Èdó phonology. *Kiabàrà* 4, 81-96/*Current Approaches to African Linguistics* 1, edited by I. Dìjoff, 185-95. Foris, Dordrecht.
- Ansre, G. [1961]. *The tonal structure of Èwè*. M.A. thesis, Hartford Seminary.
- Archangeli, D. & D. Pulleyblank. [2015]. Phonology without Universal Grammar. *Frontiers in Psychology* 6, 12-29.
- Armstrong, R. [1983]. The Idomoid languages of the Benue and Cross-River valleys. *Journal of West African Languages* 13, 91-149.
- Arnett, P. [1968]. Major describes move. *Associated Press/New York Times*, February 8, p. 14, cf. en.wikiquote.org/wiki/Vietnam_War.
- Bamba, M. [1991]. *De l'interaction entre tons & accent*. Dissertation, Université du Québec à Montréal.
- Bámgbósé, A. [1965/1966a]. Assimilation and contraction in Yorùbá. *Journal of West African Languages* 1, 21-27/Appendix 4. *A Grammar of Yorùbá*, 160-66. Cambridge University Press.
- — —. [1966b]. The assimilated low tone in Yorùbá. *Lingua* 16, 1-13.
- — —. [1972]. The meaning of Oló.dùmarè; an etymology of the name of the Yorùbá high god. *African Notes* [Ìbàdàn] 7.1, 25-32.
- Bennett, P. & J. Sterk. [1977a/b]. Benue-Kwa; internal and external relations. 8th Conference on African Linguistics, UCLA, Los Angeles /South Central Niger-Congo; a reclassification. *Studies in African Linguistics* 8, 241-73.
- Breen, M. & al. [2012]. Inter-transcriber reliability for two systems of prosodic annotation: ToBI (Tones and Break Indices) and RaP (Rhythm and Pitch). *Corpus Linguistics & Linguistic Theory* 8, 277-312. speechlab.cas.msu.edu/PDF/Breen,Dilley,Kraemer,&Gibson2012.pdf.
- Bresnan, J. [1971]. Sentence stress and syntactic transformations. *Language* 47, 257-81.
- Calabrese, A. & M. Halle. [1998]. Grimm's and Verner's Law, a new perspective. *Mir Curad; a festschrift in honor of Calvert Watkins*, edited by C. Melchert & al., 47-62. Institut für Sprachwissenschaft, Innsbruck.
- Calvet, L.-J. [1981/1987]. Évangélisation et impérialisme culturel. *Le Monde Diplomatique* 324, 16-17. www.monde-diplomatique.fr/1981/03/CALVET/36082. Revised as Chapitre 14-Politique linguistique et impérialisme, L'Institut Linguistique d'Été. *La Guerre des langues & les politiques linguistiques*, 205-17. Payot, Paris. Cut by Oxford University Press from the English-language edition; authorized English translation archived here: people.bu.edu/manfredi/CalvetCh14anglaisSIL.pdf.
- Campbell, L. [1998]. *Historical Linguistics; an introduction*. Edinburgh University Press.
- Capo, H. [1985]. Prelude to the relationship between Gbè and Yoruboid. *Journal of the Linguistic Association of Nigeria* 3, 99-103.
- — —. [1991]. *A Comparative Phonology of Gbè*. Foris, Dordrecht.
- Chomsky, N. [1964]. *Current Issues in Linguistic Theory*. Mouton, the Hague.
- — —. [1986]. *Knowledge of Language; its nature, origin & use*. Praeger, New York.
- — —. [2001]. Derivation by phase. *Ken Hale; a life in language*, edited by M. Kenstowicz, 1-52. MIT Press, Cambridge, Mass.
- Chomsky, N. & M. Halle. [1968]. *The Sound Pattern of English*. Harper, New York.
- Christaller, J. [1875]. *A Grammar of the Asante & Fante Language*. Missions buchhandlung, Basel.
- Cinque, G. [1993]. A null theory of phrase and compound stress. *Linguistic Inquiry* 24, 239-98.
- Clark, M. [1978]. *A dynamic theory of tone with special reference to the tonal system of Ìgbò*. Dissertation, UMass, Amherst/IULC, Bloomington.
- Clements, N. [1977]. Four tones from three; the extra-high tone in Àwlan [Àṅlǎ]-Èwè. *Languages & Linguistic Problems in Africa*, edited by P. Kotey & H. der Houssikian, 168-81. Hornbeam Press, Columbia South Carolina.
- — —. [1978]. Tone and syntax in Èwè. *Elements of Tone, Stress & Intonation*, edited by D. Napoli, 21-99. Georgetown University Press, Washington, D.C.
- — —. [1981/1983]. The hierarchical representation of tone features. *Harvard Studies in Phonology* 2, edited by G.N. Clements, 50-108/*Current Approaches to African Linguistics* 1, edited by I. Dìhoff, 145-76. Foris, Dordrecht.
- — —. [1990]. The status of register in intonation theory; comments on the papers by Ladd and by Inkelas & Leben. *Laboratory Phonology 1; between the grammar & physics of speech*, edited by J. Kingston & M. Beckman, 58-71. Cambridge University Press.
- Clements, N. & K. Ford. [1979]. [G] ikúyù tone shift and its synchronic consequences. *Linguistic Inquiry* 10, 179-210.
- Clements, N. & J. Goldsmith. [1980]. What is downstep? A reply to Clark. *Studies in African Linguistics* 11, 239-54.
- Clements, G. & al. [2010]. Do we need tone features? *Tones & Features; phonetic & phonological perspectives*, edited by J. Goldsmith & al., 3-24. De Gruyter, Berlin.
- Collinge, N. [1985]. *The Laws of Indo-European*. Benjamins, Amsterdam.
- Cyran, E. [2014]. *Polish Voicing; between phonology & phonetics*. Wydawnictwo Katolicki Uniwersytet, Lublin/De Gruyter, Berlin.
- Déchaine, R.-M. [2001]. On the left edge of Yorùbá complements. *Lingua* 111, 81-130.

- Dediu, D. & D. Ladd. [2007]. Linguistic tone is related to the population frequency of the adaptive haplogroups of two brain size genes, ASPM and Microcephalin. *PNAS* **104**, 10944-49.
- Dilley, L. [2005]. *The phonetics & phonology of tonal systems*. Dissertation, M.I.T., Cambridge, Mass.
- Dolphyne, F. [1994]. A phonetic and phonological study of downdrift and downstep in Àkan. Presented at ACAL **25**, Rutgers University, 27 March.
- Dressler, W. [1984]. Explaining Natural Phonology. *Phonology Yearbook* **1**, 29-51.
- Duanmu, S. [1992]. An autosegmental analysis of tone in four Tibetan languages. *Linguistics of the Tibeto-Burman Area* **15**, 65-91.
- Elugbe, B. [1977]. Some implications of low tone raising in southwestern Èdó. *Studies in African Linguistics Supplement* **7**, 53-62.
- Epps, P. & H. Ladley. [2009]. Syntax, souls or speakers? On SIL and community language development. *Language* **85**, 640-46.
- Everett, C. & al. [2015]. Climate, vocal folds and tonal languages; connecting the physiological and geographic dots. *PNAS* **112**, 1322-27.
- Éwuàrè II, Ehenedèn Erediauwà. [2016]. The Òmo N'Òba of Benin Empire Òba Éwuàrè II Speech on 2/12/2016.
www.youtube.com/watch?v=dEp-ccTLl8Y.
- Flemming, E. & H. Cho. [2015]. The phonetic specification of contour tones; evidence from the Mandarin rising tone. *Phonology* **34**, 1-40.
- Fodor, J. & Z. Pylyshyn. [1988]. Connectionism and cognitive architecture, a critical analysis. *Cognition* **28**, 3-71.
- [Wittman-] Fréchet, A.-L. [1990]. Le downdrift en gùngbè. *Cahiers d'études linguistiques* **3**, 6-27. Université Nationale du Bénin.
- — —. [1994]. Quelques faits prosodiques du gùngbè de Porto-Novo (Bénin). *Togo-Bénin; Cahiers du CRA* **8**, 25-52.
- Gbètò, F. [1995]. Quelques aspects comparatifs et diachroniques de la tonologie du Gbè. *Afrika & Übersee* **78**, 73-99.
- — —. [1997]. *Le Maxi du Centre-Bénin et du Centre-Togo*. Köppe, Köln.
- — —. [1999]. Description et hypothèses sur la nature de l'UPT: l'exemple des langues Gbè. *Journal of West African Languages* **27**, 3-20.
- — —. [2002]. Les consonnes voisées 'implosives' et leurs rôles dans la tonogénèse et la nasalité des consonnes dans quelques langues volta-congo. *Gbègbó/Gbè Studies/Études Gbè* **1**, 7-34.
- — —. [2003]. Le système tonal du Dogbo, variété dialectale aja du sud Bénin (New-Kwa, Gbè) entre le passé et le présent. *Linguistique africaine* **23**. [preprint courtesy of the author.]
- Giegerich, H. [1985]. *Metrical Phonology & Phonological Structure; German & English*. Cambridge University Press.
- — —. [2015]. *Lexical Structures; compounding & the modules of grammar*. Edinburgh University Press.
- Goldsmith, J. [1976]. *Autosegmental phonology*. Dissertation, M.I.T., Cambridge, Mass.
- — —. [1978/1981]. English as a tone language. *Communication & Cognition* **11**, 453-76/Phonology in the 1980's, edited by D. Goyvaerts, 287-308. Story-Scientia, Ghent.
- Green, M. [1949]. The classification of West African tone languages, Ìgbo and Èfik. *Africa* **19**, 213-19.
- Greenberg, J. [1963]. *The Languages of Africa*. Mouton, the Hague. [= *International Journal of American Linguistics* **29.1**].
- Hale, K. & S. Keyser. [1993]. On argument structure and the lexical expression of syntactic relations. *The View from Building 20*, edited by K. Hale & S. Keyser, 53-109. MIT Press, Cambridge, Mass.
- Halle, M. [1959]. *The Sound Pattern of Russian; a linguistic & acoustical investigation*. Mouton, The Hague.
- — —. [1997]. On stress and accent in Indo-European. *Language* **73**, 275-313.
- Halle, M. & K. Stevens. [1971]. A note on laryngeal features. *Quarterly Progress Report* **101**, 198-213. MIT Research Laboratory of Electronics, Cambridge, Mass.
- Halle, M. & J.-R. Vergnaud. [1987]. *An Essay on Stress*. MIT Press, Cambridge, Mass.
- Haraguchi, S. [1988]. Pitch accent and intonation in Japanese. *Autosegmental Studies on Pitch Accent*, edited by H. vd Hulst & N. Smith, 123-50. Foris, Dordrecht.
- Harris, J. [1999/2004]. Release the captive coda; the foot as a domain of phonetic interpretation. *UCL Working Papers in Linguistics* **11**/Phonetic Interpretation; papers in laboratory phonology **6**, edited by J. Local & al., 103-29. Cambridge University Press.
- Harrison, P. [2000]. Acquiring the phonology of lexical tone in infancy. *Lingua* **110**, 581-616.
- Haudricourt, A. [1954/1972]. De l'origine des tons en vietnamien. *Journal Asiatique* **242**, 69-82/Problèmes de Phonologie Diachronique, 147-60. Société pour l'Étude des Langues Africaines, Paris.
- Hayes, B. [1985]. Iambic and trochaic rhythm in stress rules. *Berkeley Linguistic Society* **11**, 429-46.
- Hodge, C. & H. Hause. [1944]. Hausa tone. *Journal of the American Oriental Society* **64**, 51-52.
- Hombert, J.-M. [1974]. Universals of downdrift; their phonetic basis and significance for a theory of tone. *Studies in African Linguistics Supplement* **5**, 169-83.
- Huang, J. [1980]. The metrical structure of terraced-level tones. *NELS* **10**, 257-70.
- Hyman, L. [1973]. The role of consonant types in natural tone assimilations. *Consonant Types & Tone. Southern California Occasional Papers in Linguistics* **1**, 152-79.
- — —. [1975]. *Phonology; theory & analysis*. Holt, New York.

- — —. [2009]. How (not) to do phonological typology; the case of pitch-accent. *Language Sciences* **31**, 213-38.
- — —. [2010]. Do tones have features? *Tones & Features; phonetic & phonological perspectives*, edited by J. Goldsmith & al., 50-80. De Gruyter, Berlin.
- Hyman, L. & R. Schuh. [1974]. Universals of tone rules; evidence from West Africa. *Linguistic Inquiry* **5**, 81-115.
- Hyman, L. & N. Valinande. [1985]. Globality in the Kinande tone system. *African Linguistics; essays in memory of M.W.K. Semikenke*, edited by D. Goyvaerts, 239-60. Benjamins, Amsterdam.
- Ìdòwú, 'B. [1962]. *Olódùmarè; God in Yorùbá belief*. Longman, London.
- Idsardi, W. [1992]. *The computation of prosody*. Dissertation, M.I.T., Cambridge, Mass.
- — —. [2006]. A simple proof that Optimality Theory is computationally intractable. *Linguistic Inquiry* **37**, 271-75.
- Idsardi, W. & T. Purnell. [1997]. Metrical tone and the Elsewhere Condition. *Rivista di Linguistica* **9**, 129-56.
- Iverson, G. & J. Salmons. [2003]. Laryngeal enhancement in early Germanic. *Phonology* **20**, 43-74.
- Jardine, A. [2016]. Computationally, tone is different. *Phonology* **33**, 247-83.
- Jones, D. & S. Plaatje. [1916]. *A Sechuana Reader in International Phonetic Orthography (with English Translations)*. University of London Press.
- Jones, D. & K. Woo. [1912]. *A Cantonese Phonetic Reader*. University of London Press.
- Jones, P. [2014]. *Tonal interaction in Kinande; cyclicity, opacity & morphosyntactic structure*. Dissertation, M.I.T., Cambridge Mass.
- Kager, R. [1993]. Alternatives to the iambic-trochaic law. *Natural Language & Linguistic Theory* **11**, 381-432.
- Kahnemuyipour, A. [2004]. *The syntax of sentential stress*. Dissertation, University of Toronto.
- Kaye, J. [1988/1992]. On the interaction of theories of Lexical Phonology and theories of phonological phenomena. *Phonologica 1988*, edited by U. Dressler & al., 141-55. Cambridge University Press.
- Kaye, J. & al. [1985]. The internal structure of phonological elements; a theory of charm and government. *Phonology Yearbook* **2**, 305-28.
- — —. [1990]. Constituent structure and government in phonology. *Phonology* **7**, 193-231.
- Kim, M. & S. Duanmu. [2004]. 'Tense' and 'lax' stops in Korean. *Journal of East Asian Linguistics* **13**, 59-104.
- Kimenyi, A. [2002]. *A Tonal Grammar of Kinyarwanda*. Edwin Mellen Press, Lewiston, New York.
- Kiparsky, P. [1968]. Linguistic universals and linguistic change. *Universals in Linguistic Theory*, edited by E. Bach & R. Harms, 170-202. Holt, New York.

- — —. [1973]. Phonological representations. *Three Dimensions of Linguistic Theory*, edited by O. Fujimura, 5-86. T.E.C., Tokyo.
- — —. [1982]. Lexical morphology and phonology. *Linguistics in the Morning Calm*, edited by I.-S. Yang, 3-91. Hanshin, Seoul.
- — —. [2015]. Stratal OT — synopsis and FAQs. *Capturing Phonological Shades Within & Across Languages*, edited by Y. Hsiao & L.-H. Wee, 2-44. Cambridge Scholars Publishing, Newcastle.
- — —. [2016]. Labov, sound change and phonological theory. *Journal of Sociolinguistics* **20**, 464-88.
- Köhnlein, B. [2016]. Contrastive foot structure in Franconian tone-accent dialects. *Phonology* **33**, 87-123.
- Kortlandt, F. [1986]. Proto-Indo-European tones? *Journal of Indo-European Studies* **14**, 153-60.
- Kropp-Dakubu, M.-E. [2012]. Towards a phonology of Proto-Kwa; onwards from Stewart's Proto-Akanic-Bantu. *Towards Proto Niger-Congo; comparison & reconstruction*. FIAP Culture S. Jean Monnet, Paris, 18 September. llacan.vjf.cnrs.fr/fichiers/nigercongo/fichiers/Kropp_Dakubu-Proto-Kwa.pdf.
- Kuhn, T. [1962]. *The Structure of Scientific Revolutions*. University of Chicago Press.
- Kuryłowicz, J. [1935]. Sur les éléments consonantiques disparus en indo-européen. *Études indoeuropéennes* **1**, 27-76. Polska Akademia, Kraków.
- Ladd, D. [1996]. *Intonational Phonology*. Cambridge University Press.
- Ladefoged, P. & al. [1976]. The stops of Òweré ["Owerri"] Igbo. *Studies in African Linguistics Supplement* **6**, 146-63.
- Lání.ran, Y. [1992]. *Intonation in tone languages; the phonetic implementation of tones in Yorùbá*. Dissertation, Cornell University, Ithaca New York.
- Lání.ran, Y. & N. Clements. [2003]. Downstep and high-raising; interacting factors in Yorùbá tone production. *Journal of Phonetics* **31**, 203-50.
- Leben, W. [1973]. The role of tone in segmental phonology. *Consonant Types & Tone. Southern California Occasional Papers in Linguistics* **1**, 152-79.
- Liberman, M. [1975]. *The intonational system of English*. Dissertation, MIT, Cambridge, Mass.
- Lowenstamm, J. [1999]. The beginning of the word. *Phonologica 1996; Syllables!?*, edited by J. Rennison & K. Kühnhammer, 153-66. Thesus, The Hague.
- — —. [2007]. On *n*, $\sqrt{\quad}$ and types of nouns. *Sounds of Silence; empty elements in syntax & phonology*, edited by J. Hartmann & al., 105-43. Elsevier, Amsterdam.
- — —. [2013]. Derivational affixes as roots; phasal Spell-out meets English stress shift. *The Syntax of Roots & the Roots of Syntax*, edited by A. Alexiadou & al., 230-58. Oxford University Press.
- Maddieson, I. [1974a]. A possible new cause of tone-splitting — evidence from Cama, Yorùbá and other languages. *Studies in African Linguistics Supplement* **5**, 205-21.

- — —. [1974b]. A note on tone and consonants. *Working Papers in Phonetics* 27, 18-27.
- Manfredi, V. [1979]. *Morphologization of downstep in Igbo dialects*. A.B. thesis, Harvard University, Cambridge, Mass.
- — —. [1991/1993]. Spreading and downstep. *Ágbò & Èhugbò: Igbo linguistic consciousness, its origins & limits*. Dissertation, Harvard University, Cambridge Mass., 61-93/Spreading and downstep: prosodic government in tone languages. *The Phonology of Tone; the representation of tonal register*, edited by H. v.d. Hulst & K. Snider, 133-84. De Gruyter, Berlin.
- — —. [1995]. Tonally branching *s* in Yorùbá is [lh]. *Niger-Congo Syntax & Semantics* 6, 171-82. African Studies Center, Boston University. people.bu.edu/manfredi/NCSS6b.pdf.
- — —. [2003]. A fonosyntactic parameter within Benue-Kwa and its consequences for Èdó. *Typologie des langues d'Afrique et universaux de la grammaire, vol. 2: Benue-Kwa, Soninke, Wolof*, edited by P. Sauzet & A. Zribi-Hertz, 127-62. Presses Universitaires de Vincennes/Harmattan, Paris. people.bu.edu/manfredi/paris8corrected.pdf.
- — —. [2008]. Nuclear stress in eastern Benue-Kwa (Niger-Congo). *Focus Strategies in African Languages; the interaction of focus & grammar in Niger-Congo & Afro-Asiatic*, edited by E. Aboh & al., 15-54. DeGruyter, Berlin. people.bu.edu/manfredi/nsrEasternBK.pdf.
- — —. [2009]. Morphosyntactic parameters and the internal classification of Benue-Kwa. *Historical Syntax & Linguistic Theory*, edited by P. Crisma & G. Longobardi, 329-43. Oxford University Press. people.bu.edu/manfredi/DIGS9.pdf.
- — —. [2015]. Climate alert! The future's getting more tonal every day. people.bu.edu/manfredi/SaveTheTones.pdf.
- — —. [2018]. Cyclic accentuation in Yorùbá. *Data-rich Linguistics; papers in honour of Yíwólá Awóyálé*, edited by O. Adesólá & al., 211-36. Cambridge Scholars Publishing, Newcastle upon Tyne. people.bu.edu/manfredi/YorubaCyclicAccent.pdf.
- — —. [in press]. Phonosemantic subordination. *Contemporary Studies in African Linguistics; essays in memory of Rev. Sr. M.A. Òwaláàka*, edited by L. Yuka. Benin-City Nigeria. Preprint: people.bu.edu/manfredi/PhonosemSubord.pdf.
- Matisoff, J. [1973]. Tonogenesis in Southeast Asia. *Consonant Types & Tone. Southern California Occasional Papers in Linguistics* 1, 72-95.
- McCawley, J. [1965]. *The accentual system of Standard Japanese*. Dissertation, M.I.T., Cambridge Mass.
- — —. [1970]. Some tonal systems that come close to being pitch accent systems but don't quite make it. *Chicago Linguistic Society* 6, 526-32.
- — —. [1978]. What is a tone language? *Tone; a linguistic survey*, edited by V. Fromkin, 113-31. Academic Press, New York.
- Melzian, H. [1937]. *Concise Dictionary of the Bini Language of Southern Nigeria*. Kegan Paul, London.
- Mutaka, N. & al. [2008]. *Kinande-English/English-Kinande Dictionary*. African Anaphora Project, Rutgers University, New Brunswick New Jersey.
- Nespor, M. & I. Vogel. [1986]. *Prosodic Phonology*. Foris, Dordrecht.
- Nissenbaum, J. & al. [2002]. High speed MRI of laryngeal gestures during speech production. *Journal of the Acoustical Society of America* 111, 2479-80.
- — —. [2005]. Fake raccoon soup; the reappearance of the wily low tone in Japanese compounds. Montréal-Ottawa-Toronto Phonology Workshop, McGill University, 13 February.
- Owómoyèlà, O. [2005]. *Yorùbá Proverbs*. University of Nebraska Press, Lincoln.
- Oyèláràn, 'S. [1970]. *Yorùbá phonology*. Dissertation, Stanford University, Palo Alto California.
- Penfield, P. [1997]. MIT's Building 20, the magical incubator 1943-1998. www.eecs.mit.edu/building/20 (archived).
- Pesetsky, D. [1979]. Russian morphology and lexical theory. Ms., M.I.T., Cambridge, Mass. web.mit.edu/linguistics/people/faculty/pesetsky/russmorph.pdf.
- Pierrehumbert, J. [1980]. *The phonetics & phonology of English intonation*. Dissertation, M.I.T., Cambridge, Mass.
- Pierrehumbert, J. & M. Beckman. [1988]. *Japanese Tone Structure*. MIT Press, Cambridge, Mass.
- Pike, K. [1945/1947]. *The intonation of American English*. Foreign Service Institute, Washington, D.C./University of Michigan Press, Ann Arbor.
- Pike, K. [1948]. *Tone languages; a technique for determining the number & type of pitch contrasts in a language, with studies in tonemic substitution & fusion*. University of Michigan Press, Ann Arbor.
- Pöchtrager, M. [2006]. *The structure of length*. Dissertation, Universität Wien.
- Poser, W. [1981]. On the directionality of the tone-voice correlation. *Linguistic Inquiry* 12, 483-88.
- — —. [1984/1999]. *The phonetics & phonology of tone & intonation in Japanese*. Dissertation, M.I.T., Cambridge, Mass./C.S.L.I., Palo Alto California.
- Pulleyblank, D. [1983]. *Tone in Lexical Phonology*. Dissertation, M.I.T., Cambridge, Mass.
- — —. [2004]. A note on tonal markedness in Yorùbá. *Phonology* 21, 409-25.
- Ramus, F. & al. [1999]. Correlates of linguistic rhythm in the speech signal. *Cognition* 73, 265-92.
- Richards, N. [2010]. *Uttering Trees*. MIT Press, Cambridge, Mass.
- Rotenberg, J. [1974]. *The syntax of phonology*. Dissertation, M.I.T., Cambridge, Mass.
- Rouget, G. [1963]. Le problème du ton moyen en gùn. *Journal of African Languages* 2, 273-92.

- — —. [1964]. Tons de la langue en gùn (Dahomey) et tons du tambour. *Revue de musicologie* 50, 3-29.
- — —. [1975]. Tons, intonation, accentuation; problèmes d'identification. *Langues sans tradition écrite; méthodes d'enquête et de description*, edited by G. Manessy & J. Thomas, 217-40. SELAF, Paris.
- Sato, Y. 2009. Spelling-out prosodic domains; a multiple spell-out account. *Interphases; phase-theoretic investigations of linguistic interfaces*, edited by K. Grohmann, 234-59. Oxford University Press.
- de Saussure, F. [1879]. *Mémoire sur le système primitif des voyelles dans les langues indo-européennes*. Teubner, Leipzig.
- Schachter, P. & V. Fromkin. [1968]. A Phonology of Akan: Akwapem, Asante & Fante. *Working Papers in Phonetics* 9. U.C.L.A., Los Angeles.
- Schadeberg, T. [1986]. The lexicostatistic base of Bennett & Sterk's reclassification of Niger-Congo with particular reference to the cohesion of Bantu. *Studies in African Linguistics* 17, 69-83.
- Scheer, T. [2004]. *A Lateral Theory of Phonology* 1. What is CVCV & why should it be? DeGruyter, Berlin.
- — —. [2010b]. What OT is, and what it is not. Review of P. de Lacy, ed., *Cambridge Handbook of Phonology* (Cambridge University Press 2007). *Journal of Linguistics* 46, 193-218. Unabridged version archived at sites.unice.fr/scheer/tobweb/papers.htm.
- — —. [2012]. *Direct Interface & One-Channel Translation; a non-diacritic theory of the morphosyntax-phonology interface*. De Gruyter, Berlin.
- — —. [2013]. Why phonology is flat; the role of concatenation and linearity. *Language Sciences* 39, 54-74.
- — —. [2014]. The initial CV, herald of a non-diacritic interface theory. *The Form of Structure, the Structure of Form; essays in honor of Jean Lowenstamm*, edited by S. Bendjaballah & al., 315-30. Benjamins, Amsterdam.
- — —. [2015]. A world without voiced sonorants; reflections on Cyran (2014). *Studies in Polish Linguistics* 10, 125-51, 223-47.
- Segurola, R. & J. Rassinoux. [2000]. *Dictionnaire Fɔ̀n-Français*. Société des Missions Africaines, Kútɔ̀nú ["Cotonou"].
- Selkirk, E. [1984]. *Phonology & Syntax; the relation between sound & structure*. MIT Press, Cambridge, Mass.
- Siertsema, B. [1958]. Some notes on Yorùbá phonetics and spelling. *Bulletin de l'Institut Fondamental d'Afrique Noire Série B, Sciences humaines* 20, 576-92.
- Smith, N. [1968]. Tone in Èwè. *Quarterly Progress Report* 88, Research Laboratory in Electronics, M.I.T., Cambridge, Mass.
- Sprigge, R. [1967]. Collected field reports on tone in the Àdángbè dialect of Èwè. *Collected Language Notes* 8. Institute of African Studies, University of Ghana, Legon.
- Stahlke, H. [1971]. *Topics in Èwè phonology*. Dissertation, U.C.L.A.

- — —. [1974]. The development of the three-way tonal contrast in Yorùbá. *Third Annual Conference on African Linguistics*, edited by E. Voeltz, 139-45. Indiana University Press, Bloomington.
- Stewart, J. [1965]. The typology of the Twi tone system; with comments by P. Schachter & W.E. Welmers [and replies by Stewart]. Preprint, *Bulletin of the Institute of African Studies* 1, 1-27, 43-48, 60-67. University of Ghana, Legon.
- — —. [1983]. The high unadvanced vowels of Proto-Tano-Congo. *Journal of West African Languages* 13, 19-36.
- Swift, L. & al. [1962]. *Ìgbo Basic Course*. Foreign Service Institute, Washington D.C.
- Wagner, M. [2005]. *Prosody & recursion*. Dissertation, M.I.T., Cambridge, Mass.
- Ward, I. [1952]. *Introduction to the Yorùbá Language*. Heffer, Cambridge.
- Welmers, W. [1965]. A further note on the typology of the tonal structures. *The typology of the Twò tone system; with comments by P. Schachter & W.E. Welmers* [and replies by Stewart], 49-59. [= Preprint from the *Bulletin of the Institute of African Studies* 1]. University of Ghana, Legon.
- — —. [1973]. Functional and vestigial noun class systems. *African Language Structures*, 184-210. University of California Press, Berkeley.
- Welmers, W. & G. Ansre. [1960]. A start in Èwè. *Ms.*, Hartford Seminary. [Not personally consulted; cited by Stahlke (1971).]
- Westermann, D. [1905]. *Wörterbuch der Èwè-Sprache*. Reimer, Berlin.
- — —. [1930]. *A Study of the Èwè Language*. Oxford University Press.
- Williamson, K. [1989]. Niger-Congo/Benue-Congo overview. *The Niger-Congo Languages*, edited by J. Bendor-Samuel, 3-45/247-74. American Universities Press, Lanham Maryland.
- — —. [2002/2006]. The Rivers Readers Project as an attempt to develop communities. Presidential address, WALC 23, University of Buea/*African Linguistics & the Development of African Communities*, edited by E. Chia, 98-102. CODESRIA, Dakar.
- Williamson, K. & R. Blench. [2000]. Niger-Congo. *African Languages; an introduction*, edited by B. Heine & D. Nurse, 11-42. Cambridge University Press.
- Woodrow, H. [1951]. Time perception. *Handbook of Experimental Psychology*, edited by S. Stevens, 1224-36. Wiley, New York. [Not personally consulted; cited by Hayes (1985)]
- Zubizarreta, M.-L. & J.-R. Vergnaud. [2006]. Phrasal stress and syntax. *Blackwell Companion to Syntax*, edited by M. Everaert & al., 522-68. Blackwell, Oxford.
- Zwart, J.-W. [2004]. The format of dependency relations; prosody. Indiana University, Bloomington, 22 June. www.let.rug.nl/~zwart/college/docs/indiana/zwart2.pdf.

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Tonemarking: [´] = high, [`] = low. For Àkan, Èdó and Ìgbo, no mark = same perceived pitch as preceding syllable (this is Christaller's 1875 convention for Àkan). For Gbè and Yorùbá, no mark = mid (this is Crowther's 1875 convention for Yorùbá, cf. Àjàyí 1960).

1. This question is necessary – apologies to the editors – because research paradigms are not immune to zeitgeist (Kuhn 1962), and when something is thoroughly lost, we can't neglect any avenue of recovery: *Ìnùkínù ní ñ mú ìwákúwáá wá* (Owómoyèlà 2005, 373).
2. Some unchastened tonologists escalate the war and vaunt 'big data' correlations with biochemistry and climate (Dediu & Ladd 2007, Everett & al. 2015, cf. Manfredi 2015).
3. Benue-Kwa, alias Tano-Congo (Stewart 1983, 20) and East Volta-Congo, is a "dialect continuum" (Williamson & Blench 2000, 17f.) combining the Kwa and Benue-Congo branches of standard Niger-Congo (Greenberg 1963). To refine this historical subgrouping will require stronger evidence than lexicostatistics (Bennett & Sterk 1977a,b, Schadeberg 1986, Williamson 1989), a speculative method that "should be rejected" (Campbell 1998, 186, cf. Armstrong 1983, 146f., Capo 1985, Manfredi 2009, Kropp-Dakubu 2012).
4. Fréchet (1994, 39) cites analogous forms in Gùngbè; further variations across the cluster are reported by Clements (1977) and Gbètò (1995 & seq.). In Gùngbè some tokens of the initial vowel are pronounced [o] (Fréchet 1994, 32). In (1a), nominals that lack stem H are cited in nonfinal position (before *lá*) to control for phrase-final lowering M>L.
5. Although Èwè *àtádi* is synchronically opaque, its historic derivation by compounding can be inferred from the variant *atakui* (Westermann 1905, 451, no tones given) as well as Fǎngbè *àtakín* (Segurola & Rassinoux 2000, 75), compared with Yorùbá *ata* (Abraham 1958, 73), all meaning 'pepper'.
6. Data in the left column of (3b), omitted by Ansre, are supplied by Stahlke (1971, 161ff.).
7. E.g. Archangeli & Pulleyblank (2015), Flemming & Cho (2017). *Optimality Theory* is however a misnomer: a theory is falsifiable but OT is a *procedure* – a compiling technique to emulate any given theory (E. Keenan *p.c.*, cf. Fodor & Pylyshyn 1988, Idsardi 2006, Scheer 2010, 214). "Stratal" OT straddles the two worlds, bolting OT's parallel calculus onto lexical phonology's extrinsic order (Kiparsky 1982, 2015, cf. Pesetsky 1979), but the hybrid is stuck with an unsustainable separation of phrasal grammar from listed 'words' (Kaye 1988, Lowenstamm 2013, Giegerich 2015).
8. Eventually the offglide components were attested in inscriptions of extinct Anatolian languages (Kurylowicz 1935), but in 1879 they were completely abstract. Saussure's ablaunt theory implicitly inspired Government Phonology (Kaye & al. 1985). On the e-language/i-language distinction, see Chomsky (1986).

9. For example, the *t* of Sanskrit *pitár* 'father' and *bhrátar* 'brother' receives divergent treatment in the Germanic cognates, as *d* (<*d*) and *þ* (spelled *þ*) respectively (Collinge 1985, 205). But the rule also applies in root-initial position – a clue that footing is responsible rather than progressive assimilation, cf. discussion below.

10. For this to work, Calabrese & Halle must equate "stress" to "High tone" as far as laryngeal articulation is concerned (1998, 60) while dismissing Kortlandt's idea that Indo-European roots contrasted in "tone" (1986, 158f., cf. Halle 1997, 310). The tonal view is more plausible if, as it seems, Verner's Law applied *before* Germanic accent shift potentiated Grimm's Law (Iverson & Salmons 2003, 71). Nissenbaum (2005) extends Halle-Stevens' framework to Japanese *rendaku*: lexical L is suppressed in the deaccented right branch of a nominal compound but remains laryngeally 'stable' as shown by the appearance of otherwise unexpected consonant voicing in the deaccented constituent:

hòshi-[j] *irúshi* LH-HLL 'asterisk' < *hòshi* 'star' LH, *shirúshi* LHH 'symbol'

11. As would have been expected in trademark "natural phonology" (Dressler 1984, 38f.).
12. Pre-OT, a Saussurean Kiparsky treated historical data as "external" to grammar (1973, 87).
13. For Akinlabí & Liberman (2001, 18), both H and L have abstract branching structure.
14. Adopting linear ("string-based") as opposed to autosegmental representation doesn't alter the conclusion that tone rules are computationally closer, within standard hierarchies of complexity, to syntax than segmental phonology is (Jardine 2016, 263, 276).
15. Stewart (1965, 21), Schachter & Fromkin (1968, 110-15).
16. "I have not included Hausa among my 'terraced level' languages simply because Hausa has no contrast, at any point, between 'same' and 'drop' (Welmers 1965, 57).
17. Gbètò (1997, 114; 1999, 18). Fréchet (1990) treats Gùngbè as trochaic but does not discuss the headedness cues in (4). In some phrasal contexts of Àṅlṣ-Èwè, Clements observes emergent downstep and the raising of lexical M to superhigh pitch – effects which in taxonomic terms can only be understood as "a case of tone split" (1977, 178) but which seem less exotic as consequences of re-footing stray syllables from iambic (left-branching) prosody in right-branching phrases. Similar super-raising phenomena in Mawukakan (Mande, Niger-Congo) are convincingly analyzed in metrical terms by Bamba (1991).
18. L-deletion, which blocks H-spread (Bámgbòsé 1966b), is productive and recoverable at phrase boundaries, as in these minimal contrasts where [.] indicates the elided L syllable:

<i>oló.dù</i> MHL	'possessor of a clay cauldron'	< <i>-ní òdù</i> H LL
<i>olódù</i> MHĪL	'possessor of an oracle sign'	< <i>-ní òdù</i> H ML

L-deletion is however reported to cause lexical opacity in the *oríkì* (proper name epithet) *Oló.dùmarè* (Bámgbòsé 1972, critiquing folk etymologies by Idowú 1962). Secondly, as noted by 'S. Oyèláràn (*p.c.*), L-deletion also yields unrecoverable restructuring in certain lexicalized expressions, whose stem-initial syllable should compositionally bear the H of the transparently related verbroot, but which is instead pronounced as toneless/M.

<i>ì-bejì</i> LML	‘twins’	< -bí èjì H LL’give birth to two’
<i>ì-tanràn</i> LML	‘settlement of a case’	< -tán òràn H LL’finish dispute’

To my knowledge, Àkan, Hausa and Gbè lack comparable examples.

19. Ámayo’s pitch notation (e.g. 1983, 185) does not show initial L-raising, but Melzian pointedly apologises for a “simplification of tone marking” obscuring the fact that “[a] low tone is frequently raised before a high tone...” (1937, xiii). Cf. also Elugbe (1977).
20. The [+] of (4b) is attested in many western Ìgbo varieties (e.g. Hyman & Schuh 1974, 89).
21. Thanks to A. Nevins for this comparison.
22. The samples compared are not controlled and the generalization is stated informally but the contrast is undeniable.
23. Cf. note 17 above.
24. A conversation overheard in a quiet *búkà* in downtown Òweré (= colonial “Owerri”) in 1984 produced in me the uncanny impression that Ìgbo was being spoken with non-Ìgbo words, but my fellow diners’ eavesdropped language turned out to be Ìbibio. A test for the phonation of trochaic footing can perhaps be devised in those Ìgbo varieties with the richest consonantal inventories (Ladefoged & al. 1976).
25. The lexicalization of D in these ‘bare noun’ languages is arguably null but its referential content is reinforced periphrastically by adjoined, phrase-final appositive modifiers like *lá* in (1), as in Ajíbóyè’s analysis of Yorùbá *náà* (2005, 218). Alternatively, Aboh generates *lɔ* – the Gùngbè counterpart of Èwè *lá* – directly in D (2004, 83), but then the only way to obtain observed linear orders like *távò lɔ lɛ* ‘the tables’ (2004, 77) from the assumed [*lɔ* [*lɛ* [*távò*]]] is by raising different cartographic layers by arbitrarily different types of linearization, whose status in minimalism is anyway unclear. Consistent Kaynean antisymmetric movements alias snowballs would have been expected to strand D in final position, giving ungrammatical **távò lɛ lɔ* unless the last step is diacritically marked as SPEC-to-SPEC excorporation, and such a kludge merely restates the problem without added insight.
26. *translation*: Drummed utterances can rightly be held to express how speakers perceive, if not conceive, and in any event interpret, the system of tones in operation when they speak.
27. *translation*: variations of intensity are more typical of stress and intonation than they are of tone.