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► **To cite this version:**

Fabian Zuk, Abbie Hantgan-Sonko. The Tonal Morpho-Phonology of Dogon Nominal Compounds. Les rencontres du Réseau Français de Phonologie, CERCLL; MODYCO; SFL; STL, Jul 2024, Amiens, France. hal-04661282

HAL Id: hal-04661282

<https://hal.science/hal-04661282>

Submitted on 24 Jul 2024

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The Tonal Morpho-Phonology of Dogon Nominal Compounds



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1. Dogon Language Family

- Spoken in central Mali + Burkina Faso
- ± 20–25 identifiable languages
- 400 000–800 000 speakers
 - Conflict in northern Mali
 - Use of Fulfulde as Lingua Franca
- Independent and relatively early phylum of Niger-Congo

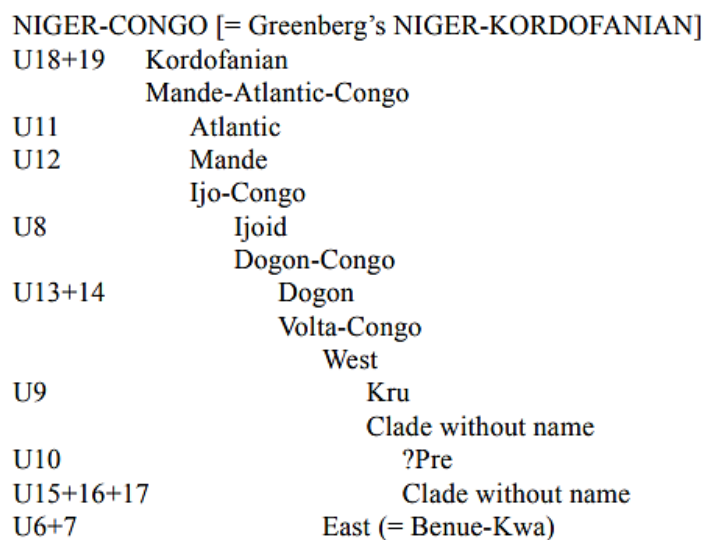


Figure 1. Phylogeny of Niger Congo according to Williamson & Blench (2000: 18). Image from Güldemann (2018)

- Internal Phylogeny of Dogon is still debated, but consensus on early split off of a Western Dogon group (Heath 2022: 707; Moran & Prokic 2013; Prokhorov, Moran & Heath 2012; Zuk 2024)
- Several languages bearing the name *So* appear to form a phylogenetic subgroup:
 - Tommo So (McPherson 2013)
 - Yorno So (Heath 2017a)
 - Donno So (Heath 2016)
 - ~~Bondu So~~ = *exonym given to Najamba-Kindige speakers by Tommo So speakers*
- *so signifies ‘talk’, ‘speech’: Yorno So /sǒ:/, Tommo So /sǒ:/, Donno So /sǒ:/
- Data from Dogon Comparative Wordlist (Heath et al. 2016), cf. dogonlanguages.info

2. Phonotactics and Tonotactics of Dogon

- 7 surface contrastive vowels in Dogon languages
 - /i, e, ε, a, ɔ, o, u/, though cf. Hantgan & Davis (2012) for proposed underlying 10-vowel system
 - height-harmony, front-back harmony and ATR affects throughout the lexicon
- Syllables may bear high |H| or low |L|, likely a feature going back to Niger-Congo (Hyman et al. 2020: 183).
- **One H stretch** = Lexical items in Tommo So, Yorno So & Donno So contain exactly one H tone stretch.
- Open class stems (nouns, adjectives, numerals, verbs) normally contain at least one syllable bearing a high tone |H| or contain |H| as part of a rising |LH| or falling |HL| contour tone (Heath & McPherson 2013; McPherson 2013; Heath 2016).
 - In Tommo So, only |H| or |LH| sequences are found in native vocabulary.
 - Also true in Jamsay (Plains Dogon) (cf. Heath 2008)
- In Tommo So, McPherson (2013: 75) argues that some syllables may carry no inherent tone (∅). In Tommo So the generic plural clitic =*mbe* /mbe/ is one such morpheme.
 - It may acquire a floating tone from an adjacent stem (cf. 1). Autosegmental (KLV 1990) and Strict CV (Scheer 2004, etc.) framework adopted here.

(1) Tommo So Tone Assignment																																	
<p>a.</p> <table style="margin-left: 40px;"> <tr> <td style="text-align: center;">L H</td> <td></td> <td></td> <td style="text-align: center;">L H</td> </tr> <tr> <td style="text-align: center;">C</td> <td style="text-align: center;">V</td> <td style="text-align: center;">‘this’</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;">→</td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">n</td> <td style="text-align: center;">ɔ</td> <td></td> <td style="text-align: center;">n</td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">ɔ</td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">[nɔ̃]</td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">‘this’</td> </tr> </table>	L H			L H	C	V	‘this’	C			→		n	ɔ		n				ɔ				[nɔ̃]				‘this’					
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- Tone reassignment presumably occurs at the word level as shown in where the demonstrative pronoun *nɔ̃* ‘this’ (1a) carries lexical tone, the plural marker *mbe* in (1b) does not, but is able to receive tone from its base when cliticised as in the plural demonstrative pronoun *nɔ̃mbé* ‘these’ in (2c).

- Tone as a lexical feature is assigned is part of the lexical representation both at the stem and word levels.

Cognates below in (2) all contain a single stretch of |H| tone.

- Surface exceptions in the lexicon explained by latent |H| tone (Heath 2016: 29)

- The overall functional load of lexical tone is light (McPherson 2013: 77)

- Some minimal pairs are given in (2)

(2) Lexical tone in three Dogon languages

	Tommo So	Yorno So	Donno So	
a.	náá	náá	nàá	‘mother’
b.	nàá	nàá	nàpá	‘cow’
c.	íiyé	yéé	íyè	‘today’
d.	ìiyé	ɲéy ⁿ	ɲěɲ	‘honey’
e.	ísé	-	-	‘empty’
f.	ìsé	ìd͡zú	ìdú	‘dog’
g.	dámmá	dámá ¹	-	‘village’
h.	dàmmá	-	-	‘hoe’
i.	dúmbu	dúm	-	‘raised’
j.	dùmbú	dùmi-ý	dùmbú	‘short’

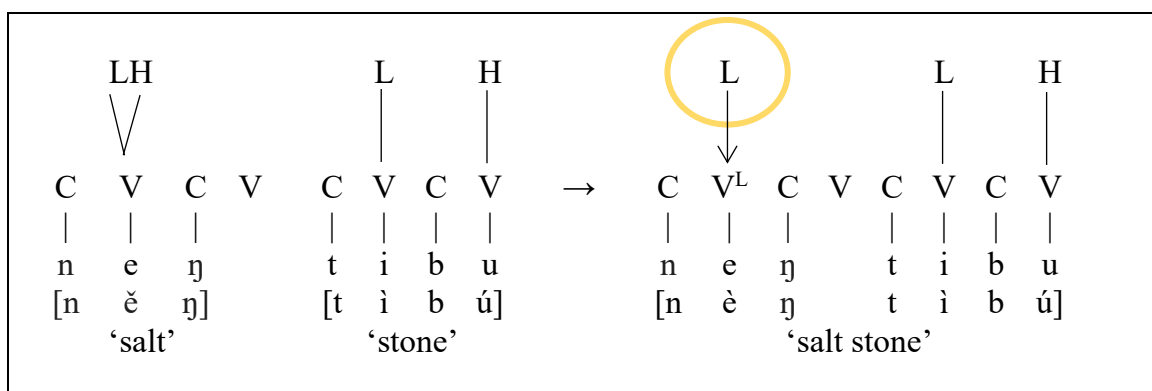
3. Compound Formation

Nominal compounds in the *So* languages are formed through the juxtaposition of two nouns accompanied by tone-dropping of the initial component of the compound.

The lexical tone of the dependent component of the input is replaced by low tone in the derived output in forms (3), (4) and (5) below. Heath (various) treats these replacement tones as cases of “tonal overlay”. The lexical tone of the head is preserved.

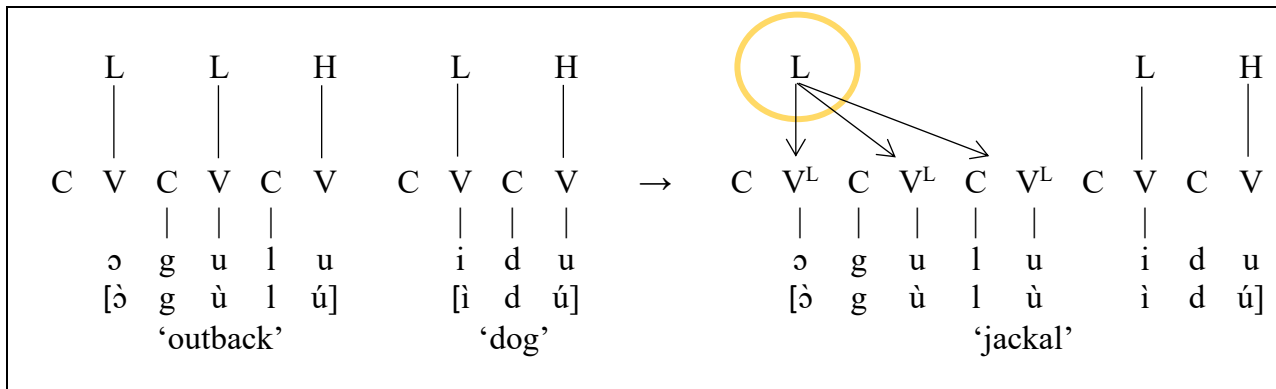
These tone overlays have been a diagnostic feature of compound vs simple word structure identification.

(3) Donno So: salt stone

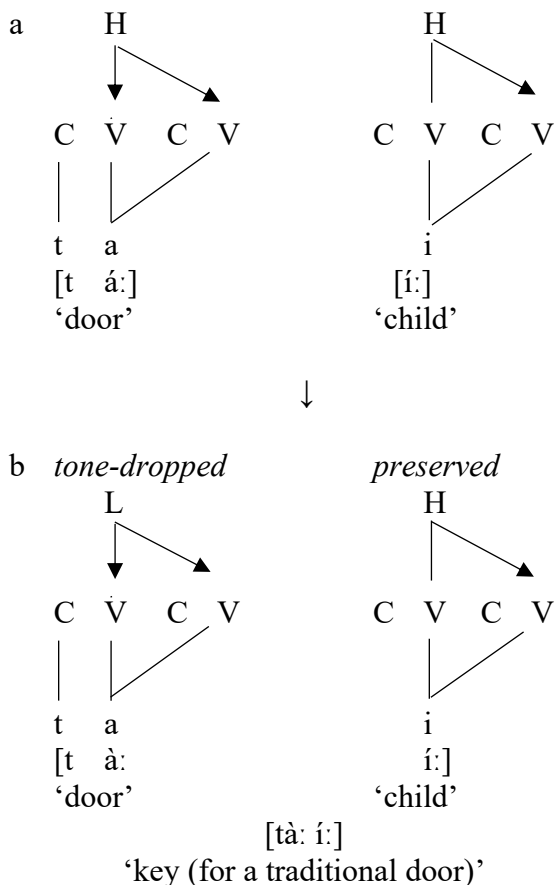


¹ Found in the name of village $\gamma\lambda^m\lambda$: *dámá* (Heath 2017b: 3)

(4) Donno So: outback “bush” dog = jackal



(5) Tommo So: door child = key (McPherson 2013: 155)



3.1 Compounding as a morphological scheme

In Dogon, the right constituent of a compound is the head, just as in such languages as English or German.

Examples (3) and (4) above are of the endocentric “*tatpurusa*” type; where the dependent serves to focus in on a semantic sub-selection of the head.

Example (5) however from Tommo So can be considered an example of exocentric “*bahuvrihi*” type compound, since a key is not properly a subset of types of children.

However, if the word ‘child’ is understood as ‘a small thing’, often interpreted as ‘fruit’ or ‘seed’, then the reading ‘small thing for door’ may in fact produce an endocentric compound. These endo-/exo-referant details are irrelevant to the current analysis.

In a Construction Morphology paradigm (Booij 2010), these compounds can be understood as

abstract $[[N] N]_N$ ‘restrictor-head’ schema.² The juxtaposition of two nouns in a compound forms a noun with the subclass features of the right constituent, i.e. NOUN + NOUN = NOUN.

² Rare $[\bar{N} [N^L]]$ ‘head-restrictor’ forms are occasionally found in the lexicon. See McPherson (2013: §6.1.1.2)

Though the *So* languages do not explicitly mark animacy contrasts as do some other Dogon languages (Najamba-Kindige, Ben Tey, Bankan Tey, Nanga, etc. (Zuk 2024)), the resulting compound formed from the schema in (6) would generally share the semantic and syntactic features of its head.

In (6), below, we see a morpho-phonologically inflected representation of the scheme. Here the superscript [^L] indicated the super-position of a low |L| tonal pattern, overriding lexical tone on the dependent, while [N^x], represents the preservation of the inherent lexical tone on the head.

(6) [[N^L] N^x]_N

Because all open-class morphemes must have at least one high tone |H|, the head is in practice characterised by the preservation of its lexical |H| tone distribution.

4. Phonological Analysis

Because syntactically triggered tonal changes are unusual (Heath (2022: 708) describes the interaction of nouns and modifiers as “unique to Dogon”, we would like to propose an alternative analysis: tone reduction, i.e. reduction to Low-Tone (L) across the dependent stem, is in fact phonological.

- Here: agnostic to computational theory
 - McPherson (2014) has proposed a combined Maximum Entropy Grammar + Construction Morphology analysis for phrasal tone lowering.
 - However, her model allows for interaction of Syn, Morph, Phon & she only employs these constructions “in those cases of idiosyncratic mappings between phonology, syntax, and semantics.” (p.75)
 - Among other constraints, McPherson (2013) employs Ident-OO(T), assess a violation for any word that surfaces with tone other than that found in its isolation form.
 - Heath (2022) argues for Noun-Phrase level prosody: [_ω{ⁿω} ω] ‘in a series of phonological words, the tone of all but the final is made low (L), but reference to syntactic categories is also required.
 - Heath (2022) invokes Hayes (1995: 368) Nuclear Stress Rule “the rightmost member of a phrase is strongest” ; in the fact that that H-stretch is preserved in the head, possible adaptation of Chomsky & Halle (1968) NCR that stress is assigned to the rightmost stressable vowel in a major constituent.

Arguments in favour of phonological solution are the fact that at the phono-syntactic level, modifying adjectives, have an identical tone-lowering effect on the noun which they modify, e.g. Tommo So *isè^L gém-ge* (dog black-DEF) ‘the black dog’, with tone lowering on the restricted stem.

The phonological facts of the Dogon *So* languages are best accounted for in a model which allows for a separation of lexical and phrasal phonological behaviours, for example the stratal-cyclic architecture proposed in Bermúdez-Otero (2012; 2017), whereby phonology at the stem level can be overridden by phonology at the word level and again at the phrasal level. Because Nouns Compounds and NOUN + ADJECTIVE phrases result in the same tone lowering of the non-head, we argue that Tone lowering as a phonological process occurs at the level of the Noun Phrase rather than the ω ‘word’ level.

4.1 Domains of computation

Σ ‘stem’ = ‘ordered set of phonemes associated to meaning’

ω ‘phonological word’

Φ ‘phonological phrase’

On the **stem level** |H| tone is an unpredictable lexical property of the morpheme.

- Continued work on comparative Dogon may help elucidate the role and placement of tone in Proto Dogon and thereby the evolution of high tone distribution among the languages. See (1c) right edge H-tone in Tommo So *íyè*, Yorno So *yéé*, but left-edge high tone in Donno So *íyè*.

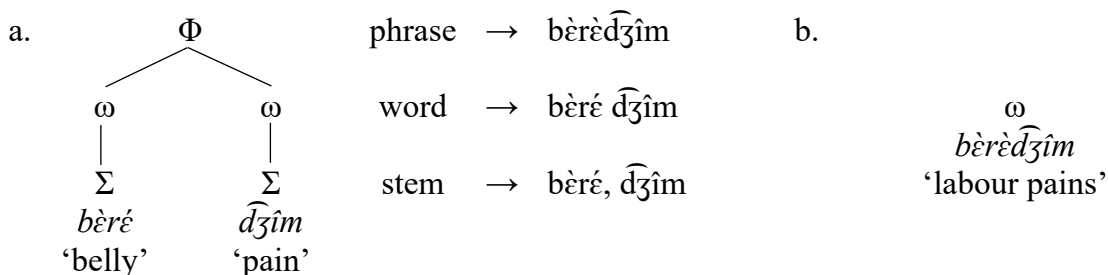
On the **word level**, work remains to be done on what constitutes the phonological word. In many cases Dogon nouns are formally equivalent to their stems. Together, both stem and word level representations make up the inventory of **lexical representations**. However, note that tone dropping has been used as a diagnostic of compounds.

On the **phrasal level**, there is a vast amount of evidence that nouns are grouped into a prosodic domain with the majority of their specifiers.

In Dogon *So* varieties, prosodic units are organized into a sequence of nouns and eventual post-nominal modifiers. Nouns (as here in compounds) adjectives and determiners all fall within the window of the phonological phrase Φ . In modern Dogon languages numerals and numeral classifiers (where they exist) generally fall beyond the scope of the phonological phrase, and by extension do not induce tone-lowering.

In (7), below, the output of both stem level and word level phonology for /bèré/ ‘belly’ and /d̄zîm/ ‘pain’ are [bèré] ‘belly’ and [d̄zîm] respectively with lexical tone preservation. Only at the phrasal level does tone lowering of the left component occur resulting in [bèrèd̄zîm]. The output of the composition process likewise results in a lexically tone-lowered lexical entry /bèrèd̄zîm/ ‘labour pain’ (7b), henceforth accessible through derivation or directly through the lexicon.

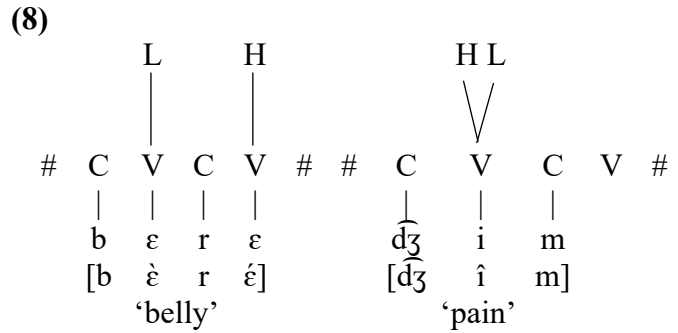
(7) Yorno So: Phonological Phases in the derivation of ‘labour pains’



- In § 4.2 and § 4.3 we opt for the direct implementation of rule bases phonological processes stratified over a Word level and a Phrase level.

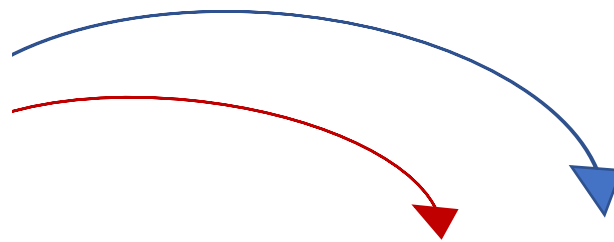
4.2 Stem + Word Cycle

- melody associated to structure
- lexical tone associated to V structure
- etc.
- i.e. in isolation lexical words retain their lexical tone.



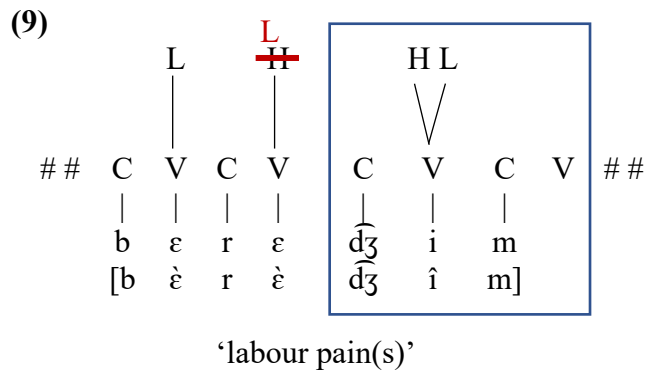
4.3 Phrase Cycle

- Select Head: [right]
- Head = N, Adj., Dem, etc.
- |H| → |L| / non-head
- Alternatively modeled as the delinking of |H| in non-head constituent with |L| fill-in.



In a more complex noun phrase such as those involving a reduplicated noun and a diminutive adjective, again the rightmost potential head is selected for tone preservation, and remaining leftward morphemes undergo tone replacement.

Donno So: ménè?
 ménè^L-ménè ‘ants’
 bánù ‘red-brown’,
 î: ‘child’
 [[[ménè-ménè] bán]^L-î:]
 ‘[[[ants] brown]-child]’
 ‘brown ants’



Such a phonological output is derivable by a direct rules-based derivation from input to output as shown in 4.2 and 4.3.

5. Going Beyond Compound Formations

In most of Dogon, there is a canonical word order within the Noun Phrase. Possessors precede possessums, while adjectives, numerals, relative clauses, demonstrative and definite article follow the noun. The NP can be followed by adverbial quantifiers. This pattern is summarised in (10). Note that neither numerals nor definite articles participate in tone lowering patterns.

(10) Poss [N – Adj – Num – RelCl – Dem/Def] – adverbial quantifiers

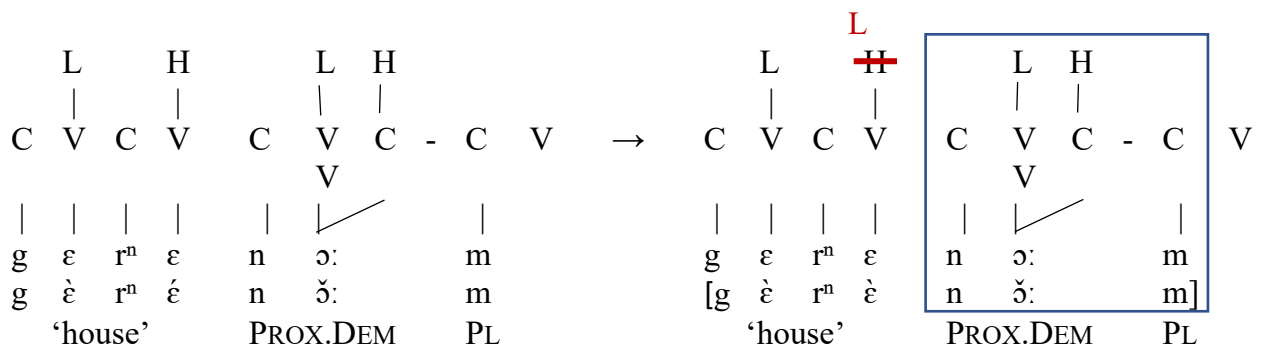
Heath (2022) identifies *tonosyntax* as the relationship between syntactic and tone-bearing units, distinguishing a) Tonosyntactic controllers including adjectives, relative complementizers and demonstratives in Dogon from b) Tonosyntactically “inert” morphemes such as numeral classifiers, definite articles and quantifiers.

“If not for the anomalous behavior of definites and especially numerals, we could frame tonosyntax as straightforward prosody. Leaving the possessor aside, the string from the noun rightward to the determiner could be marked off as a prosodic domain, as idealized [above in (10)]. Within it, only the rightmost word would be prosodically free, presenting its lexical tones, and all preceding words would be flattened to all-low tones. The remaining issue would be how the possessor interacts with this domain”. (Heath 2022: 711)

“But the behaviour of the numeral, and secondarily that of the definite marker disrupt this analysis. This forces the linguist, as it has forced generations of native speakers, to reconceptualize the system as tonosyntactic, making reference to the stem-classes of the modifiers. The only way to systematize this, as opposed to just listing controllers and non-controllers by stem-classes, is semantic” (Heath 2022: 711), cf. Heath & McPherson (2013).

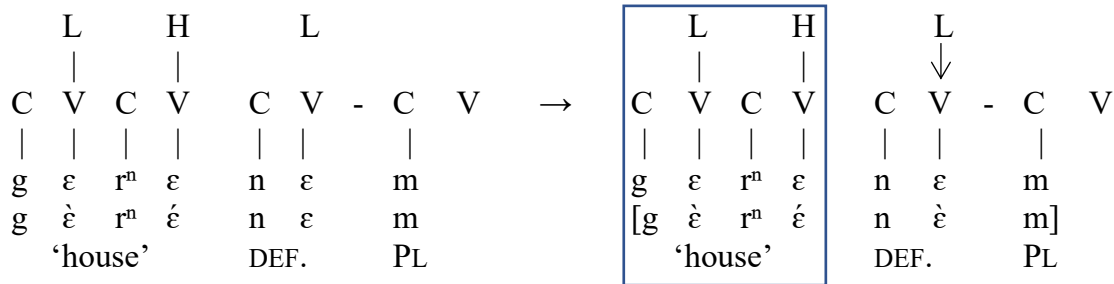
In (11) we see the tone lowering effect of the proximal plural demonstrative *nǎ:-m* ‘these’, which contrasts with the tonosyntactically inert definite article *nè-m* ‘the.PL’ in (12).

(11) Yorno So: ‘these houses’



- Demonstrative plural pronoun is selected as head of NP
- |H| tones of non-head constituents are replaced with |L| tone

(12) Yorno So: ‘the houses’ (floating tone on DEF)

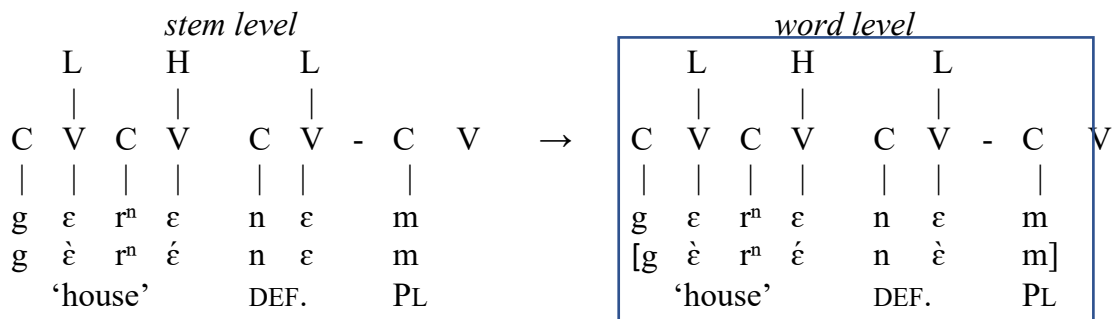


- Definite articles **cannot** be selected as head
 - therefore, the noun *gεrⁿé* ‘house’ is selected as head
- Heads do not undergo tone-lowering

From a morpho-phonological perspective we are faced with the ability of some morphemes to act as morphological heads within the noun-phrase and the inability of others to do so. Demonstratives ‘this, that, these’, may act as morphological heads (11), while definite articles ‘the’ may not (12).

- How should this be represented in the phonology? In the lexicon?
- Indexing?
- Are non-headable morphemes representationally distinct?
 - Floating tone on clitics and articles rather than associated tone as suggested in (1) and (2) = prosodically weaker?
- Do definite articles and plurals as clitics integrate the stem at word level = playing no role at phrasal level as suggested in (13)?
- Do numerals act as adjuncts rather than arguments and stand outside the phonological phrase?
- Requires further investigation.

(13) Yorno So: ‘the houses’ (clitic integration of DEF)



Conclusion

Heath (various) argues that the selection of tone-lowering morphemes and non-tone-lowering morphemes is based on semantic criteria:

“What controllers have in common is that they bisect the set of individuals denoted by a common noun” (‘house’, ‘uncle’) into two subsets, one eligible for reference and the other ineligible: “black house” versus “non-black houses”, “the house that fell” versus “houses still standing”, “this/that house” (pointing) as opposed to other houses... Non controllers do not do this. “Three houses” can consists of any set of three houses” (Heath 2022: 711)

- Though omitted from his discussion of Tonosyntax, NOUN + NOUN formations behave identically to the NOUN + ADJ and NOUN + DEM phrases discussed above, hence our desire to unite these behaviours at the phrase level.
- It may be that Tonosyntax is a synchronic phenomenon as argued by McPherson (2014) & Heath (2022), in which case the morphological compound construction schema presented in §3 may best account for the synchronic facts.
- On the other hand, Heath recognises that the current use of tone-lowering across morpho-syntactic functions “arose due to the confluence of several unrelated phenomena” beginning with the organisation of “right-headed prosodic groups” (Heath 2022: 737).

If however, behaviours attributed to syntactic categories can be reflected within phonological domains, than we may forego the interaction of the grammar across syntactic, morphological and phonological domains. As we have tentatively suggested here, richer phonological representations and phonological processes implemented over phonological strata (stems, phonological words, and phrases) easily account for tone lowering in Dogon noun compounding.

Therefore, leaving open-ended the possibility for semantically-controlled tonal variation at the phrasal level as argued for by Heath (2022) or across Semantic and Phonological domains as argued for by McPherson (2014), we would like to advance that the phonology alone appears sufficiently powerful to account for tonal effects within compounds, and, perhaps, across the Noun Phrases within Dogon more broadly.

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Annex: Map of Bandiagara (from van Eyck (1969: 174))



Acknowledgements

This research is being funded by a grant from the European Research Council (ERC) under the European Union's Horizon Europe Framework Programme (HORIZON) grant number 101045195. Our thanks to the ERC and the BANG project for financing this research and participation in this conference.