Khoekhoegowab tonal sandhi and extended projections

In Khoekhoegowab (Central Khoisan, Namibia), all lexical items are associated with one of six tonal melodies (Haacke, 1999; Brugman, 2009). Each melody comprises a sequence of at most two out of the four contrastive tone levels. However, these "citation form" melodies only occur in certain prosodic positions, to be defined below. In all other positions, an opaque process of tonal substitution occurs wherein each citation melody is mapped to an arbitrary "sandhi melody". The citation melodies and their associated sandhi forms are illustrated in (1).

(1) Citation melodies: Brugman (2009)

Citation	**Sandhi**	**Example**			**Gloss**
Superlow	Low-Falling	[!àas]	/	[ne !àà̰s]	'(this) servant'
Low	Low	[‖àas]	/	[ne ‖àas]	'(this) tie'
Low-Rising	Low-Rising	[!nàà̰s]	/	[ne !nàà̰s]	'(this) story'
High	Low-Falling	[ǂáas]	/	[ne ǂà̰à̰s]	'(this) plain'
Superhigh	High	[!nā́as]	/	[ne !náas]	'(this) tortoise'
High-Rising	Low	[ǂáā́s]	/	[ne ǂàas]	'(this) spittle'

In most syntactic contexts, sandhi affects all but the leftmost word in the XP. For example, within DPs only the leftmost word will surface with its citation melody, while all others undergo sandhi. In other words, DPs and most other XPs receive a "flat" prosodic structure, being mapped onto one sandhi domain. (In (2) and all following examples, words receiving citation melody are typeset in **bold face**; all other words receive sandhi melody.)

(2) a. **súű̄ku**
pots

b. **|ápā́** sùuku
red pots

c. **!nánī̀** |àpa sùuku
six red pots

d. **‖nāā̀** **!**nàni |àpa sùuku
those six red pots

The behavior of sandhi on verbs is considerably more complicated. Khoekhoegowab has predominantly verb-final word order; if all but the leftmost item in the VP were to undergo sandhi, we would then predict that verbs would retain their citation melody exactly when the VP is otherwise empty. This is not the case: The verb always undergoes sandhi, except in a few heterogeneous syntactic structures. This distribution has previously been claimed to depend solely on clause type (Haacke, 1999; Brugman, 2009), requiring a theory of sandhi in which the syntax marks some verbs with a diacritic making them "sandhi-resistant". Based on the results of a new production experiment, I will show that this approach is insufficient and that we can and must maintain the original prosodic generalization, namely that all but the leftmost item of a prosodic domain undergoes sandhi. In particular, my experiment shows that sandhi marking on the verb crucially depends on the position of tense marking with respect to the verb.

Khoekhoegowab expresses tense, aspect, and polarity with enclitic particles. These come in two classes: Some clitics immediately follow the verb, while others instead encliticize to some preverbal XP. I collected new production data from 4 speakers of Khoekhoegowab in order to test the effect of tense particle position on verbal sandhi. Four speakers of Khoekhoegowab were recorded reading pairs of sentences which differed only in the position of tense marking, across a variety of syntactic contexts; all of the verbs were chosen from the two tonal classes which undergo the most dramatic shift under sandhi, namely High-Rising (sandhi Low) and High (sandhi Low-Falling). The recorded verbs were extracted from the surrounding material and hand-transcribed by an experienced non-native listener blinded to the syntactic context. Additionally, principle component analysis was used to confirm that the recorded tonal contours did, in fact, form two distinct clusters.

The results of this experiment show that in matrix clauses, sandhi on the verb is triggered whenever a tense marker precedes the verb (3). Strikingly, this is true even when the tense marker is separated from the verb by a considerable distance. For example, in VP-coordination structures the single preverbal tense marker may freely occur in either the first or the second conjunct. When it occurs in the second conjunct (4-a) only the second verb undergoes sandhi; when it occurs in the first conjunct (4-b), both verbs do. This demonstrates that sandhi really does depend on linear order, not merely on the morphosyntactic identity of the tense particle.

(3) a. **|Gôã́-i** ge ra àa.
baby DECL IMPV cry
"The baby is crying."

b. **|Gôã́-i** ge **áã́** tama.
baby DECL cry NEG.NONFUT
"The baby isn't crying."

(4) a. **Dándagob** ge **ǂkhán'isa** **ǁámã́** tsi **né** khòes go mà.
D. DECL book buy and this woman PAST give
"Dandago bought the book and gave it to this woman."

b. **Dándagob** ge **ǂkhán'isa** go ǁàma tsi **né** khòes mà.
D. DECL book PAST buy and this woman give
"Dandago bought the book and gave it to this woman."

In embedded clauses, however, verbs fail to undergo sandhi even when preceded by a tense-particle:

(5) **M̓i** ta ge ra [**|gôã́b** go **mãĩ́-e** **húń̓i** -sa.]
say I DECL IMPV boy PAST pap stir -NOM
"I am saying that the boy stirred the pap."

To account for these facts, I follow López (2009) in proposing that prosodic phrasing is subject to a constraint requiring that the verb be phrased together with its extended projection (Grimshaw, 1991), which I take to include the tense marker. While in (5-b) this groups the verb *ǁama* with the tense marker preceding it, in (5-a) this constraint will require an anomalous phrasing in which the first verb forms a prosodic constituent with the second conjunct to the exclusion of first conjunct. This leaves the verb at the left edge of the phonological phrase, allowing us to maintain the generalization that sandhi affects all but the leftmost word in each phrase.

I will propose that because embedded clauses as in (5) are nominalizations (Brugman, 2009), the tense marker no longer counts as an extended projection of the verb; a prosodic markedness constraint like EqualSisters (Myrberg, 2013) forces the verb to be promoted into its own sandhi domain and receive citation form. This analysis is supported by the fact that non-nominalized embedded clauses do behave exactly like matrix clauses with respect to sandhi:

(6) **M̓i** ta ge ra [ne khoes ge **ǁgän-è** go àm ti.]
say I DECL IMPV this woman DECL meat PAST grill QUOT
"I am saying that this woman grilled the meat."

My analysis thus allows us to explain the contrast between matrix & embedded clauses while still maintaining a common generalization for sandhi in the verbal and nominal domains.

References: • Brugman, Johanna Christina. 2009. Segments, tones and distribution in Khoekhoe prosody. Doctoral Dissertation, Cornell University. • Grimshaw, Jane. 1991. Extended projection. Unpublished manuscript, Brandeis University. • Haacke, Wilfrid H. G. 1999. *The tonology of Khoekhoe (Nama/Damara).* Kŏln: Rŭdiger Kŏppe Verlag. Quellen zur Khoisan-Forschung 16. • López, Luis. 2009. Ranking the linear correspondence axiom. *Linguistic Inquiry* 40.2. • Myrberg, Sara. 2013. Sisterhood in prosodic branching. *Phonology* 30.