Minimal prosodic recursion in Khoekhoegowab

Recursivity in Phonology, Below and Above the Word

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Edges & Recursion

A common problem with identifying prosodic recursion: We often only have tests for one edge.

(1) (X (Y (Z →

a. (X) (Y) (Z)

b. (X (Y (Z)))

c. (X (Y) (Z))

d. ...

Long-distance dependencies

Khoekhoegowab provides an interesting way to partially disambiguate these options:

- A long-distance prosodic dependency exists between verbs and auxiliaries.
- This dependency can cross other prosodic dependencies **of the same type.**

Implication: Whatever prosodic grouping this corresponds to can be recursive.

Minimal recursion

But: In other aspects of the language, there exists evidence *against* allowing syntactic structure to be mapped to recursive structures.

- For example: No internal prosodic structure to DPs.

Something forces recursion in these limited contexts.

Outline

In this talk, I'll:

1. introduce Khoekhoegowab tone sandhi;
2. describe the complicated distribution of sandhi on verbs;
3. argue that this distribution indicates the presence of (minimal) prosodic recursion; and
4. show that we can (mostly) account for this recursion if we adopt certain aspects of Contiguity Theory (Richards 2016).

Background: Khoekhoe sandhi

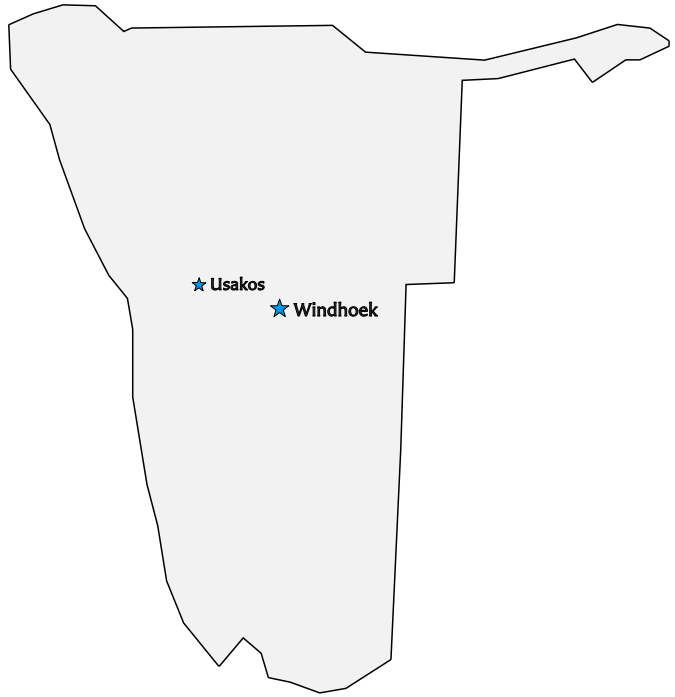
Language background

Khoekhoegowab (or Khoekhoe)

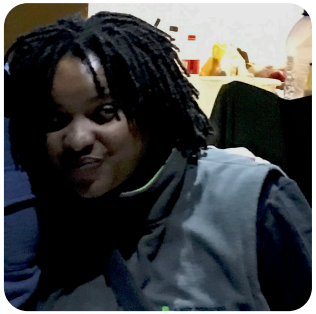
- understudied Khoe-Kwadi language
- ~200,000 people
- native to Namibia

Fieldwork

All data here comes from original fieldwork conducted in 2017 & 2019, mostly in Windhoek and some in Usakos.



Kai aios!



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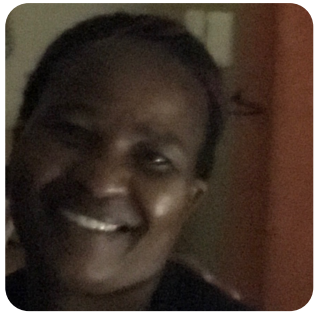

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Khoekhoe's tones

In isolation, Khoekhoe lexical vocabulary has a 6-way tonal contrast — four level tones & two contours. (Brugman 2009)

Tone		**Example**		
SH	Superhigh	/kai/	'big'	▶
H	High	/aob/	'man'	▶
L	Low	/‖ari/	'yesterday'	▶
SL	Superlow	/gomas/	'cow'	▶
H-SH	High-rising	/huni/	'stir'	▶
SL-L	Low-rising	/nesi/	'now'	▶

Khoekhoe's sandhi

Sandhi is an opaque melodic substitution process that affects each tone class differently. (Brugman 2009)

Tone		**Sandhi**	
SH	Superhigh	H	High
H	High	L-SL	Low-falling
SL	Superlow	L-SL	Low-falling
L	Low	L	Low
H-SH	High-rising	L	Low
SL-L	Low-rising	SL-L	Low-rising

Sandhi domains

Sandhi applies to all but the leftmost word in a phrase.

- e.g. in DPs, only the leftmost word keeps its citation form.

(2) a. súűku
pots

b. |ápá sùùku
red pots

c. ǁnáá |àpa sùùku
those red pots

(Brugman 2009)

The same thing happens to postpositional phrases, adverbials, etc.

Notation: what are sandhi domains?

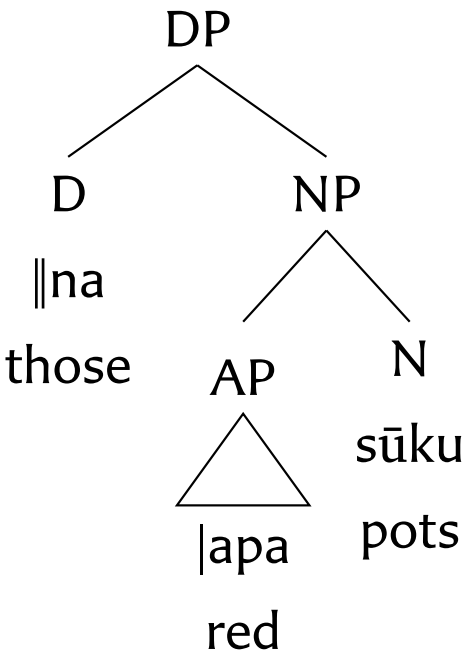
For this talk, I'm going to assume the following generalization about the distribution of sandhi:

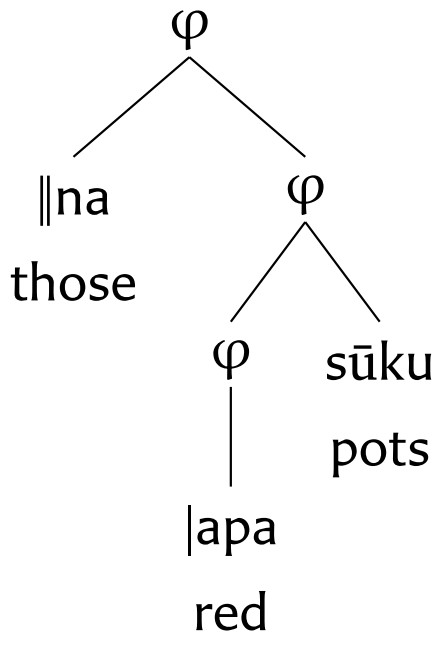
(3) Apply sandhi to all but the leftmost word in a phonological phrase (φ).

The label φ is not particularly consequential — the important part is that sandhi domains are intermediary in size between words and clauses.

Nonrecursivity in DPs

Syntactically, multi-word DPs have multiple left edges; we don't ever see all those edges in the prosody, however.





→ Prosodic recursion seems to be dispreferred.

Sandhi on verbs

A very brief tour of Khoekhoegowab syntax

Word order is broadly SOV, plus a 2nd-position clause-type clitic.

(4) Arib ge |hôasa ra saru.
dog DECL cat IMP chase
"The dog is chasing the cat."

Sandhi on verbs

If all lexical XPs are mapped to φs, we might predict that the tone on the verb would depend on the presence of an object:

(5) a. (O V) — sandhi on verb

b. (V) — no sandhi on verb

However, the reality is more complicated: Sandhi on the verb seems to depend on the position of tense marking.

Tense marking & word order

Khoekhoe fuses tense, aspect, and polarity information into a set of auxiliary particles. These come in two classes:

- Postverbal particles appear after the verb (as we would expect for a head-final language):

(6) Khoeb ge oms |kha oa tama.
man DECL home to return NEG.NF
"The man didn't return home."

- Preverbal ones encliticize to something in the middlefield (typically the immediately-preverbal element).

(7) Khoeb ge oms |kha go oa
man DECL home to PST return
"The man returned home."

Sidebar: Post-syntactic displacement

Kusmer (2019) argues that preverbal particles are displaced to that position post-syntactically.

For example: The sets are prosodically defined — monomoraic particles are preverbal, bimoraic ones are postverbal.

Preverbal particles: 1 mora

IPA	Gloss
[ra]	present stative
[ra] / [ta]	imperfect
[ke]	remote past
[ko]	recent past
[ni]	future
[ta]	negative non-finite
[ka]	irrealis

Postverbal particles: 2 moras

IPA	Gloss
[tama]	non-future negative
[tite]	future negative
[iː]	non-present stative
[hãː]	perfect

Sandhi on the verb

Whether or not the verb undergoes sandhi is entirely linked to the position of tense marking:[1]

(8) Khoeb ge oms |kha óa tama.
man DECL home to return NEG.NF
"The man didn't return home."

(9) Khoeb ge oms |kha go òǎ
man DECL home to PST return
"The man returned home."

→ The verb undergoes sandhi if and only if it is preceded by tense.

[1] Things work a bit differently in embedded clauses; feel free to ask me later.

Sandhi at a distance

This is true even when tense and the verb are not adjacent.

(10) a. Aob ge [mai-e húní́] tsi [‖gan-e áḿ́] tama.
man DECL pap stir and meat grill NEG.NF

b. Aob ge [mai-e húní́] tsi [‖gan-e go àm.]
man DECL pap stir and meat PST grill

c. Aob ge [mai-e go hùni] tsi [‖gan-e àm.]
man DECL pap PST stir and meat grill
“The man did(n’t) stir the pap and grill the meat.”

Phrasing the verb

One way to describe this pattern: The verb always prosodically phrases together with its tense marking.

(11) a. Aob ge mai-e (húnǐ tsi ‖gan-e go àm.)
man DECL pap stir and meat PST grill

b. Aob ge (mai-e go hùni tsi ‖gan-e àm.)
man DECL pap PST stir and meat grill
“The man stirred the pap and grilled the meat.”

This lets us maintain the generalization that sandhi applies to all but the leftmost word in its domain.

Recursivity!

But: This position of tense marking doesn't change the phrasing of DPs — the second object here receives its own φ.

(12) Aob ge mai-e (húní́ tsi (ǁgàn-e) go àm.)
man DECL pap stir and meat PST grill
"The man stirred the pap and grilled the meat."

→ If we maintain that DP-sandhi & verb-sandhi are both sensitive to the same domain, then that domain must be recursive.

Recursivity, cont'd

Alternatively, if you aren't convinced that verb-sandhi and DP-sandhi should be treated the same way, verb-sandhi itself involves recursion in the postverbal tense case:

(13) Aob ge mai-e (húní tsi ‖gan-e (áḿ tama)).
man DECL pap stir and meat grill NEG.NF
"The man didn't stir the pap and grill the meat."

Interim summary

- Most of the time, Khoekhoegowab resists recursive prosodic structure — DPs are flattened, for instance.
- Verbs always phrase together with tense marking, wherever that tense marking occurs.
- Achieving this phrasing for the verb requires at least some minimal recursion.

Some analysis

Violable constraints

This looks like a job for OT: “Don’t recurse, except where necessary to phrase the verb and tense marking together.”

(14) NoRecursion: Assign one violation to each φ contained in another φ. (*φ_{NonMax})

(15) ǁnáā̋ |àpa sùùku

those red pots

[ǁnā [[|apa] sūku]]	NoRec	M-XP	M-φ
a. ☞ (ǁnā |apa sūku)	0	2	0
b. (ǁnā ((|apa) sūku))	2	0	0
c. (ǁnā) (|apa) (sūku)	0	2	2

Contiguity Theory

Richards (2016) develops a theory of Contiguity: Certain syntactic relationships *beyond constituency* must be preserved in the prosody.

- For example, agreement between C^0 and a *wh* item.
- Richards uses this to explain certain typological correlations between prosodic and syntactic factors.
- For example: *wh* movement, for Richards, serves to bring the *wh* item and C^0 into a particular *prosodic* relationship, not a syntactic one.

Prominence

Key to Richards' framework is the asymmetry of the syntactic relations he considers — e.g. probe & goal in *wh* agreement.

- This asymmetry is part of what is preserved in the prosody: Not only must probe & goal be in the same prosodic constituent, but the goal must be more "prominent".
- A word is considered "prominent" if it is sitting at a prosodically-active boundary (i.e. receives prosodic marking — tone, lengthening, accent, etc.).

Prominence in Khoekhoegowab

In Khoekhoegowab, the left edge of φ is prominent in the sense that it is marked — there is no cue to right edges.

- This left edge is also the position that preserves the 6-way tonal contrast.

Generalized Contiguity

If α either agrees with or selects β, α & β must be dominated by a single prosodic node, within which β is Contiguity-prominent. (Richards 2016)

For Khoekhoe, we don't need the full power of Generalized Contiguity; instead, I'll tie Contiguity in this case to the notion of Extended Projections.[2] (Grimshaw 1991)

(16) ExtendedProjection: If α is in the Extended Projection of β, assign one violation if there is no φ containing α & β in which β is prominent.

(cf. López 2009)

[2] Richards sees EP-relations as a subset of "selection", and in fact explicitly postpones consideration of other selection relations.

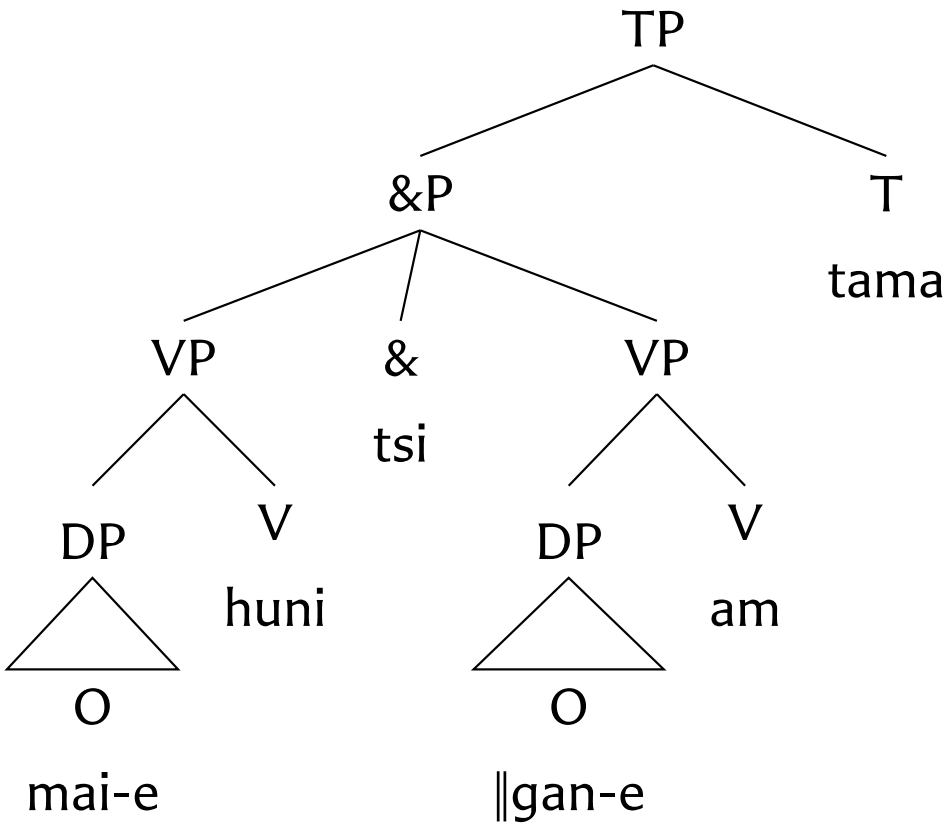
ExtendedProjection, illustrated

Since T is in the Extended Projection of the verb, this constraint will prefer structures where V & T are grouped, and V is at the left edge of that φ:

	...V...T...	ExtendedProjection
a. ☞	...(V...T...)	0
b.	(...V...T...)	1
c.	...(V...)T...	1

The structure of coordination

(17) Aob ge mai-e huni tsi ǁgan-e am tama.
man DECL pap stir and meat grill NEG.NF
"The man didn't stir the pap and grill the meat."



Postverbal tense

Looking first at a postverbal tense marker:

[[[O] V] & [[O] V] T]	ExtProj	NoRec	M-XP	M-φ
a. ☞ (O) (V & (O) (V T))	0	2	3	2
b. (O) (V & (O) V T)	1!	1	3	1
c. (O) V & (O) V T	2!	0	3	0

Late preverbal tense

If the tense marker precedes the verb, ExtendedProjection cannot be satisfied: Only left edges are active, so there cannot be a φ that contains both with V at its left edge.

[[[O] V] & [[O] V] T]	ExtProj	NoRec	M-XP	M-φ
a. ☞ (O) (V & (O) T V)	1	2	3	1
b. (O) (V & (O) (T V))	1	2	3	2!
c. (O) V & (O) V T	2!	0	3	0

Early preverbal tense

[[[O] V] & [[O] V] T]	ExtProj	NoRec	M-XP	M-φ
a. ☞ (O) T V & (O) V	2	0	3	0
b. (O) (T V & (O) V)	2	2	3	1!

A problem

There's a problematic candidate that this set of constraints can't rule out:

[[[O] V] & [[O] V] T]	ExtProj	NoRec	M-XP	M-φ
a. ☞ (O) (V & (O) T V)	1	1	3	1
b. ☹ (O) (V & O T V)	1	0	4	1

We can satisfy NoRecursion by demoting the second object, with no penalty to the high-ranked ExtendedProjection.

What went wrong

I said earlier that the generalization was “Don’t recurse, except where necessary to group the verb and tense.”

But a better generalization would be: “Don’t recurse, except where necessary to group the verb and tense **while still grouping other XPs**.”

That last clause makes this quite hard to handle in a violable-constraint framework.

Some possible solutions

I can see a couple of possible solutions:

- **Spellout by phase**: DPs (and other sorts of middlefield XPs) are phases, and are spelled out early; later phases cannot destroy prosodic structure created in early ones.

→ The problematic candidate just isn't in the set.

- **DPs are also EPs**: DPs are their own Extended Projections, so the constraint ExtendedProjection applies to them.
- Getting this to work involves getting into the weeds of DP syntactic structure, and also probably expanding to full Generalized Contiguity (Richards 2016).

→ The problematic candidate also violates high-ranked ExtendedProjection.

Takeaways

Khoekhoegowab seems to allow only limited recursion of sandhi domains.

- Even though we only have tests for one edge of the domain, long-distance relationships let us infer the presence of recursive domains.
- But recursive structure seems dispreferred: Nested constituents in the syntax become flat constituents in the prosody.
- There's some relation — maybe Extended Projection — that Khoekhoe tries to represent in the prosody, even if it incurs recursive domains in doing so.

(18) Kấi àios!

big thanks

“Thank you very much!”

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