The Mirror Principle and Pseudo-cyclicity in Bantu Templatic Morphology

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Introduction

The Mirror Principle and Cyclic Concatenation

- Commonly held view of the syntax-morphology interface:

(1) **The Mirror Principle [MP]:** "Morphological derivations must directly reflect syntactic derivations (and vice versa)." (Baker 1985)

  - i.e., the linear order of morphological exponents within a word should reflect the constituent structure of the (morpho)syntax.

- The MP is usually implemented via cyclic morphological concatenation:

(2) Procedure for cyclic concatenation

Step 1: Attach the first affix that combines with the root.
Step 2: Attach the next affix that combines with the root. (repeat)

Introduction

Morphological Templates

- One *prima facie* challenge to the MP and cyclic concatenation is morphological templates:

(3) **Morphological Templates:** Morphemes always appear in a particular order, regardless of structure/scope.

- A famous example is the "CARP template" in Bantu (Hyman & Mchombo 1992:350, Hyman 2003b:247, Good 2005, *a.o.*):

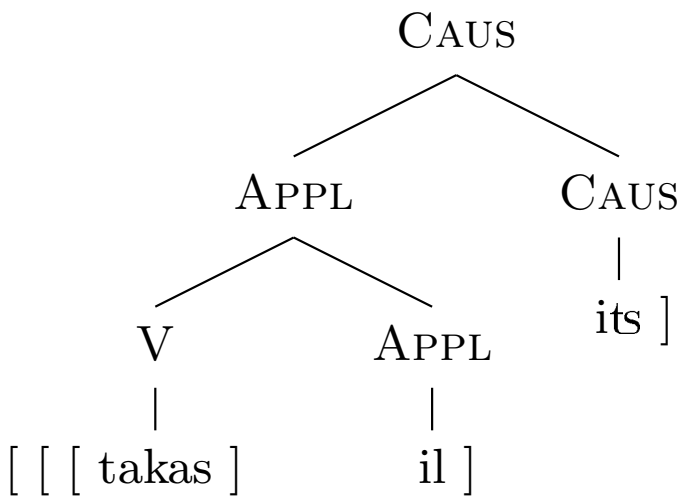
(4) **CARP template:** Causative-Applicative-Reciprocal-Passive

Introduction

CARP: Causative and Applicative in Chichewa

- The only way to form a Causativized Applicative (5) in Chichewa (Mchombo 2004) is in accordance with the CARP template (6a).

(5) Causativized Applicative



(6) a. **CARP order ✓**
takas-its-il-
stir-CAUS-APPL-
'cause to [stir with]'

b. **Mirror/Cyclic order ✗**
**takas-il-its-*
stir-APPL-CAUS-
intended: 'cause to [stir with]'

(Hyman 2003b:248)

⋆ Patterns like this tell us that cyclic concatenation can't be the whole story.

Introduction

The Syntax of Root-Caus-Appl Orders in Chichewa

- Nevertheless, syntactic evidence confirms that the (morpho)syntactic structures remain contrastive even when ordering is neutralized:

- When CARP order has Applicativized Causative interpretation, and gets passivized, only the Applicative argument can be promoted to subject (7).

(7) **Applicativized Causatives** (Hyman 2003b:260, ex. 22; Zukoff 2023:416)

a. Mchómbó a-ná-líl-**its-il**-a [$_{\text{CAUSEE}}$ aná] [$_{\text{APPL}}$ ndodo]
'Mchombo made the children cry with a stick'

b. [$_{\text{APPL}}$ ndodo] i-ná-líl-**its-il**-idw-á [$_{\text{CAUSEE}}$ aná]
'a stick was used to make the children cry'

c. ?* [$_{\text{CAUSEE}}$ aná] a-ná-líl-**its-il**-idw-á [$_{\text{APPL}}$ ndodo]
'the children were made to cry with a stick'

Introduction

The Syntax of Root-Caus-Appl Orders in Chichewa

- When CARP order has Causativized Applicative interpretation, and gets passivized, only the Causee can be promoted to subject (8).

(8) **Causativized Applicatives** (Hyman 2003b:260, ex. 23; Zukoff 2023:417)

a. Mchómbó a-ná-lím-**its-il**-a [$_{\text{CAUSEE}}$ aná] [$_{\text{APPL}}$ makásu]
'Mchombo made the children cultivate with hoes'

b. [$_{\text{CAUSEE}}$ aná] á-ná-lím-**its-il**-idw-á [$_{\text{APPL}}$ makásu]
'the children were made to cultivate with hoes'

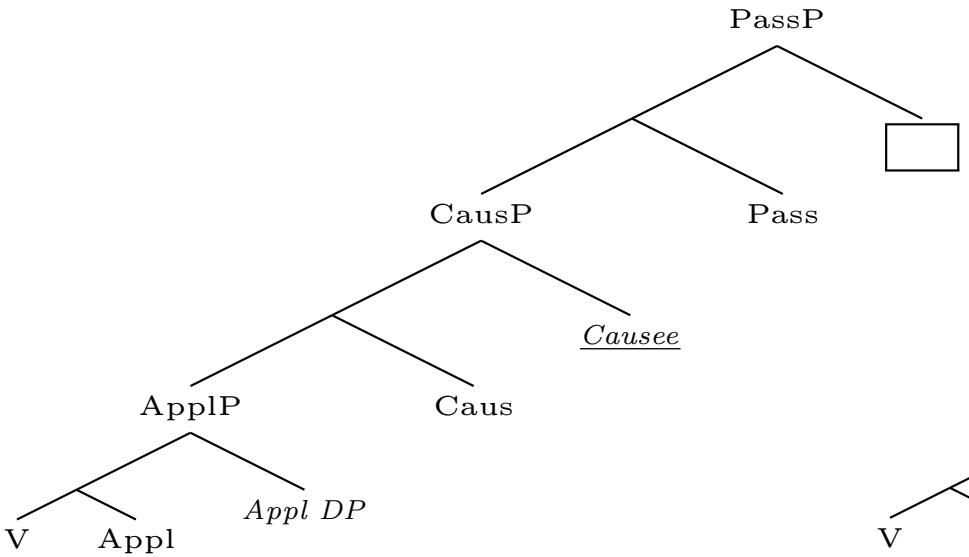
c. ?* [$_{\text{APPL}}$ makásu] a-ná-lím-**its-il**-idw-á [$_{\text{CAUSEE}}$ aná]
'hoes were used to make the children cultivate'

Introduction

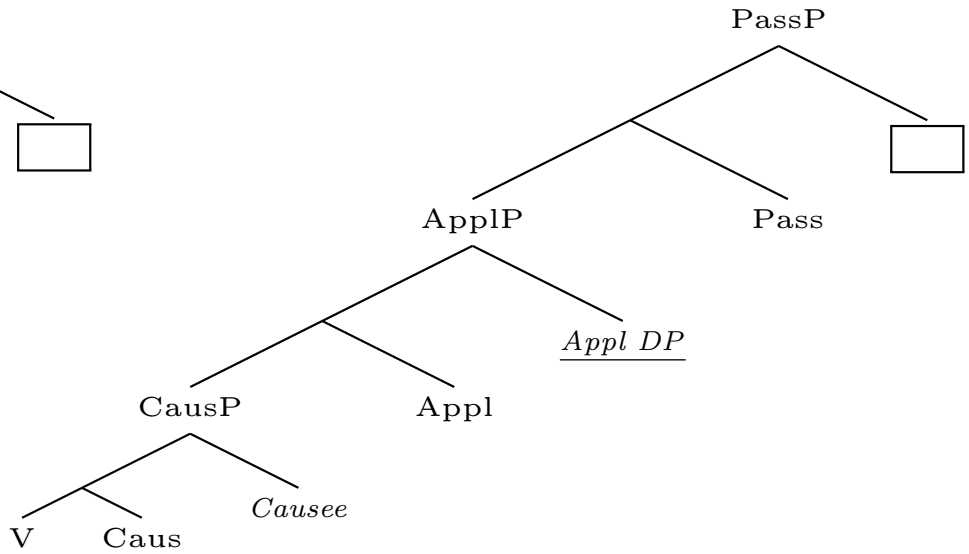
The Syntax of Root-Caus-Appl Orders in Chichewa

- Only the syntactically highest argument can move to subject.
  - → There must truly be distinct syntactic structures underlying the ambiguous surface form of the verb word.

(9) Applicativized Causative (= (7))



(10) Causativized Applicative (= (8))



Introduction

Goals of this talk

- The goal of this talk is to resolve this tension between the Mirror Principle and morphological templates.
  - **Empirical focus:** two kinds of ordering alternations in Chichewa (Mchombo 2004), and opacity in Nyakyusa (Persohn 2017).
- The solution is to allow structure to influence the derivation without employing a literally cyclic model.

Introduction

Components of the framework

- Order is determined ***in parallel***, *in the phonological component* primarily by the interaction between two constraint types:

  1. Bigram morphotactic constraints (Ryan 2010) favoring arbitrary templatic orders.

     ↪ **Morphological templates**

  2. CONTIGUITY-BD (cf. McCarthy & Prince 1995, Benua 1997) favoring faithfulness to base orders.

     ↪ **Mirror Principle**

∗ In Zukoff (2021, 2023), I primarily use Alignment constraints (McCarthy & Prince 1993) to derive MP behavior. They are not needed for the cases presented here, so I show the simpler model using just CONTIGUITY-BD.

Roadmap

1. Introduction

2. **Asymmetric Compositionality in Chichewa**
   Interpretive asymmetries between CARP forms and non-CARP forms

3. **Suffix Doubling in Chichewa**
   Restricted suffix doubling and associated asymmetric compositionality

4. **Overapplication opacity in Nyakyusa**
   Unexpected application of phonology in CARP forms dependent on structure

5. **Conclusion**

Asymmetric Compositionality in Chichewa

Causative and Reciprocal in Chichewa

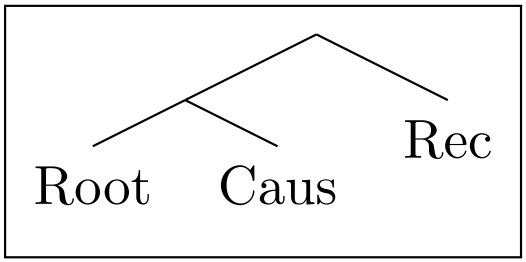
- We'll start by considering forms with Causative and Reciprocal.

(11) a. Causative ⇔ /its/
b. Reciprocal ⇔ /an/
c. $\sqrt{tie}$ ⇔ /mang/

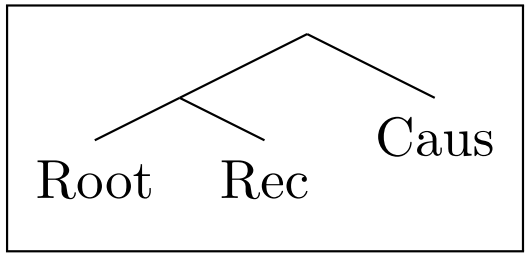
- Chichewa allows both structural combinations of these two morphemes, yielding distinct interpretations:

(12) Permissible structures with Caus and Rec

a. *Reciprocalized Causative*



b. *Causativized Reciprocal*



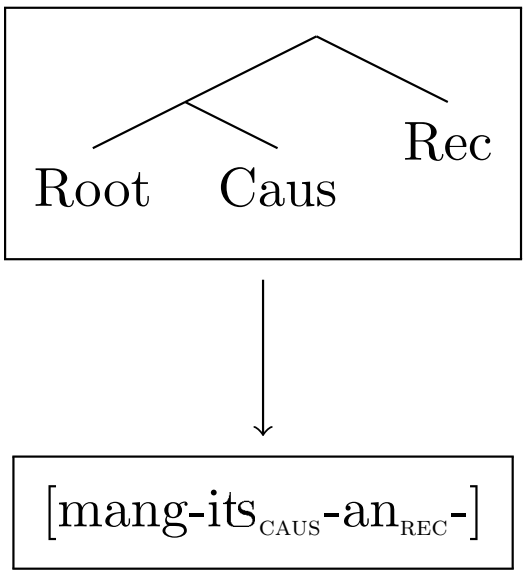
Asymmetric Compositionality in Chichewa

Mirror Orders

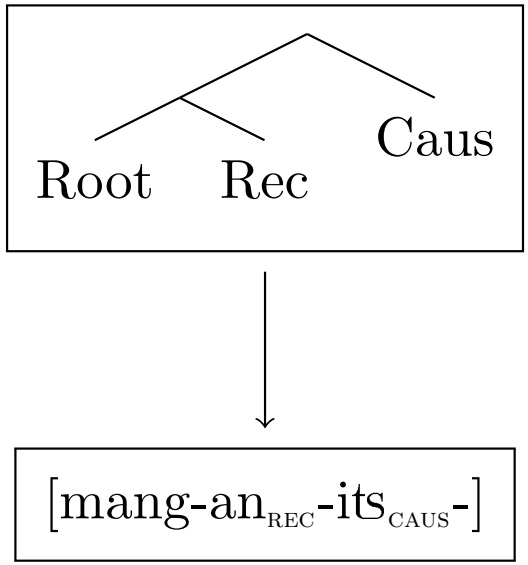
- The orders expected via MP / cyclic concatenation are grammatical:

(13) Cyclic/mirror mappings permissible

a. *Reciprocalized Causative*



b. *Causativized Reciprocal*



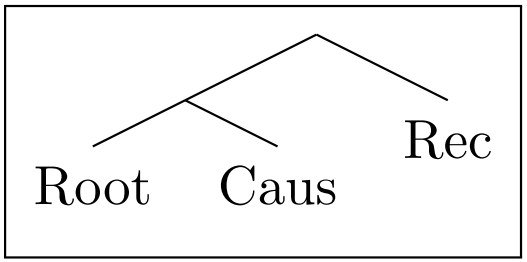
Asymmetric Compositionality in Chichewa

CARP Orders

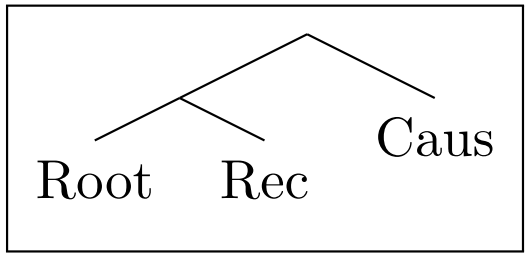
- The Causativized Reciprocal can alternatively have the order [Root-Caus-Rec].
  → This violates the Mirror Principle, but obeys the CARP template.

(14) CARP-obeying, Mirror-violating mapping permissible

a. *Reciprocalized Causative*



b. *Causativized Reciprocal*



[mang-its$_{\text{CAUS}}$-an$_{\text{REC}}$-]

[mang-an$_{\text{REC}}$-its$_{\text{CAUS}}$-]

CARP

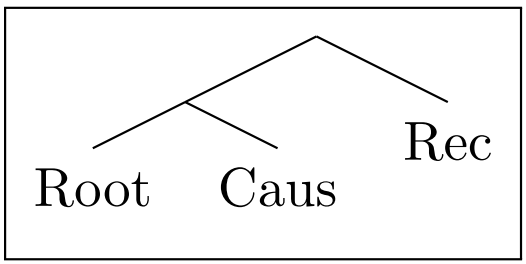
Asymmetric Compositionality in Chichewa

No Anti-CARP Orders

- The Reciprocalized Causative *can't* have MP-violating order [Root-Rec-Caus].
  → Only CARP can induce MP violations.

(15) No Anti-CARP mappings

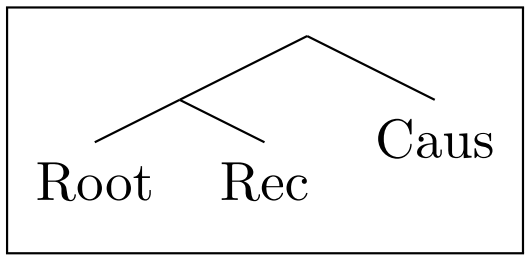
a. *Reciprocalized Causative*



[mang-its$_{\text{CAUS}}$-an$_{\text{REC}}$-]

CARP

b. *Causativized Reciprocal*



[mang-an$_{\text{REC}}$-its$_{\text{CAUS}}$-]

Anti-CARP

Asymmetric Compositionality in Chichewa

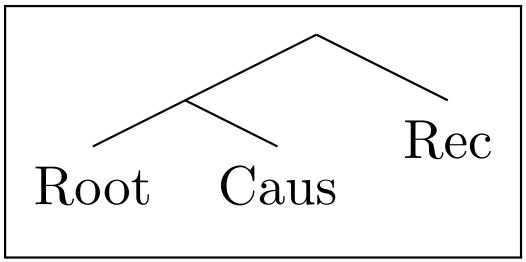
Asymmetric Compositionality

- Hyman (2003b) calls this "**asymmetric compositionality**".
  - Structures whose MP orders violate CARP are linearly ambiguous.
  - Orders that obey CARP are structurally/semantically ambiguous.

→ Order-structure pairs that violate both CARP and MP are not allowed.

(16) Asymmetric compositionality

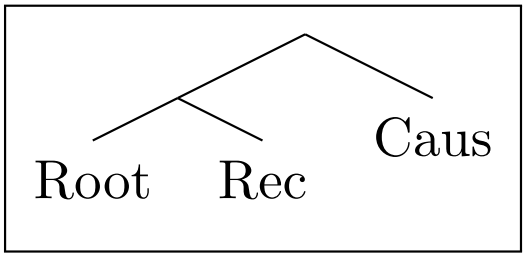
a. *Reciprocalized Causative*



[mang-its$_{\text{CAUS}}$-an$_{\text{REC}}$-]

CARP

b. *Causativized Reciprocal*



[mang-an$_{\text{REC}}$-its$_{\text{CAUS}}$-]

Anti-CARP

Asymmetric Compositionality in Chichewa

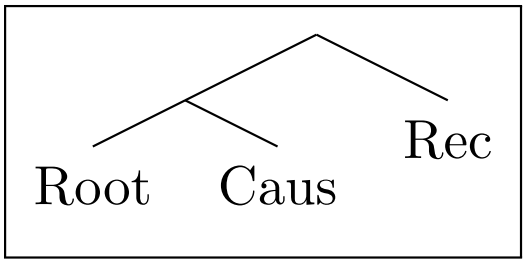
What do we need our theory to do?

- Our theory of morpheme ordering must derive two types of mappings:

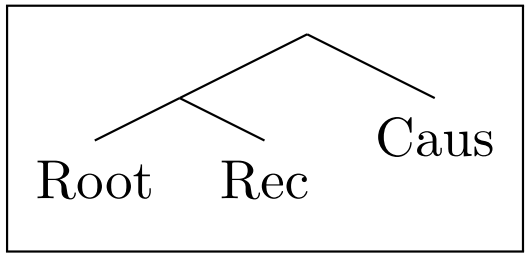
(17) a. MP-obeying mappings, regardless of structure (solid lines)
b. CARP-obeying mappings, regardless of structure (dashed lines)

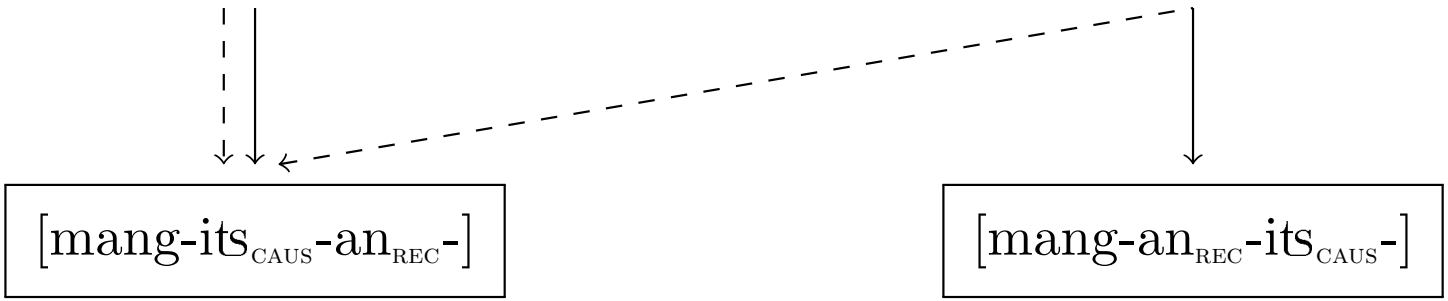
(18) Required mappings

a. *Reciprocalized Causative*



b. *Causativized Reciprocal*





CARP **Anti-CARP**

Asymmetric Compositionality in Chichewa

Proposal

⋆ There is no obvious way to do this using cyclic concatenation alone.

- I propose to account for these mappings through the parallel interaction of two types of constraints:

(19) a. **Bigram morphotactic constraints** (Ryan 2010)
↪ Responsible for CARP orders

b. **CONTIGUITY-BD** (cf. McCarthy & Prince 1995, Benua 1997)
↪ Responsible for MP orders via faithfulness to order of the base

- The alternations inherent to asymmetric compositionality are derived through variable ranking.

∗ I assume that morphemes are *unordered* in the phonological input (McCarthy & Prince 1993, Zukoff 2023). All order is determined through constraint interaction.

Asymmetric Compositionality in Chichewa

CARP and Bigram Morphotactic Constraints

- CARP mappings can be accounted for using "bigram morphotactic constraints" (Ryan 2010): constraints that prefer specific orders between pairs of morphemes.

- To generate the preference for, e.g., Root-Caus-Rec orders over Root-Rec-Caus orders:

(20) **Caus-Rec:** When exponents of Causative and Reciprocal are both present in the output, assign a violation if an exponent of Causative is not followed by an exponent of Reciprocal.

(21) **Rec-Caus:** When exponents of Causative and Reciprocal are both present in the output, assign a violation if an exponent of Reciprocal is not followed by an exponent of Causative.

(22) **Ranking:** Caus-Rec $\gg$ Rec-Caus

Asymmetric Compositionality in Chichewa

Bigram Constraints and Fixed Ordering

- If a derivation contained only these bigram constraints, it would select the CARP-obeying order, regardless of the underlying structure.

(23) **Generating the CARP order:** *mang-its-an-* (Root-Caus-Rec)

/mang$_{\text{ROOT}}$, its$_{\text{CAUS}}$, an$_{\text{REC}}$/	Caus-Rec	Rec-Caus
a. ☞ mang-its-an- (Root-Caus-Rec)		*
b. mang-an-its- (Root-Rec-Caus)	*!	

- Some Bantu languages are rigidly CARP obeying (e.g. Chimwiini, Abasheikh 1978; Kinyarwanda, Banerjee 2019). These languages would have invariably undominated bigram constraints.

Asymmetric Compositionality in Chichewa

Base-Derivative Correspondence and Pseudo-Cyclicity

⋆ *How can we get MP orders coexisting with templatic orders?*

- Traditional cyclic/stratal phonological frameworks build up complex forms by adding one affix at a time, i.e. "cyclic concatenation".
  - e.g. *SPE* (Chomsky & Halle 1968), Lexical Phonology (Kiparsky 1982), Distributed Morphology, (Halle & Marantz 1993), Stratal OT (Kiparsky 2000, Bermúdez-Otero 2018)

- Base-Derivative Correspondence (Benua 1997, *et seq.*) is "pseudo-cyclic":
  - Cyclic effects arise through correspondence and faithfulness to a morphological base.
  - This allows for fully parallel constraint interaction in the derivation of affix order in complex derivatives.

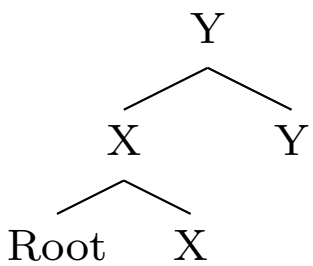
→ I adopt the parallel, BD-Correspondence model here (cf. Zukoff 2023) because it will uniquely allow for "cyclic" affix order to be *variable*.

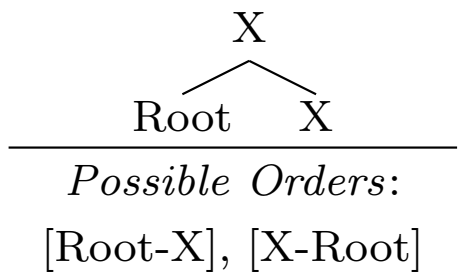
Asymmetric Compositionality in Chichewa

Contiguity-BD and Basehood

- The "base" in BD-Correspondence will be the output form exponing the immediate morphosyntactic subconstituent of the complex derivative:

(24) Structure of the derivative ⇒ (25) Structure of the base





- Cyclic (i.e. MP-obeying) order can be enforced using the 𝔽 constraint Contiguity (McCarthy & Prince 1995), defined over the BD corr. relation:

(26) **Contiguity-BD:** Assign one violation for each pair of segments which are adjacent in the base but not adjacent in the derivative.

→ Crucially, this is a *violable* constraint, so non-cyclic orders can be induced by constraint conflict.

Asymmetric Compositionality in Chichewa

Deriving Chichewa's Mirror Principle behavior

- The two different MP orders can be derived by CONTIGUITY-BD, as shown in (27) and (28).

(27) **Reciprocalized Causative** *mang-its-an-* (Root-Caus-Rec)

BASE: [$\text{mang}_{\text{ROOT}}$-$\text{its}_{\text{CAUS}}$-] [[Root]Caus] INPUT: /$\text{mang}_{\text{ROOT}}$, its_{CAUS}, an_{REC}/ [[[Root]Caus]Rec]	CONTIGUITY-BD
a. ☞ mang-its-an- (Root-Caus-Rec)	
b. mang-an-its- (Root-Rec-Caus)	*!

(28) **Causativized Reciprocal** *mang-an-its-* (Root-Rec-Caus)

BASE: [$\text{mang}_{\text{ROOT}}$-$\text{an}_{\text{REC}}$-] [[Root]Rec] INPUT: /$\text{mang}_{\text{ROOT}}$, its_{CAUS}, an_{REC}/ [[[Root]Rec]Caus]	CONTIGUITY-BD
a. mang-its-an- (Root-Caus-Rec)	*!
b. ☞ mang-an-its- (Root-Rec-Caus)	

Asymmetric Compositionality in Chichewa

Variable Ranking Generates Asymmetric Compositionality

- Asymmetric compositionality is derived through ranking variation.

⋆ The active bigram constraint and CONTIGUITY-BD are "underlyingly" unranked. The variable ranking is resolved any given derivation:

(29) a. Bigram ≫ CONTIGUITY ⇒ CARP order
b. CONTIGUITY ≫ Bigram ⇒ MP order

- When the structure is "CARP-obeying", these two coincide.
  → This is the source of the asymmetry.

Asymmetric Compositionality in Chichewa

Variable Ranking with "CARP-obeying" Structure

- When Rec is structurally higher than Caus (Reciprocalized Causative), MP-order is CARP-obeying.
  - Base order is [Root-Caus], so CONTIG prefers Root-Caus-Rec order.
  - Active bigram is CAUS-REC, which prefers Root-Caus-Rec order.

→ Since the constraints prefer the same order (no constraint conflict), there is no order variation, regardless of how the ranking is resolved.

Asymmetric Compositionality in Chichewa

Variable Ranking with "CARP-obeying" Structure

(30) **CARP input:** Bigram ≫ CONTIG ⇒ *mang-its-an-* (Root-Caus Rec)

BASE: [mang$_{\text{ROOT}}$-its$_{\text{CAUS}}$-] [[Root]Caus] INPUT: /mang$_{\text{ROOT}}$, its$_{\text{CAUS}}$, an$_{\text{REC}}$/ [[[Root]Caus]Rec]	CAUS-REC	CONTIGUITY-BD
a. ☞ mang-its-an- (Root-Caus-Rec)		
b. mang-an-its- (Root-Rec-Caus)	*!	*!

(31) **CARP input:** CONTIG ≫ Bigram ⇒ *mang-its-an-* (Root-Caus Rec)

BASE: [mang$_{\text{ROOT}}$-its$_{\text{CAUS}}$-] [[Root]Caus] INPUT: /mang$_{\text{ROOT}}$, its$_{\text{CAUS}}$, an$_{\text{REC}}$/ [[[Root]Caus]Rec]	CONTIGUITY-BD	CAUS-REC
a. ☞ mang-its-an- (Root-Caus-Rec)		
b. mang-an-its- (Root-Rec-Caus)	*!	*!

Asymmetric Compositionality in Chichewa

Variable Ranking with "CARP-violating" Structure

- When Caus is structurally higher than Rec (Causativized Reciprocal), the MP-order is CARP-*violating*.

  → CONTIG and bigram prefer different outputs, hence, order variation.

(32) **Non-CARP input:** Bigram ≫ CONTIG ⇒ *Output*: Root-Caus-Rec

BASE: [mang$_{ROOT}$-an$_{REC}$-] [[Root]Rec] INPUT: /mang$_{ROOT}$, its$_{CAUS}$, an$_{REC}$/ [[[Root]Rec]Caus]	CAUS-REC	CONTIGUITY-BD
a. ☞ mang-its-an- (Root-Caus-Rec)		*
b. mang-an-its- (Root-Rec-Caus)	*!	

(33) **Non-CARP input:** CONTIG ≫ Bigram ⇒ ***Output*: Root-Rec-Caus**

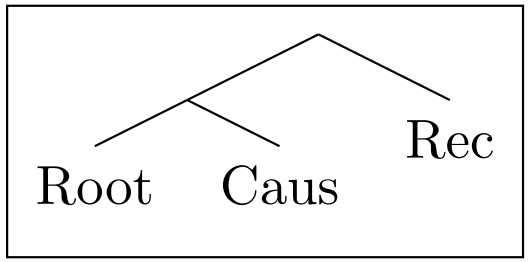
BASE: [mang$_{ROOT}$-an$_{REC}$-] [[Root]Rec] INPUT: /mang$_{ROOT}$, its$_{CAUS}$, an$_{REC}$/ [[[Root]Rec]Caus]	CONTIGUITY-BD	CAUS-REC
a. mang-its-an- (Root-Caus-Rec)	*!	
b. ☞ mang-an-its- (Root-Rec-Caus)		*

Asymmetric Compositionality in Chichewa

Local Summary

(34) Permissible mappings between structure and order

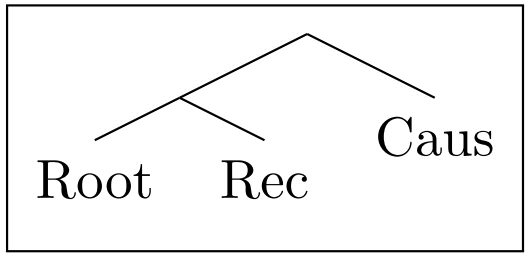
a. *Reciprocalized Causative*



(30) (31)

[mang-its$_{\text{CAUS}}$-an$_{\text{REC}}$-]

b. *Causativized Reciprocal*



(32) (33)

[mang-an$_{\text{REC}}$-its$_{\text{CAUS}}$-]

- CARP bigram (Caus-Rec) ranks higher ⇒ CARP order (dashed lines)
- Contig ranks higher ⇒ Mirror Principle order (solid lines)

  ↪ Only way to get CARP-violating order (33).

Asymmetric Compositionality in Chichewa

Local Conclusions

- Integrating Contiguity-BD + bigrams resolves the tension between the Mirror Principle and morphological templates.
- Asymmetric compositionality falls out from the way that structure interacts with ranking variability.

- This approach requires parallel constraint interaction, partially dependent on structure (via base selection).
- Cannot be replicated with cyclic concatenation.

Roadmap

1. **Introduction**

2. **Asymmetric Compositionality in Chichewa**
   Interpretive asymmetries between CARP forms and non-CARP forms

3. **Suffix Doubling in Chichewa**
   Restricted suffix doubling and associated asymmetric compositionality

4. **Overapplication opacity in Nyakyusa**
   Unexpected application of phonology in CARP forms dependent on structure

5. **Conclusion**

Suffix Doubling in Chichewa

Applicative and Reciprocal in Chichewa

- Unlike with the combination of Causative and Reciprocal, Chichewa does not allow the CARP-violating MP order for an Applicativized Reciprocal:

(35) a. **CARP order ✓**
mang-il-an-
tie-APPL-REC-
'tie each other for/at'

(Hyman 2003b:253)

b. **Mirror order ✗**
**mang-an-il-*
tie-REC-APPL-
intended: 'tie each other for/at'

(36) Applicative ⇔ /il/

Suffix Doubling in Chichewa

Fixed Ordering and Bigrams

- This is an instance of "fixed ordering" (Ryan 2010), as opposed to asymmetric compositionality.
- Fixed ordering can be generated by having the bigram invariably outrank Contiguity-BD.
- In this case, the relevant bigram constraint is Appl-Rec:

(37) **Appl-Rec:** When exponents of Applicative and Reciprocal are both present in the output, assign a violation if an exponent of Applicative is not followed by an exponent of Reciprocal.

Suffix Doubling in Chichewa

Deriving Fixed Ordering of Applicative and Reciprocal

- For the Reciprocalized Applicative, CARP order satisfies Contig:

(38) **CARP input:** Bigram ≫ Contig ⇒ *Output*: Root-Appl-Rec

Base: [mang$_{\text{ROOT}}$-il$_{\text{APPL}}$-] [[Root]Appl] Input: /mang$_{\text{ROOT}}$, il$_{\text{APPL}}$, an$_{\text{REC}}$/ [[[Root]Appl]Rec]	Appl-Rec	Contiguity-BD
a. ☞ mang-il-an- (Root-Appl-Rec)		
b. mang-an-il- (Root-Rec-Appl)	*!	*

- For the Applicativized Reciprocal, CARP order violates Contig:

(39) **Non-CARP input:** Bigram ≫ MAP ⇒ *Output*: Root-Appl-Rec

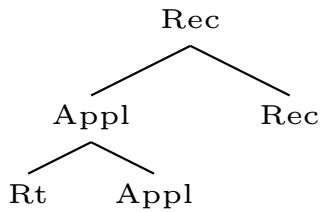
Base: [mang$_{\text{ROOT}}$-an$_{\text{REC}}$-] [[Root]Rec] Input: /mang$_{\text{ROOT}}$, il$_{\text{APPL}}$, an$_{\text{REC}}$/ [[[Root]Rec]Appl]	Appl-Rec	Contiguity-BD
a. ☞ mang-il-an- (Root-Appl-Rec)		*
b. mang-an-il- (Root-Rec-Appl)	*!	

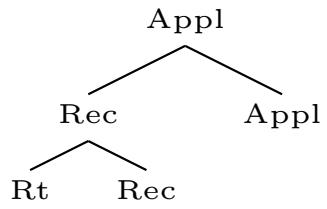
Suffix Doubling in Chichewa

Suffix Doubling

- There's one more licit output involving Applicative and Reciprocal:

(40) Permitted orderings of Applicative /il/ + Reciprocal /an/ in Chichewa





Single exponents				
a.	APPL-REC (CARP)	*mang-il-an-*	✓ (MP)	✓
b.	REC-APPL	*mang-an-il-*	✗	✗ (MP)
Doubled exponents				
c.	APPL-REC-APPL	*mang-il-an-il-*	✗	✗
d.	REC-APPL-REC	*mang-an-il-an-*	✗	✓

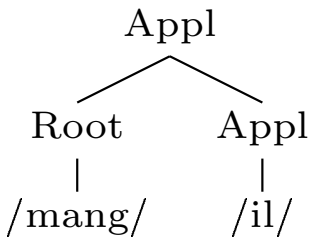
(Hyman & Mchombo 1992:351ff., Hyman 2003b:253ff.)

Suffix Doubling in Chichewa

Structure and (Pseudo-)Cyclicity in Suffix Doubling

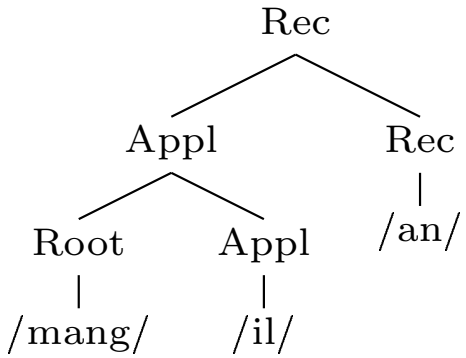
(41) **Applicative first structures**

a. Applicative *mang-il-*



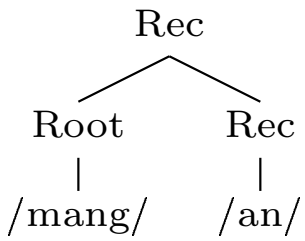
b. Reciprocalized Applicative

mang-il-an-



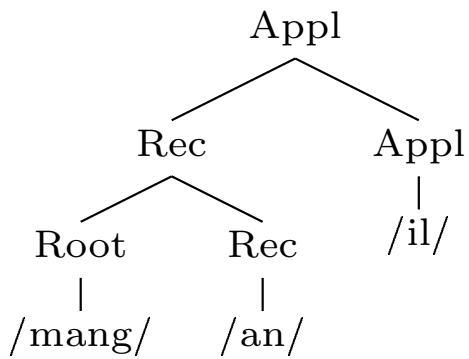
(42) **Reciprocal first structures**

a. Reciprocal *mang-an-*



b. Applicativized Reciprocal

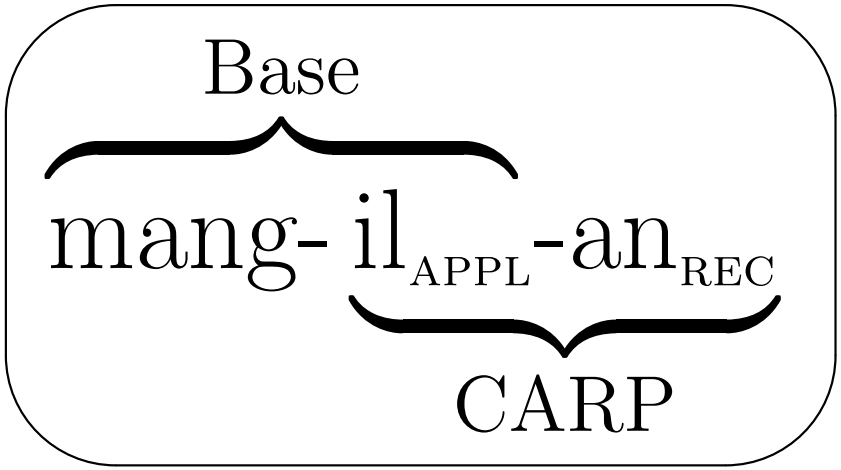
**mang-an-il-* → *mang-an-il-an-*



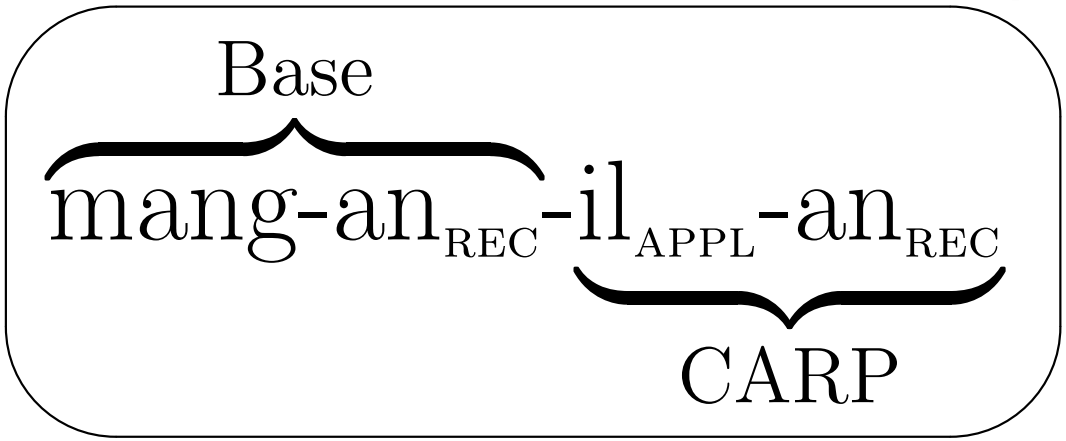
Suffix Doubling in Chichewa

Have your CARP and eat it too

(43) Reciprocalized Applicative (cf. Applicative [mang-il$_{\text{APPL}}$])



(44) Applicativized Reciprocal (cf. Reciprocal [mang-an$_{\text{REC}}$])



Suffix Doubling in Chichewa

Analyzing Suffix Doubling

- Contiguity-BD will prefer maintaining the base order in the derivative.
  - i.e., it penalizes having a different affix adjacent to the Root.

- Doubling is penalized by an Input-Output faithfulness constraint against splitting: Integrity (McCarthy & Prince 1995).

(45) **Integrity-IO:** Assign one violation for each segment in the input with multiple correspondents in the output.

⋆ Placing these two constraints in a variable ranking relation induces alternation between the doubling form and the simple CARP form.

Suffix Doubling in Chichewa

Variation between Suffix Doubling and CARP for the Applicativized Reciprocal

(46) **Non-CARP input:** CONTIGUITY-BD ≫ INTEGRITY-IO ⇒ *doubling*

BASE: [mang$_{ROOT}$-an$_{REC}$-] [[Root]Rec] / INPUT: /mang$_{ROOT}$, il$_{APPL}$, an$_{REC}$/ [[[Root]Rec]Appl]			APPL-REC	CONTIG-BD	INTEG-IO
a.		mang-il-an- (Root-Appl-Rec)		*!	
b.		mang-an-il- (Root-Rec-Appl)	*!		
c.		mang-il-an-il- (Root-Appl-Rec-Appl)		*!	*
d.	☞	mang-an-il-an- (Root-Rec-Appl-Rec)			*

(47) **Non-CARP input:** INTEGRITY-IO ≫ CONTIGUITY-BD ⇒ *CARP*

BASE: [mang$_{ROOT}$-an$_{REC}$-] [[Root]Rec] / INPUT: /mang$_{ROOT}$, il$_{APPL}$, an$_{REC}$/ [[[Root]Rec]Appl]			APPL-REC	INTEG-IO	CONTIG-BD
a.	☞	mang-il-an- (Root-Appl-Rec)			*
b.		mang-an-il- (Root-Rec-Appl)	*!		
c.		mang-il-an-il- (Root-Appl-Rec-Appl)		*!	*
d.		mang-an-il-an- (Root-Rec-Appl-Rec)		*!	

Suffix Doubling in Chichewa

No variation for the Reciprocalized Applicative

- No variation for the Reciprocalized Applicative because all the constraints prefer the same order:

(48) **CARP input:** CARP/MP output (no variation)

BASE: [$\text{mang}_{\text{ROOT}}$-$\text{il}_{\text{APPL}}$-] [[Root]Appl] INPUT: /$\text{mang}_{\text{ROOT}}$, il_{APPL}, an_{REC}/ [[[Root]Appl]Rec]			APPL-REC	CONTIG-BD	INTEG-IO
a.	☞	mang-il-an- (Root-Appl-Rec)			
b.		mang-an-il- (Root-Rec-Appl)	*!	*	
c.		mang-il-an-il- (Root-Appl-Rec-Appl)			*!
d.		mang-an-il-an- (Root-Rec-Appl-Rec)		*!	*!

Suffix Doubling in Chichewa

Local Conclusion

- We can analyze certain cases of suffix doubling using the same technology as we did for the basic CARP cases involving asymmetric compositionality:
  - Contiguity-BD
  - Variable ranking
  - Templatic order via bigram morphotactic constraint

(49) a. **Asymmetric compositionality:**
Contiguity-BD ∼ Bigram
b. **Suffix doubling:**
Contiguity-BD ∼ Integrity-IO (with undominated bigram)

⋆ **Important take-away:** Moving away from a purely cyclic architecture to a constraint-based implementation of ordering that is *dynamically and violably* tied to morphosyntactic structure (via Contig-BD) provides the flexibility to handle trickier phenomena.

Roadmap

1. **Introduction**

2. **Asymmetric Compositionality in Chichewa**
   Interpretive asymmetries between CARP forms and non-CARP forms

3. **Suffix Doubling in Chichewa**
   Restricted suffix doubling and associated asymmetric compositionality

4. **Overapplication opacity in Nyakyusa**
   Unexpected application of phonology in CARP forms dependent on structure

5. **Conclusion**

Opacity in Nyakyusa

Morphology or phonology?

- Up to this point, evidence for the BD-Correspondence approach to MP comes from ordering alternations.
  - One might reasonably argue that all of the components of these analyses could be located "in the morphology" (cf. Hyman 2003b).

⋆ Now I'll show you equivalent evidence from *morphophonology*, using the same kind of technology.

→ This will show that we need BD-faithfulness constraints in the phonology.

Opacity in Nyakyusa

"Transitive" Suffix in Bantu

- There is one more verbal extension that participates in the CARP system in some Bantu languages.
- In Nyakyusa (Persohn 2017), it has the form /i̱/ ([i̱,y]).
- I'll follow Good (2005:9ff.) in referring to this as the "transitive".
  - It is usually called the (short) causative.

Opacity in Nyakyusa

Properties of the "Transitive" Suffix

- We'll be interested in the interaction between the following two properties of the Transitive:

  1. In many Bantu languages (including Nyakyusa), its reflex triggers some sort of palatalization on preceding segments (e.g. Hyman 2003a).

  2. In many Bantu languages (including Nyakyusa), its reflex participates in templatic ordering (e.g. Good 2005):

(50) **The "CARTP" template:** CAUS-APPL-REC-**TRANS**-PASS

→ In Nyakyusa, the interaction of these two properties results in *opacity*.

∗ This interaction is simpler than a lot of other similar interactions in this domain in other Bantu languages (Hyman 2003a,b), but hopefully it can serve as a model for how to start analyzing those harder problems.

Opacity in Nyakyusa

Transitive in Nyakyusa

- Transitive /-i̱/ induces spirantization of most preceding consonants:

(51) Transitive forms (Hyman 2003b:269, Myler 2017:105)

Basic verb		**Transitive verb**	
[sat-]	'be in pain'	[sa**s**-i̱-]	'give pain'
[gel-]	'measure'	[ge**s**-i̱-]	'try'
[ag-]	'run out'	[a**s**-i̱-]	'make run out'
[sok-]	'go out'	[so**s**-i̱-]	'take out'
[tup-]	'become thick'	[tu**f**-i̱-]	'thicken'
[olob-]	'become rich'	[olo**f**-i̱-]	'make rich'

(52) **Spirantization** (Hyman 2003b:269, Persohn 2017:85)

a. Coronals/dorsals:
/t,l,j,k,g/ → [s] / _ i̱

b. Labials:
/p,b/ → [f] / _ i̱

Opacity in Nyakyusa

Spirantization in Nyakyusa

- Assuming [f,s] uniquely are [+strident]:

(53) ***C$_{[-\text{strident}]}$i̯:** Assign one violation for each sequence of non-strident consonant followed by a superhigh front vocoid.

(54) **IDENT[±strident]-IO:** Assign one violation for each segment in the output which has a different value of the feature [±strident] than its correspondent in the input.

(55) **Generating spirantization in the basic case**

/sat, i̯$_{\text{TRANS}}$/		*C$_{[-\text{strident}]}$i̯	IDENT[±strident]-IO
a.	sat-i̯	*!	
b. ☞	sas-i̯		*

Opacity in Nyakyusa

Reciprocal in Nyakyusa

- Nyakyusa has the same /-an/ Reciprocal morpheme as Chichewa.

(56) Reciprocal forms (Persohn 2017:90)

Basic verb		**Reciprocal verb**	
[sek-]	'laugh (at)'	[sek-an-]	'make fun of each other'
[tuːl-]	'help'	[tuːl-an-]	'help each other'
[tit-]	'pinch'	[tit-an-]	'pinch each other'

- Reciprocal /-an/ can co-occur with Transitive /-i̧/.

Opacity in Nyakyusa

Templatic Ordering of Reciprocal and Transitive

- Nyakyusa has fixed ordering of Reciprocal before Transitive according to CARTP, regardless of scope (57c,d).

(57) Transitive and reciprocal (Myler 2017:105, citing Hyman 2000:9)

a.	[sob-]	'get lost (intr.)'	
b.	[sof-ị̱-]	'lose' (tr.)'	(Transitive)
c.	[sob-an-ị̱-]	'get each other lost'	(Transitivized Reciprocal)
d.	[sof-an-ị̱-]	'lose each other'	(Reciprocalized Transitive)

- This motivates an undominated bigram constraint Rec-Trans.

Opacity in Nyakyusa

Opaque Spirantization

- In the Reciprocalized Transitive (57d), we observe **spirantization** of the root-final C, *even though the trigger is not adjacent.*

(57) Transitive and reciprocal (Myler 2017:105, citing Hyman 2000:9)

a.	[sob-]	'get lost (intr.)'	
b.	[sof-ị-]	'lose' (tr.)'	(Transitive)
c.	[sob-an-ị-]	'get each other lost'	(Transitivized Reciprocal)
d.	[sof-an-ị-]	'lose each other'	(Reciprocalized Transitive)

Opacity in Nyakyusa

Asymmetric Spirantization

- Yet, in the Transitivized Reciprocal (57c), there is **no spirantization** of the root-final C, as we might have otherwise expected.

(57) Transitive and reciprocal (Myler 2017:105, citing Hyman 2000:9)

a.	[sob-]	'get lost (intr.)'	
b.	[sof-ị-]	'lose' (tr.)'	(Transitive)
c.	[sob-an-ị-]	'get each other lost'	(Transitivized Reciprocal)
d.	[sof-an-ị-]	'lose each other'	(Reciprocalized Transitive)

Opacity in Nyakyusa

Asymmetric Opaque Spirantization

- Two things to explain:

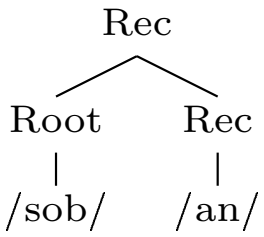
  1. Why *do* we get spirantization in the Reciprocalized Transitive?
  2. Why *don't* we get spirantization in the Transitivized Reciprocal?

Opacity in Nyakyusa

Structure and Opaque Spirantization

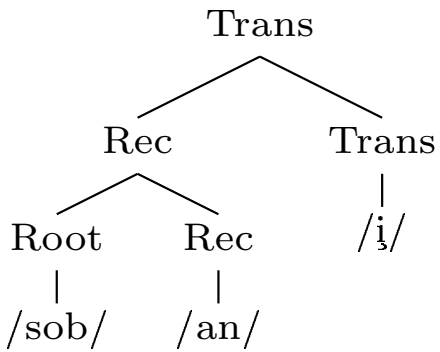
(58) **Reciprocal first structures**

a. Reciprocal *sob-an-*



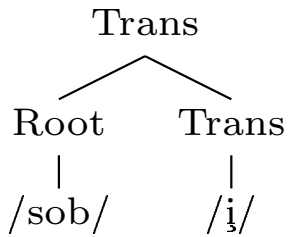
b. Transitivized Reciprocal

sob-an-ɨ-



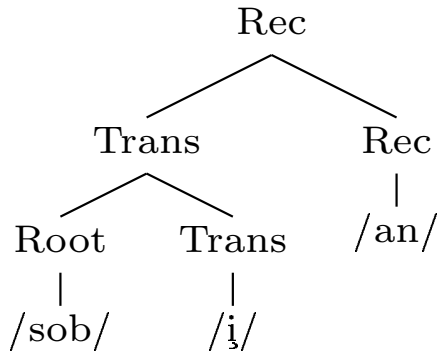
(59) **Transitive first structures**

a. Transitive *sof-ɨ-*



b. Reciprocalized Transitive

**sof-ɨ-an-* → *sof-an-ɨ-*



Opacity in Nyakyusa

Opaque Spirantization via BD-Correspondence

- This is cyclic overapplication, as was basically suggested by Hyman (2003b).
  ↪ Can be handled just like suffix doubling in Chichewa: BD-Correspondence.

- Overapplication of spirantization triggered by IDENT[±strident]-**BD**:

(60) **IDENT[±strident]-BD:** Assign one violation for each segment in the derivative which has a different value of the feature [±strident] than its correspondent in the base.

Opacity in Nyakyusa

Deriving Opaque Spirantization

(61) **Non-CARTP input:** opaque spirantization *sof-an-i͡ʒ-*

BASE: [sof$_{RT}$-i͡ʒ$_{TRANS}$-] [[Rt]Trans] INPUT: /sob$_{RT}$, i͡ʒ$_{TRANS}$, an$_{REC}$/ [[[Rt]Trans]Rec]	REC-TRANS	ID[str]-BD	*C$_{[-str]}$i͡ʒ	ID[str]-IO
a. sob-an-i͡ʒ- (Root-Rec-Trans)		*!		
b. ☞ sof-an-i͡ʒ- (Root-Rec-Trans)				*
c. sob-i͡ʒ-an- (Root-Trans-Rec)	*!	*!	*!	
d. sof-i͡ʒ-an- (Root-Trans-Rec)	*!			*

(62) **CARTP input:** no spirantization *sob-an-i͡ʒ-* (regular non-application)

BASE: [sob$_{RT}$-an$_{REC}$-] [[Rt]Rec] INPUT: /sob$_{RT}$, i͡ʒ$_{TRANS}$, an$_{REC}$/ [[[Rt]Rec]Trans]	REC-TRANS	ID[str]-BD	*C$_{[-str]}$i͡ʒ	ID[str]-IO
a. ☞ sob-an-i͡ʒ- (Root-Rec-Trans)				
b. sof-an-i͡ʒ- (Root-Rec-Trans)		*!		*
c. sob-i͡ʒ-an- (Root-Trans-Rec)	*!	*!	*!	
d. sof-i͡ʒ-an- (Root-Trans-Rec)	*!			*

Opacity in Nyakyusa

Local Conclusions

- BD-Correspondence generates restricted overapplication in the same way it generates restricted suffix doubling:
  - Undominated bigram constraint + BD-faithfulness constraint
- Here, it is an IDENT constraint, and thus the BD effect is clearly phonological rather than morphological.
- This approach generates "cyclic" opacity without having to posit reordering or late affix movement by drawing on insights of cyclic phonology/morphology without implementing a literally cyclic framework.

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Conclusion

Summary

- This talk examined three phenomena related to the CARP template:
  1. Asymmetric compositionality
  2. Suffix doubling
  3. Overapplication opacity

Conclusion

Conclusion

- In each case, Base-Derivative faithfulness drove the asymmetry, when tied directly to morphosyntactic structure in the form of base selection:
  - → Bases are defined structurally, therefore structure drives the alternations, which is exactly the sort of logic behind the Mirror Principle.

- Crucially, given the variability inherent to asymmetric compositionality and suffix doubling, these structure-dependent effects have to be *violable*.
  - ◦ Traditional cyclic approaches don't have the capacity to do this.

⋆ Integrating templatic and non-templatic morphology requires reference to morphosyntactic structure through parallel constraint interaction.
  - → Morphological templates preclude cyclic concatenation without additional mechanisms.

Conclusion

Big-picture Takeaway

Big-picture takeaway:

⋆ Structure is crucial even in templatic morphology.

→ The latter two cases involved fixed ordering where it is not obvious the Mirror Principle is in effect at all.

Thank you!

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