

# Deriving syntax-phonology mismatches through cyclic spell-out

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## 1 Introduction

- Over the past decades, it has become clear that phonological domains are connected to syntactic domains in one way or another (see, e.g., Kratzer and Selkirk 2007, Adger 2007, Ishihara 2007, Cheng and Downing 2007, 2016, Pak 2008, Kahnemuyipour 2009, Embick 2010, Sande and Jenks 2018).
  - There are, however a number of areas where there appears to be a mismatch between syntactic and phonological domains (see overview in Selkirk 2011, Downing 2013, Cheng and Downing 2016, Bonet et al. 2019).
    - This has led to conclusions such as:
      - \* Phonological domains cannot be computed directly from the syntactic output.
      - \* The output of syntax is mapped onto an intermediate structure from which phonology is computed.
      - \* Reference to syntax can thus only be indirect.
        - Indirect reference deemed necessary as mismatches are highly limited.
  - This problem is exemplified here by penultimate vowel lengthening (PVL) in Chicheŵa (Kanerva 1990, Downing and Mtenje 2011a,b).
    - Syntactic domains don't always match the domain of PVL.
      - \* The phonological domain may extend beyond the syntactic domain.
      - \* The syntactic domain may be too large for the phonological domain.
    - DPs only seem to form domains for PVL when they are modified (branchingness effects).
  - Arguments against direct interface in general focus on particular iterations and properties that are not inherent to such approaches.
  - Through examining both the syntax and the spell-out process, these mismatches can be shown to be merely apparent.
    - The size effects can be accounted for in two ways:
      - \* Phonological domains may appear to extend beyond syntactic domains as a result of interleaving phonology and syntax (cf. Kaisse 1985, Bobaljik 2000, Embick 2007, Shwayder 2015, Sande and Jenks 2018, Harðarson 2020a, Fenger 2020).
      - \* Phonological domains may appear smaller than the syntactic domain due to spell-out occurring in two tiers (cf. Monahan 1982, Kiparsky 1982, Pak 2008, Harðarson 2020a).
    - The branchingness effects can be accounted for by taking DP-internal syntax into account.
- The model argued for here allows for a more consistent architecture of grammar.
    - No need for an intermediate structure—a single structure building mechanism.
    - No need for extrinsic constraints to limit the range of potential mismatches.
      - \* Domains of application are calculated from the syntactic structure.
      - \* Apparent mismatches follow from syntactic properties.
    - Spell-out is consistent from the word-level to the clausal level.

## 2 Penultimate Vowel Lengthening

- PVL refers to a process in which the penultimate vowel within a particular domain undergoes lengthening.
    - Process found in a number of Bantu languages (see, e.g. Kanerva 1990, Kenstowicz and Kisseberth 1990, Hyman and Katamba 1993, 2010, Pak 2008, Cheng and Downing 2007, Downing 2013).
    - Domain shared by a number of other processes (Kanerva 1990, Downing and Mtenje 2011a,b).
- (1)
- a. (Downing and Mtenje 2011a:1968)  
 físi a-na-dyá m-k[áa]ngo.  
 CL1.hyena 1SUBJ-TAM-eat CL3-lion  
 ‘The hyena ate the lion.’
  - b. (Kanerva 1990:103)  
 mfúumu i-na-pátsá mwaná zóov[áa]la  
 CL9.chief 9SUBJ-TAM-give CL1.child CL10.clothes  
 ‘The chief gave the child clothes.’
  - c. (Downing and Mtenje 2011b:69)  
 ma-kóló a-na-pátsá mwaná ndlámá zá súk[úu]lu.  
 CL6-parent 6SUBJ-TAM-give CL1.child CL10.money CL10.of CL9.school  
 ‘The parents gave the child money for school.’
- Adverbials form separate domains for PVL (Kanerva 1990, Downing and Mtenje 2011a,b).
- (2)
- (Downing and Mtenje 2011a:1972)
- a. M-balá í-ma-th[áa]wa [mu-gálím[oo]to].  
 CL9-thief 9SUBJ-TAM-escape LOC-CL5.car  
 ‘The thief escapes into a car.’
  - b. M-phunzitsi a-ná-wóna a-l[eé]ndó [ku-m-sonkh[aa]no].  
 CL1-teacher 1SUBJ-TAM-see CL2-visitor LOC-CL3-meeting  
 ‘The teacher saw the visitors at the meeting.’
  - c. Ti-ná-pírikitsa m-b[áa]lá [ku-chókéra mu-m-s[ii]ka] [ku-pítá ku-tchál[íi]tchi]  
 we-TAM-chase CL9-thief INF-leave LOC-CL3-market INF-arrive LOC-church  
 ‘We chased the thief from the market to the church.’
- The phrasing of the subject also varies (Downing and Mtenje 2011a,b).
    - The subject may phrase with the rest of the clause, (3).
    - \* Subject of complement clauses always phrases with the rest of the clause, (4).
    - In other cases, the subject phrases separately, (5).
- (3) *Main clause subject phrasing with the clause* (Downing and Mtenje 2011a:1975)  
**Bándá** a-ná-wá-ona a-l[eé]ndó [dz[uu]lo]  
 CL1.Banda 1SUBJ-TAM-1OBJ-see CL2-visitor yesterday  
 ‘Banda saw the visitors yesterday.’
- (4) *Subject of embedded clause* (Downing and Mtenje 2011a:1975)  
 A-ná-néna [kuti **Bándá** a-ná-wóna a-l[eé]ndó [dz[uu]lo]]  
 1SUBJ-TAM-say that CL1.Banda 1SUBJ-TAM-see CL2-visitor yesterday  
 ‘S/he said that Banda saw the visitors yesterday.’
- (5) *Main clause subject phrasing separately*  
**B[áan]dá** a-ná-wá-ona a-l[eé]ndó [dz[uu]lo]  
 CL1.Banda 1SUBJ-TAM-1OBJ-see CL2-visitor yesterday  
 ‘Banda saw the visitors yesterday.’
- Downing and Mtenje (2011a,b) argue that the separate subject is a dislocated subject, outside the CP (cf. Cheng and Downing 2009 on Zulu).
  - Focus is also a conditioning factor.
- (6) *Broad focus* (Downing and Mtenje 2011b:70)      (7) *Object focus* (Downing and Mtenje 2011b:71)
- a-ná-ménya **nyumba** ndí mw[áa]lá      a-ná-ménya **ny[úu]mba** ndí mw[áa]lá  
 1SUBJ-TAM-hit CL9.house with CL3-rock      1SUBJ-TAM-hit CL9.house with CL3-rock  
 ‘S/he hit the house with a rock.’      ‘S/he hit the house with a rock.’

## 2.1 Domain too small

- There are a number of instances where the domain of PVL appears to extend beyond the syntactic domains within the clause (Downing and Mtenje 2011a,b).

– Simple sentences are standardly assumed to consist of multiple domains, (8).

\* Only a single instance of PVL.

\* No effects for unmodified DPs.

(8) *The structure of (1a)*

[CP [DP HYENA] [VP ATE [DP LION ]]]  
 fisi a-na-dyá m-k[áa]ngo.  
 CL1.hyena 1SUBJ-TAM-eat CL3-lion

‘The hyena ate the lion.’

– Multiclausal sentences do not necessarily yield multiple instances of PVL (Downing and Mtenje 2011a,b).

(9) *Complement clause, repeated from (4)*

A-ná-néna [CP kuti Bándá a-ná-wóna a-l[eé]ndó dz[uu]lo]  
 1SUBJ-TAM-say that CL1.Banda 1SUBJ-TAM-see CL2-visitor yesterday

‘S/he said that Banda saw the visitors yesterday.’

(10) *Clause-final relative clause* (Downing and Mtenje 2011b:70)

a-ná-kwíyá [PP ndí [DP [CP m-phunzitsi a-méné a-lendó á-ná-mu-gulíla zóóv[áa]la]]]  
 2SUBJ-TAM-get.angry with CL1-teacher CL1-REL CL2-visitor 2SUBJ-TAM-1OBJ-buy.for CL10.clothes

‘They got angry at the teacher for whom the visitors bought clothes.’

(11) *Clause-initial relative clause* (Downing and Mtenje 2011b:78)

[DP [CP káláta i-méné m-phunzitsi á-ná-wel[ée]nga]] í-ma-néna m-f[úu]mu  
 CL9.letter CL9-REL CL1-teacher 1SUBJ-TAM-read 5SUBJ-TAM-criticize CL9-chief

‘The letter which the teacher read criticizes the chief.’

- As Cheng and Downing (2016) and Bonet et al. (2019) discuss, this is not expected under the version of a spell-out based direct interface approach they argue against.

– A holding bin approach to phases (cf. Pak 2008).

– Assumes that no process may cross phase boundaries or reference previous cycles.

## 2.2 Branchingness effects

- In Chicheŵa, the phrasing of DPs varies depending on the presence or absence of modifiers within the DP (Kanerva 1990, Downing and Mtenje 2011a,b).

– When a DP is unmodified, it phrases with the rest of the clause, (12).

– When a DP is modified, each modifier undergoes PVL, (13)

(12) *Unmodified DPs* (Downing and Mtenje 2011b:1977)

[CP [DP a-lendó] [VP a-na-dyétsa [DP a-nyani] [DP n-s[óo]mba]]]  
 CL2-guest 2SUBJ-TAM-feed CL2-baboon CL10-fish

‘The guests fed the baboons fish.’

(13) *Modified indirect object* (Downing and Mtenje 2011b:1977)

a-lendó a-na-dyétsa [DP a-nyanó á-s[aa]nu á-á-k[úu]lu n-s[óo]mba  
 CL2-guest 2SUBJ-TAM-feed CL2-baboon 2-five 2.L-2-big CL10-fish

‘The guests fed five big baboons fish.’

- Similar effects are attested across various languages (see, e.g., Selkirk 2011, Downing 2013, Cheng and Downing 2016, Bonet et al. 2019 and references cited therein).

- These effects are argued to be incompatible with a spell-out based direct interface approaches (e.g., Selkirk 2011, Downing 2013, Cheng and Downing 2016, Bonet et al. 2019)

– Syntax does not distinguish between modified and unmodified XPs wrt. domains.

- I argue that a spell-out based direct reference approach is still compatible with these data.

– Requires elaborating on the spell-out process and the relevant syntactic structures.

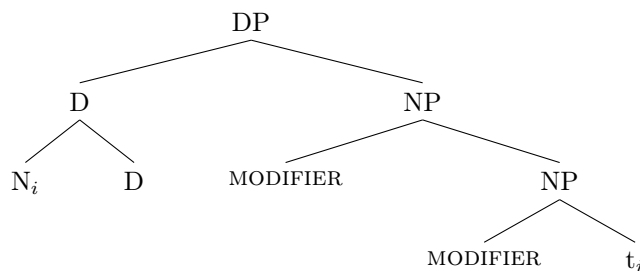
### 3 DP-syntax and the Branchingness effects

- The noun precedes all modifiers (Mchombo 2004:24–25).
  - The order of modifiers within the DP varies with discourse/information structure related effects (Mchombo 2004:25).

- (14) a. (Mchombo 2004:24)  
**mikángo** y-anú i-tátu iyi...  
 CL4.lions 4-your 4-three 4.DEM  
 b. ‘These three lions of yours...’  
 c. (Downing and Mtenje 2011a:1976)  
**Galú** wá-m-kúlúu-yo...  
 CL1.dog 1.of-1.big-1.that  
 ‘That big dog...’  
 d. (Downing and Mtenje 2011a:1977)  
 ... **a-nyaní** á-saanu á-á-kúulu...  
 CL2-baboon 2-five 2.of-2-big  
 ‘... the five big baboons...’

- Downing and Mtenje (2011a:1983) argue that the order is derived by raising the noun above the modifiers.
  - N moves to the position above D.
  - Characterized here as head movement to D (cf. Carstens 2008).

- (15) The structure of a modified DP



- N escapes the spell-out domain of D.
- Assuming that the domain of PVL is the spell-out domain.
  - No application of PVL in unmodified DPs.

- There are at least three possible explanations for the application of PVL to DP-internal modifiers.
  - The modifiers are inherently focused (Downing and Mtenje 2011a).
  - The modifiers are headed by phases they do not escape.
    - \* See, e.g., Talić (2015) for evidence for phases in APs.
  - The modifiers may be NP-adjuncts.
    - \* Order of modifiers is relatively free.
    - \* Adjectives and nominal modifiers carry associative markers (Mchombo 2004).
      - See, e.g., Pietraszko (2019) on associative constructions in Ndebele.
    - \* Modifiers expected to pattern with adverbs (see below).

- The branchingness effects follow from the syntactic properties of the elements within the DP.
  - The noun moves to D and avoids spell-out at that cycle.
  - The modifiers remain within the complement of D.
    - \* Undergo spell-out with the complement of D.
  - No need for special treatment for the phasal properties of D.



- Gives the impression of a non-cyclic application.
  - The same vowel can be targeted at multiple cycles.
  - Explains why only a single application of PVL is observed with sentence-final subordinate clauses.
- Consider the sentence in (4) (the adverbial omitted).
  - The same vowel is targeted at every cycle.
  - Skipping to the cycle that spells out the complement of *v*.

(21) Spell-out of a CP with an embedded CP

- a.  $[_{VP} \text{ SAY } [_{CP} / \text{kuti}/ \wedge / \text{Bándá-anáwóna-al} \boxed{\text{eé}} \text{ndó}/]]$   
           that      Banda    see    visitor
- b.  $[_{CP} / \text{Anánéna}/ \wedge / \text{kuti-Bándá-anáwóna-al} \boxed{\text{eé}} \text{ndó}/]$   
           say            that Banda    see    visitor

## 4.2 Adjuncts

- Recall that adverbials phrase separately from arguments and each other.

(22) (Downing and Mtenje 2011a:197)  
 Bándá      a-ná-óna      a-l $\boxed{\text{eé}}$ ndó [mofulum $\boxed{\text{ii}}$ ra]  
 CL1.Banda 1SUBJ-TAM-see CL2-visitor quickly  
 ‘Banda saw the visitors yesterday.’

- The adverbs each forming a domain can mean that they are contained within a phase they cannot escape.
  - Analogous to the DP-internal modifiers.
  - A single layer approach to Spell-out does not predict the application of PVL to the object in (22).
- Concatenation occurs in two tiers, early and late (cf. Pak 2008).
  - Early concatenation applies to elements in a selectional relationship.
    - \* Downing and Mtenje (2011a,b) also assume a role for selection for domain formation in Chicheŵa, building on Cheng and Downing’s (2009, et seq.) proposal for Zulu.
    - \* See also, e.g., Zubizarreta (1998) and Simpson and Wu (2002) on the significance of selection for phrasal phonology, and Harðarson (2016, 2017, 2020a) on the role of selection in word-internal phonology.
  - Late concatenation applies to the strings created in early concatenation.
  - Processes may be specified for whether they apply at early or late concatenation (cf. Monahan 1982, Kiparsky 1982, Pak 2008).
  - PVL is specified to apply at early concatenation.
- Different parts of the structure may then undergo early concatenation simultaneously within the domain.
  - PVL applies within each of these subparts of the structure.
  - The resulting strings are then concatenated under late concatenation.
- Consider the spell-out of (22).
  - At the point of spelling out of the complement of *v*, the object undergoes early concatenation.
  - The same applies within the adverbial (potentially in a previous cycle).
  - PVL applies at the end of this process to each substring.

(23) *Early concatenation within the complement of v*

$[_{VP} \text{ see } [ / \text{al} \boxed{\text{eé}} \text{ndó}/ / \text{mofulum} \boxed{\text{ii}} \text{ra}/ ]]$   
           visitor            quickly

- Subsequently, the resulting strings are concatenated under late concatenation.

(24) *Late concatenation within the complement of v*

$[_{VP} \text{ see } [ / \text{al} \text{eé} \text{ndó}/ \wedge / \text{mofulum} \text{ii} \text{ra}/ ]]$   
           visitor            quickly

- The spell-out of the subsequent cycles includes the string created by late concatenation.
  - \* Proceeds as outlined above.
  - \* Target for PVL has already undergone lengthening.

(25) *Early concatenation of the complement of CP*  
 [CP /Bándá/∧ /anáóna/∧ /aleéndó-mofulum<sup>[ii]</sup>ra/]  
 Banda saw visitor quickly

- The variable phrasing of subjects also follows from this model under Downing and Mtenje’s (2011a, 2011b) analysis.
  - When the subject phrases with the rest of the clause, (26), it is within CP.
  - When the subject phrases separately, (27), it receives a topic reading.
    - \* Left dislocation.
    - \* Adjoined to CP.
    - \* See also Cheng and Downing (2009) on Zulu.

(26) *CP-internal subject (repeated from (3))*  
**Bándá** a-ná-wá-ona a-l<sup>[eé]</sup>ndó [dz<sup>[uu]</sup>lo]  
 CL1.Banda 1SUBJ-TAM-1OBJ-see CL2-visitor yesterday  
 ‘Banda saw the visitors yesterday.’

(27) *Left-dislocated subject (repeated from (5))*  
**B<sup>[áa]</sup>ndá** a-ná-wá-ona a-l<sup>[eé]</sup>ndó [dz<sup>[uu]</sup>lo]  
 CL1.Banda 1SUBJ-TAM-1OBJ-see CL2-visitor yesterday  
 ‘Banda saw the visitors yesterday.’

- In (26), spell-out of the subject proceeds as outlined above.
- In (27), as an adjunct, the subject undergoes early concatenation, and hence PVL, separately, (28).
  - \* Concatenated with the rest of the clause under late concatenation, (29).

(28) *Early concatenation of the subject*  
 /B<sup>[áan]</sup>dá/ /anáwáona-aleéndó-dz<sup>[uu]</sup>lo/  
 Banda see visitor yesterday

(29) *Late concatenation of the subject*  
 /Báandá/∧ /anáwáona-aleéndó-dzuulo/  
 Banda see visitor yesterday

### 4.3 Preliminary remarks on Relative Clauses

- Under the structures assumed by Downing and Mtenje (2011b), the phrasing of restrictive relative clauses follows, (30).

- No prosodic break between the head and the relative clause.

(30) *Restrictive relative clause (repeated from (10))*  
 a-ná-kwíyá [PP ndí [DP [CP m-phunzitsi a-méné a-lendó á-ná-mu-gulílá zóón<sup>[áa]</sup>la]]]  
 2SUBJ-TAM-get.angry with CL1-teacher CL1-REL CL2-visitor 2SUBJ-TAM-1OBJ-buy.for CL10.clothes  
 ‘They got angry at the teacher for whom the visitors bought clothes.’

- Downing&Mtenje assume a head-internal analysis of restrictive relative clauses (cf. Kayne 1994).
  - The head of the relative clause is contained within the relative CP.
  - CP is a complement of DP.

(31) The structure of restrictive relative clauses  
 [DP [CP HEAD [ RELATIVE CLAUSE]]]

- Under the current approach, the phrasing is unsurprising.
  - The spell-out of the relative clause CP proceeds as outlined for complement clauses above.
  - The right edge effects are due to PVL targeting different vowels at different cycles.

## (32) Spell-out of (30)

- a. [<sub>VP</sub> GET.ANGRY [ /ndí/∧/mphunzitsi-améné-alendó-ánámugulíla-zóov[áa]la]]  
 with teacher REL visitor buy.for clothes
- b. [<sub>CP</sub> /anákwíyá/∧/ndí-mphunzitsi-améné-alendó-ánámugulíla-zóov[áa]la  
 they.got.angry with teacher REL visitor buy.for clothes

- The phrasing of non-restrictive relative, (33), clauses also follows from the structure assumed by Downing and Mtenje (2011b).
  - Prosodic break between the head and the relative clause.
  - PVL applies to the head of the relative clause.

(33) *Non-restrictive relative clause* (Downing and Mtenje 2011b:89)

[<sub>DP</sub> a-[eé]ndó [<sub>CP</sub> a-méné á-ná-mú-óna Bánd[aa]-wo [dz[uu]lo]]] a-p[íí]tá  
 CL2-visitor CL2-REL 2SUBJ-TAM-1OBJ-see CL1.Banda-CL2.REL yesterday 2SUBJ.PERF-go  
 ‘The visitors, who saw Banda yesterday, have gone.’

- Downing and Mtenje (2011b) assume a DP-adjoined analysis of non-restrictive relative clauses (cf. Demirdache 1991).

(34) *The structure of non-restrictive relative clauses*

[<sub>DP1</sub> [<sub>DP1</sub> HEAD] [<sub>DP-rel</sub> [<sub>CP</sub> RELATIVE CLAUSE]]]

- Linearization is not affected by selection.

- Applied immediately.
- May disrupt concatenation.

- The relative clause and the noun are spelled out in the same cycle.

- The relative clause is an adjunct and thus subject to late concatenation within this cycle.
- Prevents the noun from early concatenation with any material to the right.
  - \* Under a contextual approach to PVL the noun can be targeted.

(35) *Spell of (33)*a. *Early concatenation*

[<sub>CP</sub> /al[eé]ndó/ /améné-ánámúóna-Bándaawo-dz[uu]lo/ /ap[íí]tá/  
 visitor REL saw Banda yesterday have.gone

b. *Late concatenation*

[<sub>CP</sub> /al[eé]ndó/∧/améné-ánámúóna-Bándaawo-dz[uu]lo/∧/ap[íí]tá/  
 visitor REL saw Banda yesterday have.gone

- There is an open issue of the phrasing of restrictive relative clauses omitting the complementizer *-méné*.
  - In the dialect discussed by Downing and Mtenje (2011a,b) there is consistently a prosodic break between the head and the relative clause.
    - \* Kanerva (1990) and Mchombo (2004) do not report such an effect for the dialect they discuss.
    - \* Unclear if this is a dialectal difference or if other factors are at play (Downing and Mtenje 2011b:107, fn 19).

(36) *Restrictive relative clause with-méné* (Downing and Mtenje 2011b:89)

[a-lendó a-méné á-ná-mú-óna B[aa]nda [dz[uu]lo]] ap[íí]tá  
 CL2-visitor CL2-REL 2SUBJ-TAM-1OBJ-see CL1.Banda-CL2.REL yesterday 2SUBJ.PERF-go  
 ‘The visitors who saw Banda yesterday have gone.’

(37) *Restrictive relative clause without-méné* (Downing and Mtenje 2011b:89)

[a-l[eé]ndó \_\_\_ á-ná-mú-óna B[aa]nda [dz[uu]lo]] ap[íí]tá  
 CL2-visitor 2SUBJ-TAM-1OBJ-see CL1.Banda-CL2.REL yesterday 2SUBJ.PERF-go  
 ‘The visitors who saw Banda yesterday have gone.’



- It may be the case that the absence of -méné occurs with head-external restrictive relative clauses.
  - Predicts an absence of reconstruction effects (see, e.g., Bhatt 2002).
    - \* Which seems to be the case for locative relative clauses in Zulu (Cheng and Downing 2010:46–47).
  - What is the appropriate structure?
    - \* Complement of head N (e.g., Bhatt 2002, Platzack 2000)?
    - \* Adjoined to NP (cf. Chomsky 1977)?
    - \* As the relative clause is DP-internal under these structures, no phrase break is predicted.
  - The range of possible factors, structural and otherwise, are left for further research.

- In moving forward:
  - Adopting a direct relationship between syntax and phonology allows for phonology to inform syntactic analyses.
    - \* Phonology can distinguish between competing syntactic analyses.

## 5 Conclusions

- In this talk we have seen that a spell-out based direct reference approach to the syntax-phonology interface is viable.
  - No need for intermediate structure.
  - Apparent mismatches between syntax and phonology can be computed from the syntactic structure.
    - \* The phonological string created in a cycle is included in subsequent cycles.
    - \* Yields the effects of the phonological domain extending beyond the syntactic domain.
    - \* Branchingness effects can be derived via DP-internal syntax.
    - \* Obviates the need for intermediate structures.

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