CONSONANT STRICTURE HARMONY IN YABEM: MANNER ASSIMILATION AT A DISTANCE*

Gunnar Ólafur Hansson and Allie Entwistle
University of British Columbia

1. Introduction

Interactions between non-adjacent segments, such as those seen in harmony processes of various kinds, have long been a topic of central interest to phonological theory, bearing on questions of locality and the formal properties of phonotactic constraints or (morpho)phonological relations. In recent years, consonant harmony has come under renewed focus in this context, for two reasons. First, it has become clear that at least some instances of consonant harmony involve featural agreement at a distance, rather than the local spreading/extension of a feature or articulatory gesture (Rose & Walker 2004, Hansson 2010a). Second, the non-adjacent interactions observed in consonant harmony raise certain challenges from the point of view of learnability (Heinz 2010) as well as theories of assimilatory sound change (Ohala 1993, Blevins 2004).

The cross-linguistic typology of consonant harmony phenomena, while quite diverse in terms of the possible featural bases for assimilation, displays a markedly skewed profile with regard to frequency of attestation. At the extreme end of high typological frequency is coronal harmony, in particular its instantiation as sibilant harmony, while other types are so rare as to being almost unattested. The list in (1), which is based on the survey in Hansson (2010a), arranges different types of consonant harmony roughly by relative frequency of attestation from most to least frequent.

(1) Attested types of consonant harmony (Hansson 2010a)
- Coronal harmony
  - Sibilant coronal harmony (e.g. [s z ts ts’] vs. [ʃʒ tʃ tʃ’])
  - Non-sibilant coronal harmony (e.g. [t d ʊ] vs. [t d ŋ])
- Dorsal harmony (e.g. [k k’] vs. [q q’])
- Nasal consonant harmony (e.g. [m n] vs. [b d])
- Liquid harmony (e.g. [l] vs. [r])
- Laryngeal harmony (e.g. [p t k] vs. [pʰ tʰ kʰ])
- Secondary-articulation harmony (e.g. [s z ts] vs. [sʰ zʰ tsʰ])
- Stricture harmony (e.g. [t d] vs. [s z])

In this paper we focus our attention on a harmony type that lies at the extremely rare end of the typological continuum in (1). We examine the only robustly attested case of (active) consonant harmony in terms of constriction degree (essentially the phonological feature [±continuant]), namely stricture harmony in Yabem, an Oceanic language of Papua New Guinea. The essence of the Yabem sound pattern is that when a homorganic fricative and stop straddle an intervening vowel (in that order), the fricative becomes a stop. In other words, the process is /…SVT…/ → […TVT…]. We describe the relevant generalizations, and the various restrictions that the harmony is subject to, and de-
velop a formal constraint-based analysis in terms of agreement by correspondence (Rose & Walker 2004, Hansson 2010).

Typological outliers are often particularly valuable from the point of view of progress in the theoretical domain. For one thing, they often serve as crucial test cases, clinching the argument for one theory or hypothesis over another. For example, most cases of consonant harmony are ambiguous as to whether they involve feature spreading (temporal extension of an articulatory gesture) or a truly non-adjacent interaction in terms of featural agreement. Since “stopness” (oral closure) cannot possibly spread from one consonant to another through or via an intervening vowel, stricture harmony must by definition involve agreement rather than spreading. Secondly, cases that are typological outliers in one respect often turn out to be less remarkable when studied in greater detail. As we will see in §3 and §4 below, Yabem stricture harmony patterns with other more frequent types of consonant harmony in most respects. Finally, typological outliers often raise important questions as to the reason for their cross-linguistic rarity. These may lead to a shift in attention from the synchronic properties of the sound patterns in question to the various historical sources and mechanisms responsible for their emergence. We will briefly consider stricture harmony in Yabem from this diachronic perspective in §5.

2. Background

2.1 The Yabem language

Yabem is a language belonging to the vast Oceanic subbranch of the Austronesian language family. It is spoken in the North Huon Gulf area (Morobe province) of Papua New Guinea; three decades ago the number of first-language Yabem speakers was estimated at about 2,100 (Lewis et al. 2013). In addition, the language served as a local lingua franca in the area for much of the 20th century, thanks to having been adopted and advocated in that capacity by German missionaries and local evangelists from the 1880s onwards, although in that function it has now largely been replaced by Tok Pisin (Ross 1995).

The main data source on the Yabem language is the descriptive grammar by the great Austronesianist Otto Dempwolff (1939; page references below are to the 2005 English translation). In what follows, we primarily rely on this source, though we also draw upon more recent published work on the language by Bradshaw (1979) and Ross (1988, 1993, 1995).

2.2 Yabem phonology and morphology: the basics

The consonant and vowel inventories of Yabem are as shown in (2) on the next page. In addition, the language has a tonal contrast between high- and low-toned syllables. See below for the phonological status of voicing in stops and its relation to tone. Yabem syllable syllables are open, (C)V, but closed syllables (C)VC are allowed in word-final position; complex margins are not permitted. A restricted inventory of consonants can occur in the (word-final) syllable coda: the oral labial stop /p–b/, the glottal stop /ʔ/, and the nasals /m n/. Prenasalized obstruents are limited to non-initial position, and hence can only occur in word-medial syllable onsets.
Although there is suffixation in the possessive morphology of nominals (e.g. [támá-m] ‘your (sg.) father’), only the verbal morphology, which is entirely prefixing, will be relevant here. In terms of phonotactic shape, verb roots are either monosyllabic, CV(C) or disyllabic, CVCV(C). These are preceded by subject agreement prefixes, which all have the shape (C)VC-, cf. [gâ-dén] ‘I move towards (realis)’. In addition, the realis/irrealis distinction in verbs is marked on the one hand by a partly complementary set of agreement prefix allomorphs and on the other by a floating [+nasal] featural prefix, which docks onto any prenasalizable consonants in the stem: [jâ-ndén] ‘I will move towards (irrealis)’.

Perhaps the most unusual aspect of Yabem phonology is the fact that voicing in obstruents is entirely predictable based on tone (Poser 1981, Ross 1993, Hansson 2004). Stops are voiceless in high-toned syllables, voiced in low-toned syllables; contrast [gâ-dén] ‘I move towards (realis)’ with [kâ-tên] ‘I ask (realis)’. The sole fricative, /s/, is consistently voiceless and can occur in high- and low-toned syllables alike, due to a relatively recent merger of [s] and [z]; even as late as the early 20th century, Dempwolff (1939) described /s/ in low-toned syllables as being “somewhat voiced”. Obstruent voicing is thus allophonic rather than contrastive in Yabem; we will emphasize this by representing obstruents in input forms with /P/, /T/, /S/, etc. Furthermore, there is tone spreading within the two final syllables of the word, and this results in an alternation of both tone and obstruent voicing in prefixes such as 1.SG.REALIS [Ka-] → [kâ-] when the following verb root is monosyllabic. Outside of this two-syllable window (and hence before disyllabic roots), prefixes are high-toned by default ([jâ-mâdôm] ‘I break in two (realis)’). For a constraint-based analysis of the interplay of tone and voicing in Yabem, see Hansson (2004).

Since prenasalized stops are all voiced, the tone-voicing interdependence further entails that they too are limited to low-toned syllables. As a result, the floating irrealis [+nasal] prefix can only surface on low-toned bases: compare [jâ-ndén] ‘I will move towards (irr.)’ against [jâ-tên] I will ask (irr.)’ (from /-Tên/ ‘move towards’ and /-Têŋ/ ‘ask’, respectively). Prenasalized [ns] reveals its origin in earlier *[nts] in that it too is limited to low-toned syllables. This further means that irrealis nasalization targets /S/ in low-toned roots but not high-toned ones, despite the fact that /S/ is voiceless in both cases: [jâ-nsûn] ‘I will shove (irr.)’, but [jâ-sôm] ‘I will speak (irr.)’ (/sûŋ/ ‘shove’, /sûm/ ‘speak’).

2.3 Non-adjacent dependencies among consonants

At first glance, Yabem appears to display three types of assimilatory dependencies between non-adjacent obstruents, listed in (3). Each of these three phenomena could, at least in principle, be taken to reflect a consonant harmony requirement (agreement) of some kind.
(3) a. Voicing harmony?
   [ká-tāŋ] ‘I weep’
   [gá-dēŋ] ‘I move towards’

   b. Prenasalization harmony?
   [-dâb*â?] ‘untie (realis)’
   [-ndâmb*â?] ‘untie (irrealis)’

   c. Stricture harmony
   ‘t/d…t/d  s…s  *s…t/d

As we have seen above, the pattern in (3)a is simply the by-product of tone spreading and tone-induced voicing, rather than some separate demand for voicing agreement in co-occurring obstruents. The prenasalization agreement pattern in (3)b is primarily evident from the multiple docking of the floating irrealis [+nasal] morpheme on any and all eligible targets within the verb root. Entwistle (2013) proposes an analysis which attributes this multiple docking to a phonological consonant harmony in the [±nasal] among co-occurring obstruents.

Our focus in this paper, however, is on the pattern mentioned in (3)c, whereby co-occurring coronal obstruents are, under certain conditions, required to agree with one another in degree of constriction: the fricative vs. stop distinction. This “stricture harmony”, which among other things results in harmony alternations between [s] and [t]/[d] in prefixes, is typologically unique and hence of considerable theoretical interest (Rose & Walker 2004, Hansson 2010a).

3. Stricture harmony

3.1 The basic pattern

The essence of Yabem stricture harmony is the phonotactic generalization that homorganic fricative…stop sequences are not allowed. Since [s] is the only fricative in the language, what this means in practice is that *[s…t] and *[s…d] are not permitted. (The situation with prenasalized [ns] and [nd] is complicated, a point to which we will return in §3.2 below.) As Dempwolff (1939) puts it, “[t]he consonant sequences s…t and s…d do not appear in the same word” (p. 8).

Morpheme-internally, this harmony takes the form of a static prohibition: roots of the shape /SVTV(C)/ are simply absent from the lexicon. There is no shortage of morphemes containing non-homorganic fricative…stop sequences, however, as illustrated in (4) below. (“D” + page number refers to the 2005 English translation of Dempwolff 1939.)

(4) sápā ‘fence’
   -sép  ‘to go down, to move downward’
   sâb*â ‘potsherds; spleen’
   sib  ‘[his] nephew (sister’s son)’
   sâkîŋ ‘service’
   sâgū ‘boy eligible for circumcision rites’
   -sêgâ (suffix denoting socially elevated position)

1 It appears, however, that non-adjacent obstruent voicing agreement did play some role in the historical tonogenesis process in Yabem (Bradshaw 1979, Ross 1993), and that the current dependence of voicing on tone to some extent is the result of “rule inversion”.
In heteromorphemic contexts, stricture harmony manifests itself dynamically in the form of fricative/stop alternations. The one place where this can be observed directly is in the 3.pl subject agreement prefix /Se-/ (used in realis and irrealis paradigms alike). As shown in (5), this prefix normally surfaces as [sɛ-] (or as [sɛ-] by vowel harmony with a /ɛ/ or /ɔ/ root vowel), either high- or low-toned depending on context. If the root begins with a coronal stop [t] or [d], however, the /S/ of the prefix surfaces as a stop instead, either [t] or [d] as dictated by the tonal context, as we see in (6).

(5) sé-wi ‘they leave’ D30
sé-jándá ‘they hunt’ D39
sé-láʔ ‘they sail’ D39
sé-mʷá ‘they stay’ D36
sé-níŋ ‘they’ll eat’ D38
sé-ső ‘they fail’ D14
sé-mbɛŋ ‘they’ll incise, notch’ D16
sé-báláŋ ‘they carried, hoisted’ D63
sé-kóləŋ ‘they shake’ D18
sé-gɛlɛʔ ‘they drum’ D18
já-sé-kájš ‘they (went and) built’ D36

(6) té-táŋ ‘they cried’ D77
té-túlú ‘they change’ D30
té-tákú ‘they took fright’ D37
té-trŋ ‘they ask’ D14
té-tʃ ‘they paint’ D14
dɛ-ðɛŋ ‘they reached’ D41
dɛ-ðɛʔ ‘they disapprove, do not like’ D16
té-dágʊ ‘they follow’ D18

cases like the last example in (6) show that the prefix consonant (the harmony target) need not surface as completely identical to the root consonant (the harmony trigger). If the two consonants in the underlying /S…T/ sequence find themselves in syllables that differ in tone—as will always happen when the root is disyllabic and low-toned, since tone spreading is confined to the final two-syllable window—then the two will surface with different voicing: [t…d].

3.2 Limitations of stricture harmony

we have already seen how stricture harmony is limited to homorganic fricative…stop sequences (e.g. /Se-Túlú/ → [té-túlú] ‘they change’ vs. /Se-Pálæŋ/ [sɛ-bálæŋ] ‘they carried, hoisted’). this can be interpreted as a similarity effect: a pair of co-occurring consonants will only interact if the two fall above a certain threshold of relative similarity (Rose & Walker 2004, Hansson 2010a). Prior agreement in place of articulation thus seems to contribute to the definition of what constitutes sufficient similarity. the trigger and target are also both required to be obstruents; the nasal stop /n/ does not trigger harmony ([sɛ-níŋ] ‘they’ll eat’). at the time of Dempwolff (1939), agreement in prenasalization was also a prerequisite for interaction, in that prenasalized [nd] (whether under-
lying or the product of irreals formation) is explicitly described as not triggering stricture harmony. This can be seen in examples like (7).

(7)  

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>sè-ndēŋ</td>
<td>‘they’ll move toward’</td>
</tr>
<tr>
<td>sè-ndë?</td>
<td>‘they’ll disapprove, not like’</td>
</tr>
<tr>
<td>sè-ndâŋû</td>
<td>‘they’ll follow’</td>
</tr>
</tbody>
</table>

This particular similarity restriction appears to have been relaxed, in that Ross (1995) describes prenasalized [nd] as triggering harmony no less than its oral counterparts [d] or [t]. For example, the first form in (7) is given as [dè-ndëŋ] by Ross (1995:51). However, stricture harmony has also become an optional process, and the unharmonized [sè-ndëŋ] of Dempwolff’s day thus also remains as a possible output even in present-day Yabem. We will return to the optionality at the end of this section.

In addition to such similarity effects, there is also a *locality effect*, in that the trigger and target may be separated by at most a vowel; in other words, they must occupy adjacent-syllable onsets. (Recall from §2.2 that coronals cannot occur in coda position.) This is seen in cases like (8), where harmony is not triggered by a root-medial /T/. In the terminology of Hansson (2010a), Yabem stricture harmony is a *transvocalic* consonant harmony, not an unbounded one.

(8)  

<p>| | |</p>
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</thead>
<tbody>
<tr>
<td>sè-mé tô</td>
<td>‘they straighten’</td>
</tr>
<tr>
<td>sè-katóŋ</td>
<td>‘they make a heap’</td>
</tr>
</tbody>
</table>

A third limitation is that Yabem stricture harmony also displays a *directionality effect*: whereas [s…t/d] sequences are prohibited (and repaired by regressive assimilation), their mirror-image [t/d…s] sequences are permitted and not subject to harmony. This is seen most clearly with the 1.PL.INCL. subject prefix /Ta-/ which surfaces consistently as either [tâ-] or [dâ-] but never undergoes nor triggers stricture harmony.

(9)  

<p>| | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>tâ-sôm</td>
<td>‘we (incl.) speak’</td>
</tr>
<tr>
<td>tâ-sëwâ</td>
<td>‘we pour’</td>
</tr>
<tr>
<td>tâ-sëléŋ</td>
<td>‘we (incl.) travel’</td>
</tr>
<tr>
<td>dâ-sûŋ</td>
<td>‘we (incl.) shove’</td>
</tr>
</tbody>
</table>

Stricture harmony is thus unidirectional (regressive only: /T…S/ → [t…s] or [d…d]) as well as being featurally asymmetric (fricative assimilates to stop, not vice versa: /T…S/ → [s…s]).

As mentioned earlier, stricture harmony has become *optional* in present-day Yabem. Ross (1995) describes it as such (e.g. [të-tâŋ] = [së-tâŋ] ‘they weep’) and argues that the optionality is a recent development. In a footnote to the 2005 English translation of Dempwolff (1939), the editors make a similar comment about the use of [te-]/[de-] instead of [se-] for the 3.PL. prefix with /T/-initial roots, citing a local missionary linguist: “[t]his restriction seems to be fading out (Rev. Karl Holzknecht, pers. comm.)” (p. 14). It appears, then, that the stricture harmony alternations are in the process of becoming levelled out in favour of the unharmonized prefix alternants.

It is easy to understand the historical change in the status of prenasalized [nd] in stricture harmony—that is, the apparent generalization of harmony from
The central assumption of the ABC model is that such long-distance interactions are driven by constraints that demand featural agreement rather than feature spreading (though see Hansson 2010b on how spreading can emerge as the op-
timal means of achieving agreement). Furthermore, interaction between non-adjacent segments is assumed to be mediated by an abstract correspondence relation (C↔C correspondence) which links co-occurring output segments provided that they meet certain criteria. Agreement then results from IDENT[F] constraints that operate over this C↔C correspondence dimension.

4.1 CORR-C↔C and IDENT[F]-CC constraints

In the ABC analysis of consonant harmony, the presence of a C↔C correspondence relation between the interacting consonants is not given a priori (as is the case for Input↔Output or Base↔Reduplicant correspondence); rather, C↔C correspondence is put in place through the effects of ranked and violable constraints. The motivating factor is relative similarity between C₁ and C₂: the more similar they are (the more features they share), the stronger the demand that the two be linked by a correspondence relation. The family of constraints in question is referred to as CORR-C↔C, and individual constraints can be defined as per the template in (11) below (Rose & Walker 2004).

(11)  CORR-X↔Y
Let S be an output string of segments and let X, Y be segments that share a specified set of features F. If X, Y ∈ S, then X is in a relation with Y; that is, X and Y are correspondents of one another.

Here we will follow a labelling convention whereby “X” and “Y” are represented by segments that are maximally different from each other while still sharing the required feature set F. For example, in accounting for interactions among sibilants in a coronal harmony system, CORR-Z↔C would require correspondence between sibilants that share the features [coronal, +strident] (but potentially differ in any or all of [+continuant, ±voice, ±anterior]), whereas its counterpart CORR-Z↔Š has a higher similarity threshold, pertaining only to those sibilant pairs that have matching [+continuant] values as well (that is, fricative…fricative and affricate…affricate pairs). CORR-C↔C constraints thus form similarity-based hierarchies, owing to subset-superset relations among the shared feature sets F that they stipulate.

For the analysis of stricture harmony in Yabem as described by Dempwolff (1939; that is, “Stage I” in (10) above), the pivotal constraint is CORR-S↔D as defined in (12):

(12)  CORR-S↔D
If X and Y are segments in the output and X, Y are both specified as [−consonantal, βsonorant, γnasal, δPlace], then X, Y are correspondents of one another.

This constraint, when sufficiently high-ranked, forces the presence of a correspondence relation between the members of a co-occurring obstruent…obstruent pair (as well as in sonorant…sonorant pairs), provided that these are homorganic ([δPlace]) and either both oral or both prenasalized ([γnasal]). For instance, (12)

2 For simplicity, we assume that prenasalized obstruents such as [mb] or [ns] are specified as [−sonorant, +nasal], whereas nasals are [+sonorant, +nasal]. The distinction be-
will induce correspondence among members of the sets \{ t, d, s \}, \{ nd, ns \}, \{ p, b, p^\prime, b^\prime \}, and so forth.

In terms of its effects (/S/ → [t] or [d]), Yabem stricture harmony affects the two features \([±\text{continuant}]\) and \([±\text{strident}]\). As \([s]\) is the only segment in Yabem that is \([+\text{continuant}, +\text{strident}]\), we will for convenience use the privative cover feature “[stop]” to represent the combination \([–\text{continuant}, –\text{strident}]\). The constraint that enforces agreement—and hence assimilation—between corresponding consonants is \(\text{IDENT[stop]}\)-CC. This constraint checks for feature mismatches in terms of the [stop] feature (i.e. \([–\text{continuant}, –\text{strident}]\)). To fully account for the directionality asymmetry, to be addressed in §4.3 below, we build reference to the linear order of the two consonants into the definition of this constraint, following Rose & Walker (2004; for a somewhat different approach to directionality asymmetries, see Hansson 2010a):

\[
\text{IDENT[stop]}\cdot C_R C_L
\]

Where \(C_L\) and \(C_R\) are corresponding segments in the output, and \(C_L\) precedes \(C_R\) in the output string, if \(C_R\) is [stop], then \(C_L\) is also [stop].

Note that \{ t d s \} and \{ nd ns \} are the only groupings demarcated by the constraint \(\text{CORR-S↔D}\) whose members can in principle differ in [stop] specifications. Therefore, these are the only classes that can potentially be affected by the demands of the \(\text{IDENT[stop]}\cdot C_R C_L\) constraint.

In order for the combined effects of \(\text{CORR-S↔D}\) and \(\text{IDENT[stop]}\cdot C_R C_L\) to result in overt stricture harmony, both constraints must outrank the faithfulness constraint in (14), which penalizes the change /S/ → [t] or [d]. The basic ranking schema is illustrated by the tableau in (15). In candidate outputs in tableaux, the presence of a CC correspondence relation is indicated by matching subscript indices; the absence of such a relation in competing candidates is shown by mismatched subscripts between the same two consonants.

\[
\text{IDENT[stop]}\cdot \text{OI}
\]

If \(X\) is a segment in the output and \(Y\) is a correspondent of \(X\) in the input, then if \(X\) is [stop], \(Y\) is [stop].

\[
\begin{array}{|c|c|c|}
\hline
\text{/Se-Táŋ/} & \text{CORR-S↔D} & \text{IDENT[stop]}\cdot C_R C_L & \text{IDENT[stop]}\cdot \text{OI} \\
\hline
\text{a. s}_x\text{-t}ā\text{ŋ} & *! & & \\
\text{b. s}_x\text{-t}ā\text{ŋ} & & *! & \\
\text{c. t}_x\text{-t}ā\text{ŋ} & & & * \\
\hline
\end{array}
\]

4.2 The similarity restriction

The fact that stricture harmony does not apply to heterorganic fricative…stop sequences is due to the low ranking of those \(\text{CORR-C↔C}\) constraints that define somewhat broader equivalence classes, such as that in (16):

tween oral [b] and prenasalized [mb] is thus one of [–nasal] vs. [+nasal] alone. Our analysis can be easily adapted to other representational assumptions about prenasalization.
(16) CORR-S→B
If X and Y are segments in the output and X, Y are both specified as
[a:consonantal, b:sonorant, γ:nasal], then X, Y are correspondents of one
another.

Specifically, such constraints must be outranked by Input-Output faithfulness in
the guise of IDENT[stop]-OI (14):

(17) /Se-Pá/ → [sé-pá] ‘they chop’

<table>
<thead>
<tr>
<th>/Se-Pá/</th>
<th>IDENT[stop]-CnC_l</th>
<th>IDENT[stop]-OI</th>
<th>CORR-S→B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. s_i-p_uá</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. s_i-p_uá</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. t_i-p_uá</td>
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</table>

The same applies to obstruent pairs which are homorganic, but differ in
nasality (i.e. prenasalization). The relevant constraint here is CORR-S→ND,
defined in (18). The ranking of this constraint below IDENT[stop]-OI results in
the absence of harmony in such sequences as well, as illustrated in (19).

(18) CORR-S→ND
If X and Y are segments in the output and X, Y are both specified as
[a:consonantal, b:sonorant, γ:Place], then X, Y are correspondents of one
another.

(19) /Se-[+nas]-Tèŋ/ → [sè-nďèŋ] ‘they will reach’ (Dempwolff 1939)

<table>
<thead>
<tr>
<th>/Se-[+nas]-Tèŋ/</th>
<th>IDENT[stop]-CnC_l</th>
<th>IDENT[stop]-OI</th>
<th>CORR-S→ND</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. s_i-nď_eñ</td>
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<td></td>
<td>*</td>
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<tr>
<td>b. s_i-nď_eñ</td>
<td>*</td>
<td></td>
<td></td>
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<tr>
<td>c. d_i-nď_eñ</td>
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We now also have a formal account of the difference between the stric-
ture harmony pattern as described by Dempwolff (1939), in which prenasalized
stops categorically fail to trigger harmony, and the present-day pattern as de-
scribed by Ross (1995), in which the class of harmony triggers has been general-
ized to encompass prenasalized stops as well. The difference lies in the relative
ranking of CORR-S→ND vis-à-vis the faithfulness constraint IDENT[stop]-OI. The
widening of the scope of stricture harmony to [s…nd] pairs reflects a pro-
motion of the former constraint over the latter, as depicted in (20).
4.3 The directional and featural asymmetries

In order to account for the fact that stricture harmony is regressive only, the agreement-triggering constraint in (13) has been defined in such a way as to specify a right-to-left (anticipatory) dependency of $C_1$ ("C₁") on $C_2$ ("C₂") in a $C₁…C₂$ sequence of the relevant type. The mirror-image counterpart of that constraint, IDENT[stop]-C₁C₂, must be lower ranked. We can see this from the lack of harmony in forms where the 1PL.INCL. prefix /Ta-/ precedes an [s]-initial root, as shown in (21).

(21) /Ta-Séwá/ → [tá-séwá] ‘we (incl.) pour’

<table>
<thead>
<tr>
<th>/Ta-Séwá/</th>
<th>CORR[-S→D]</th>
<th>IDENT[stop]-C₁C₂</th>
<th>IDENT[stop]-OI</th>
<th>IDENT[stop]-C₁C₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tₐ-s-éwá</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. tₐ-s-éwá</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. tₐ-tₐ-éwá</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

Secondly, we need to explain why disharmonic sequences are never repaired by changing the stop into [s] rather than vice versa. In terms of our privative "[stop]" feature (= [-continuant, -strident]), we need to distinguish between on the one hand the gain of that feature, which is penalized by IDENT[stop]-OI as defined in (14) above, and on the other the loss of that feature, such as by the change /T/ → [s]. The latter instead constitutes a violation of IDENT[stop]-IO:

(22) IDENT[stop]-IO

If X is a segment in the input and Y is a correspondent of X in the output, then if X is [stop], Y is [stop].

The ranking of this constraint above IDENT[stop]-OI ensures that the enforcement of harmony in the kinds of [s…t] or [s…d] sequences that are penalized by IDENT[stop]-C₁C₂ is always achieved by means of (regressive) "stopping" of /S/ and never by (progressive) “fricativization” of /T/:

(23) /Se-Tañ/ → [té-tañ] ‘they cry’

<table>
<thead>
<tr>
<th>/Se-Tañ/</th>
<th>IDENT[stop]-C₁C₂</th>
<th>IDENT[stop]-OI</th>
<th>IDENT[stop]-OI</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sₐ-tₐ-án</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. tₐ-tₐ-án</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. sₐ-sₐ-án</td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
4.4 The locality restriction

Finally, our analysis must capture the fact that stricture harmony only takes place when the trigger and target are separated by no more than a vowel—that is, when the two obstruents occupy the onsets of adjacent syllables. While much is yet unclear about the nature of the locality restriction that defines “transvocalic” consonant harmony systems (see Hansson 2010a:175–178 for discussion), we will here adopt a relatively conventional interpretation in terms of syllable adjacency (Odden 1994, Rose & Walker 2004, Bennett 2013).

The idea is that a high-ranked constraint requires correspondents to be in adjacent syllables—and hence bans correspondence relations from holding across greater distances than that. Following Rose & Walker (2004), we will refer to this constraint as PROXIMITY, defined here as in (24).

(24) PROXIMITY
If X and Y are correspondent output segments, then X and Y are located in the same syllable or in adjacent syllables.

When ranked above the crucial CORR-C↔C constraint, PROXIMITY has the effect of preventing correspondence, and hence circumventing the need for agreement (harmony), between consonants that are more than a syllable apart:

(25) /Se-méTóʔ/ → [sé-métóʔ] ‘they straighten’

<table>
<thead>
<tr>
<th>/Se-méTóʔ</th>
<th>PROXIMITY</th>
<th>CORR-S↔D</th>
<th>IDENT[stop]-CᵣC_L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. s̥-mé-t,óʔ</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. s̥-mé-t,óʔ</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. t̥-mé-t,óʔ</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Importantly, PROXIMITY must outrank not just the most general of the CORR-C↔C constraints that define eligible trigger-target pairs, but even the narrowest, most stringent one. For example, CORR-S↔T requires correspondence between homorganic obstruents that agree in nasality and voicing; it thus takes scope over [s…t] pairs while ignoring [s…d] pairs. As shown in (26), this constraint too must be outranked by PROXIMITY.

(26) /Se-méTóʔ/ → [sé-métóʔ] ‘they straighten’

<table>
<thead>
<tr>
<th>/Se-méTóʔ</th>
<th>PROXIMITY</th>
<th>CORR-S↔T</th>
<th>CORR-S↔D</th>
<th>IDENT[stop]-CᵣC_L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. s̥-mé-t,óʔ</td>
<td>*</td>
<td></td>
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</tr>
<tr>
<td>a. s̥-mé-t,óʔ</td>
<td>*</td>
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<td></td>
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<td>b. t̥-mé-t,óʔ</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Were the ranking instead CORR-S↔T >> PROXIMITY >> CORR-S↔D, the result would be a hybrid system in which stricture harmony is unbounded for [s…t] sequences, but transvocalic for [s…d] sequences. That is, we would find long-distance stricture harmony enforced in /Se-méTóʔ/ → (26)c *[té-mé tôʔ]
where that change would have turned a selective sound change at all. Rather, agreement in \([-\text{continuant}, -\text{strident}]\)

(27)

In his article on Yabem tonogenesis, Bradshaw (1979) comments, in a footnote regarding the stricture harmony, that “[t]his ‘realization’ of s as \(t\) and \(\tilde{s}\) [= s in a low-toned syllable] as \(d\) may actually be preservation of an earlier stage before \(d\) … became \(\tilde{s}\) and \(t\) became \(s\) before the upper-mid front vowel in the 3rd person plural subject prefix, \(\ddot{e} [= /e/]\)” (Bradshaw 1979: 201, n. 7; emphasis added). The scenario that Bradshaw describes can be depicted as in (27):

(27) Pre-Yabem: \(\{t,d\} > \{s,z\} / \_ e\)

Yabem: \(\text{té-kátónj} \quad \text{dé-wi} \quad \text{tě-táké} \quad \text{dé-dênj}\)

\(\text{dé-wi} \quad \text{s} \quad \text{z} \quad \text{blocked} \quad \text{blocked}\)

\(\text{sé-kátónj} \quad \text{zé-wi} \quad \text{tě-táké} \quad \text{dé-dênj}\)

\( (> \text{ sé-wi})\)

If this is correct, then the observed instances of stricture harmony (that is, agreement in \([-\text{continuant}, \pm\text{strident}]\)) did not arise by means of any assimilatory sound change at all. Rather, consonant harmony emerged by means of the selective blocking of an otherwise regular sound change in just those cases where that change would have turned an already agreeing \([t/d…t/d]\) sequence

5. Cross-linguistic typology and the emergence of stricture harmony

In the preceding section we demonstrated how a correspondence-based agreement analysis can be applied to Yabem stricture harmony. Despite its uniqueness within the typology of consonant harmony systems (Hansson 2010a), this case displays many of the same traits that other more common, types of harmony exhibit, such as similarity effects, directionality effects and locality restrictions. However, it still behooves us to ask why it is that stricture harmony is so strikingly rare among the world’s languages. If there is nothing remarkable about the synchronic grammar-internal mechanism for this type of consonant harmony, does the key perhaps lie in the diachronic mechanisms responsible for its emergence? What are those mechanisms? How does stricture harmony arise?

Questions such as these reflect a reorientation of the study of cross-linguistic typological patterns towards diachronic (“evolutionary”) explanations (e.g. Blevins 2004; see Hansson 2008 for an overview). In this vein, for example, Hansson (2007) studied another extremely rare type of consonant harmony, that involving secondary articulations like palatalization or pharyngealization, and found that the attested cases tend to have come into being by rather fortuitous and indirect routes. Importantly, none of these appear to involve a historical process of non-local assimilation in the relevant secondary-articulation feature. For example, consonant palatalization harmony in Karaim represents an inherited Turkic front/back vowel harmony that has been “transposed” onto the surrounding consonants (in part for reasons of contact with neighbouring Baltic and Slavic languages). Consonant pharyngealization harmony in Tsilhqot’in turns out to have originated in a straightforward sibilant harmony system, where the relevant contrasts in the sibilant inventory have eventually shifted into a radically different featural dimension (from \([s]:[ʃ]\) via \([ɡ]:[s]\) to \([s']:[s]\)).

Could something similar be the case for Yabem stricture harmony? Interestingly, the answer appears to be yes, although as yet the details of the historical development are not fully understood and have not been investigated systematically. In his article on Yabem tonogenesis, Bradshaw (1979) comments, in a footnote regarding the stricture harmony, that “[t]his ‘realization’ of \(s\) as \(t\) and \(\tilde{s}\) [= \(s\) in a low-toned syllable] as \(d\) may actually be preservation of an earlier stage before \(d\) … became \(\tilde{s}\) and \(t\) became \(s\) before the upper-mid front vowel in the 3rd person plural subject prefix, \(\ddot{e} [= /e/]\)” (Bradshaw 1979: 201, n. 7; emphasis added). The scenario that Bradshaw describes can be depicted as in (27):

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\(\text{dé-wi} \quad \text{s} \quad \text{z} \quad \text{blocked} \quad \text{blocked}\)

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\( (> \text{ sé-wi})\)

If this is correct, then the observed instances of stricture harmony (that is, agreement in \([-\text{continuant}, \pm\text{strident}]\)) did not arise by means of any assimilatory sound change at all. Rather, consonant harmony emerged by means of the selective blocking of an otherwise regular sound change in just those cases where that change would have turned an already agreeing \([t/d…t/d]\) sequence
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It appears, however, that of the sound patterns that are the synchronic manifestation of stri harmony image inherited "disharmonic" sequences consistently. T...

Another case in point is the ubiquitous (though mostly gradient rather than categorical) retroflex harmony documented in numerous languages of the Indian subcontinent by Arsenault (2012), in particular in the Dravidian family. In Proto-Dravidian, retroflex stops (/t/) were absent root-initially. Subsequently, in many of the daughter languages, instances of root-initial \[T\] develop from a variety of sources (borrowing, sound change). However, this happens significantly less often—or not at all—precisely in roots where a non-retroflex coronal (i.e. dental) stop /T/ followed; that is, /TVK/ sequences do arise by various means, but /TVT/ sequences remain conspicuously unattested or underrepresented. This goes hand in hand with (sporadic) historical changes of the mirror-image inherited “disharmonic” sequences /TV\[T\]/ > /\[TV\]/, where retroflexion harmony was induced by active assimilation.

As noted above, much remains unclear about the origins and development of the sound patterns that are the synchronic manifestation of stricture harmony in Yabem. It appears, however, that this is yet another case in which a synchronic pattern of non-adjacent consonant assimilation (in the input-output mapping) did not arise by a historical process of active assimilation of that same kind, but rather by the reanalysis of identity patterns that had a somewhat different origin.

6. Conclusions

We have shown that Yabem stricture harmony is a well behaved and unremarkable instance of consonant harmony in most respects. The featural basis for the harmony is indeed highly unusual from a typological perspective; its other aspects, however, are not. Consequently, the Yabem case is amenable to the same kind of synchronic analysis, in terms of correspondence-based agreement, as has been developed for other types of systems. This also applies to the apparent historical change in the behaviour of prenasalized \[nd\] (from non-trigger to trigger), which is easily modelled in the grammar as a change in constraint ranking.

Interestingly, Yabem can be said to fill an otherwise unexpected typological gap. Recent work on long-distance consonant dissimilation as resulting from the same kind of correspondence-based constraint machinery as consonant harmony (Bennett 2013) predicts that long-distance agreement in the feature \[±\text{continuant}\] should be possible. This is exactly what the Yabem harmony pattern appears to instantiate.
Finally, we commented on the unusual historical origins of this unusual case, which seem to have involved the blocking of (accidental) appearances of “disharmonic” consonant pairs due to other sound changes. However, the relevant details still require much investigation, for example regarding the full range of historical sources of Yabem /s/ and the extent to which it is a historical reflex of earlier */t/ or */d/.

References


