

Aspiration ‘Dissimilation’ in Tangkhul Naga Prefixation

Deepthi Gopal
University of Manchester

1 Introduction

In Tangkhul Naga¹ (henceforth also TN; Tibeto-Burman, Manipur, Nagaland, upper Myanmar), obstruent-initial prefixes² are strictly unaspirated if followed by any stem-initial obstruent, and aspirated before stem-initial sonorants (Arokianathan 1987, Mortensen 2003, Shosted 2007). (Note the two-way system of laryngeal contrasts in stops, between plain and aspirated, in Tangkhul Naga.) I illustrate this in (1) for the verbal prefix /k^hə-/, which obligatorily appears in the citation form of the verb and is by far the most (synchronically) productive.

(1) /k^hə-/: *Sonorant-initial roots require aspiration in the prefix; obstruent-initial roots require deaspiration.* (Mortensen 2003)

- i. *Sonorant*
 - k^hə-rɪŋ ‘to live’
 - k^hə-ŋə.ŋə ‘to hear’
 - k^hə-lum ‘to warm’
- ii. *Unaspirated obstruent*
 - kə-pəm ‘to sit’
 - kə-təm ‘to read’
 - kə-kə.ʃut ‘to brush’
- iii. *Aspirated obstruent*
 - kə-hək ‘(to be) big’
 - kə-p^hi ‘to filter’
 - kə-k^hə-ra ‘to sharpen’

An identically-conditioned alternation exists as (2) for the causative /ʃi-/ – this must surface as [tʃi-] if followed by an obstruent onset, but as [ʃi-] if followed by a stem-initial sonorant.

* I’m grateful to Yuni Kim and Ricardo Bermúdez-Otero for feedback, and to audiences and anonymous reviewers at AMP 2016 and the LAGB 2016 Annual Meeting for helpful comments. Particular thanks to S. Zimik, for sharing her language with me with great kindness and patience, at exceptionally short notice.

¹ Examples are generally drawn from Arokianathan 1987, Mortensen 2003, and consultation with one Tangkhul informant [F 29] from Ukhul, resident at the time in Bangalore, India. Note that while TN speech varieties differ greatly between neighbouring villages (Mortensen 2003), the Ukhul dialect represents something of a lingua franca and is the base of virtually all existing descriptions of TN.

² I am not aware of an obstruent-initial prefix in TN not subject to identical alternations. However, due to the relative poverty of the system, it is not clear whether this is an accidental or a systematic gap, and thus I avoid further remark at this time.

(2) /ʃi-/: *Fricative surfaces for a following sonorant onset, affricate surfaces for a following obstruent onset.* (Victor 1997)

i. *Sonorant*

ʃi.ra	'send towards'
ʃi.mən	'cause to drink'
ʃi.met	'cause/d to get down'

ii. *Unaspirated obstruent*

tʃi.ka	'send up'
tʃi-kan.saj	'cause/d to cross'
tʃi-tuŋ.tə.ləj	'to brush'

iii. *Aspirated obstruent*

tʃi-tʰəj	'cause/d to see'
kə-tʃi-han	'to expect'

Other infrequent or non-productive forms in the lexicon follow similar patterns e. g. [pʰə.ŋa] 'five' but [pə.ti] 'four', where the numerical prefix p^(h)ə- is no longer productive in TN; the examples given in (1) and (2) are the only synchronically productive obstruent-initial prefixes of which I am aware.

I suggest here that these alternations do not straightforwardly correspond to either a purely-assimilating or a purely-dissimilating system. Consider a system in which alternations are driven by some assimilating force: in such a case, we must expect sequences of identically-specified laryngeally marked segments to be allowed (✓ k^h ... k^h) and sequences differing in specification to be disallowed (✗ k^h ... k) – but in (1), we have obligatory deaspiration before aspirates (✗ k^h ... k^h). Along similar lines, in a dissimilating system, we expect sequences of identically-specified segments to be banned (✗ k^h ... k^h) and sequences that differ in laryngeal specification to be allowed (✓ k^h ... k) – but in TN aspirated prefixes may not appear even with an unaspirated following onset (✗ k^h ... k). If we see assimilation as 'similarity-increasing' and dissimilation as 'similarity-decreasing', then (1iii, 2iii) are too similarity-decreasing to be assimilatory, and (1ii, 2ii) are too similarity-increasing to be dissimilatory.

In this paper, I propose (treating (1) and (2) identically, as briefly justified in the following section) that the laryngeal alternations in TN prefixes can be modeled as the interaction of apparently contrary penalties on *both* agreement and disagreement – this provides a concise and complete account of the situation in TN. I demonstrate that such an analysis then requires that assimilation and dissimilation be given formally independent motivations in order to allow their interaction – crucially, some existing models appear not to permit this, and consequently cannot straightforwardly be made to account for the TN data. I include a brief comment on similar phenomena in closely-related languages.

2 Analysis and considerations

In establishing the analysis, I note here that, in the remainder of this discussion, I understand the k^h – k alternation in terms of the feature [±spread glottis]; it would be appealingly parsimonious to consider the ʃi – tʃi alternation in (2) identically. I propose, to unify our treatment of (1) and (2), that TN follows the apparent crosslinguistic tendency for voiceless fricatives to be [+spread glottis] and to consistently pattern with aspirated stops (see: Vaux 1998; Vaux & Miller 2011) – (un-aspirated) affricates are expected instead to pattern with the plain stops. Consider (3): essentially identically to the case for New Julfa Armenian given by Vaux 1998, postnasal voicing is blocked for both fricatives and aspirates, as a consequence of the avoidance of the highly marked [+nasal, +spread glottis].

(3) Post-nasal voicing in Tangkhul Naga obstruents:

i. *Affricates and plain stops voice:*

/rəmtʃo/	rəmdʒo	'forest'
/tʃəntʃi/	tʃəndʒi	'tongs'
/kəmpɔr/	kəmbɔr	'blanket'
/jamkər/	jamgər	'hammer'

ii. *Fricatives and aspirates do not:*

/riŋsən/	riŋsən	'red ant'
/kʰonʃat/	kʰonʃat	'curse'
/riŋpʰət/	riŋpʰət	'agree'
/zintʰən/	zintʰən	'dawn'

2.1 Proposal Gallagher (2010:16) observes that no language penalises *both* roots with stops that agree in laryngeal features *and* roots with stops that disagree in laryngeal features. One possible such language, assuming both assimilatory and dissimilatory constraints are highly-weighted, is the language in which laryngeally-marked stops are only allowed to occur if no other stop appears in the root – laryngeally-marked stops are banned both from co-occurring (dissimilation) and coexisting with an unmarked stop (assimilation). Such constraint activity generates the pattern in (4), which remains unattested in roots.

(4) ✗ K^h-T^h, ✗ K^h-T, but ✓ K-T, ✓ K^h-N

This gap is cited as support for the proposition that an unintegrated model relying on separate constraints to enforce assimilation and dissimilation necessarily overgenerates – if a model allows both assimilatory and dissimilatory constraints to be active with respect to a single feature, then it must predict (4). In this paper no claim is made as to whether the absence of (4)-like patterns in roots is indeed accidental or systematic³, but if we recall the TN pattern of (1) and (2), the analytic relationship seems straightforward – a generalisation of (1) is identical to (4). In a consequent analysis, then, we will propose that assimilatory constraints militate against sequences of non-identical obstruents to generate the pattern (✗ k^h ... k) of (1ii), and that simultaneously, independently-operating dissimilatory constraints ban sequences of *identical* marked obstruents, (✗ k^h ... k^h).

2.1.1 Constraints I note here that although I will explicitly define dissimilatory and assimilatory constraints below to facilitate the analysis, in this instance it does not seem necessary to provide any particular formulation thereof; the only requirement is that constraints enforcing agreement operate *independently* of those enforcing disagreement. A further illustration of this requirement appears in section 3. Nevertheless, in order to clearly illustrate, constraints are defined as in this subsection.

Dissimilation: We require an anti-agreement/similarity-decreasing markedness constraint of appropriate form. Consider a generalized OCP constraint (on the Obligatory Contour Principle, see: Leben 1973, Goldsmith 1976, McCarthy 1986; on allowing non-local interactions: Alderete 1997, Suzuki 1998, MacEachern 1999). The OCP penalises adjacent identical features occurring within a single root; the family of generalized OCP constraints relaxes the strict adjacency requirement, extending the domain in which multiple occurrences of a particular feature are forbidden. In order to (partially!) account for the Tangkhul Naga case, what is required is a (very simplified generalized OCP) constraint imposing a ban on sequences of multiple aspirates – that is, sequences of multiple segments specified [+spread glottis]. This can be given as in (5):

(5) *+[sg][+sg]: Assign a violation for each occurrence of two segments specified [+spread glottis].

Assimilation: I reiterate here that this analysis is not reliant on any particular definition of the assimilatory constraint. In the broader context of work on long-distance consonant assimilation (Hansson 2001, Rose & Walker 2004, inter alia) assimilation is derived by imposing correspondence relations on sufficiently similar non-adjacent consonants, which then are subject to further constraints on featural identity. I argue that the

³ Nearly all non-monosyllables in the TN lexicon are morphologically transparent – while it would be of interest to comment on the state of root co-occurrence and ordering restrictions in TN, this option does not seem open to us.

particular structure of these CC-correspondence constraints is not of material significance, and analogously to the simplification made in (5), we may denote the operation of relevant CC-correspondence with a markedness constraint on consonant co-occurrence penalizing disagreement in laryngeal features (6) (after Gallagher 2010: 33).

- (6) * $[\pm\text{sg}][\mp\text{sg}]$: Assign a violation for each sequence of segments with opposing $[\pm\text{spread glottis}]$ specification.

Constraints of these types then interact with standard IDENT[F], as well as constraints enforcing faithfulness to the root (cf. Beckman 1998):

- (7) IDENT[SG]: Corresponding input and output segments must have the same value for [spread glottis]. IDENTROOT[SG]: Corresponding input and output segments *within the root* must have the same value for [spread glottis].

If (5) outranks IDENT[F] and (6) does not, then we expect a classically dissimilating system; if vice versa, then we expect an assimilating system. If both (5) and (6) outrank IDENT[F], the resulting system must show some 'mixed' pattern. (1) may now be quite trivially modeled, with the note that we (definitionally or axiomatically) have that sonorants, being *without* $[\pm\text{spread glottis}]$ specification, are not subject to either the similarity-increasing or similarity-decreasing constraints on [spread glottis]. The necessary demonstration is given in (8) (9) (10) below; in all cases, the root onset position is preserved, concordant with generally robust tendencies towards faithfulness in such positions.

- (8) /k^hə.pəm/: unaspirated obstruent root onset, prefix deaspirates in output.

/k ^h ə.pəm/	IDENT-ROOT	*[+SG][+SG]	*[±SG][∓SG]	IDENT-IO
ᵐᵐ kə.pəm				*
k ^h ə.pəm			*!	
kə.p ^h əm	*!		*	*
k ^h ə.p ^h əm	*!	*		*

- (9) /k^hə.p^hi/: aspirated obstruent root onset, prefix deaspirates in output.

/k ^h ə.p ^h i/	IDENT-ROOT	*[+SG][+SG]	*[±SG][∓SG]	IDENT-IO
ᵐᵐ kə.p ^h i			*	*
k ^h ə.p ^h i		*!		
kə.p ^h i	*!			*
k ^h ə.p ^h i	*!		*	*

- (10) /k^hə.lum/: sonorant root onset, prefix does not deaspirate in output.

/k ^h ə.lum/	IDENT-ROOT	*[+SG][+SG]	*[±SG][∓SG]	IDENT-IO
kə.lum				*!
ᵐᵐ k ^h ə.lum				

In (8), the fully faithful candidate violates the assimilatory constraint: the ban * $[\pm\text{sg}][\mp\text{sg}]$ on differing [spread glottis] specifications requires that the aspirated prefix deaspirate before an unaspirated following onset. In (9), the fully faithful candidate violates the dissimilatory constraint: a higher-ranking ban on successive marked values of [+spread glottis], * $[\text{+sg}][\text{+sg}]$, forces the aspirated prefix to deaspirate *despite* the incurred violation of the assimilatory constraint. In (10), sonorant segments unspecified for [sg] trigger neither constraint, and we predict faithful output.

3 Other options

3.1 Dissimilation in Agreement by Correspondence In 2.1.1, I briefly mentioned correspondence-based theories of long-distance assimilation. In this section, I discuss some particular implementations of

Agreement by Correspondence (ABC), and the potential analytic irregularities raised by the TN case – those implementations of ABC which do not allow an interaction between anti-agreement and agreement for the same feature within the same domain are here problematic.

In Agreement by Correspondence (Hansson 2001; Rose & Walker 2004, Bennett 2013, *inter alia*), assimilation (and dissimilation, discussed further below) are attributed to the interaction of surface segments whose *correspondence* is determined by phonological similarity – the more similar the segments, the higher-ranked the correspondence between them must be. These correspondence relationships are enforced by the family of CORR constraints (11), defined within a particular domain (precise domain of operation is not a crucial issue in this discussion).

- (11) CORR-A↔B: Assign a violation to a pair of segments not in correspondence in the output.
IDENT-CC[F]: Assign a violation to corresponding segments disagreeing in [F] specification.

CORR constraints occupy a fixed hierarchy scaled by similarity. An example, adapted loosely from Rose and Walker 2004, is given in (12) below:

- (12) An example similarity hierarchy.

Highest similarity	Less similarity	Lowest similarity
CORR-N↔N	CORR-T↔T ^h	CORR-N↔T ^h
CORR-T ^h ↔T ^h		

The property of correspondence is assigned to then mediate further segment-segment interaction: given two segments which (are similar enough to) correspond, a constraint on featural identity IDENT-CC[F] within the correspondence set (if two segments correspond, they are constrained to be identical for a given feature [F]) forces assimilation (segments match in [F]-specification in order to satisfy identity constraints).

Bennett's (2013) ABC-D framework extends the ABC analysis of long-distance harmony to cases of long-distance disharmony. Dissimilation happens "as an escape from correspondence requirements" – corresponding segments that are subject to a highly-ranked *further* constraint penalizing correspondence will dissimilate – reducing the phonological similarity between the segments allows them to be subject to a lower-ranked correspondence constraint, which may be violated at lower cost. Penalties on correspondence are imposed by Bennett's family of CC-LIMITER constraints – these constraints assign violations to corresponding segments based on some further property, e. g.

- structural position (onset, coda)
- locality (adjacency of syllable)
- (morphological) domain edge
- featural agreement

Dissimilation then occurs because some CC-LIMITER constraint(s) outranks the constraints enforcing identity between highly similar corresponding input segments – in order to avoid CC-LIMITER violation, the segments become dissimilar enough to escape correspondence itself. Crucially, this necessarily implies a unification of the mechanism driving assimilation and the mechanism driving dissimilation – segmental correspondence fulfilled leads to harmony, and segmental correspondence denied to disharmony.

Consider the examples in (1iii). This subset of the TN data shows classically dissimilatory behavior – [+spread glottis] in the prefix is lost when followed in sequence by another [+spread glottis] segment. If we posit a placeholder (CC-LIMITER) constraint enforcing dissimilation i. e. penalizing correspondence between segments, a fairly simple analysis (13) adequately gives (1iii) – given once again, although not made explicit in these examples, that the root onset is not targeted for repair.

- (13) /k
- ^h
- ə-p
- ^h
- i/: if some (CC-LIMITER) blocks correspondence, deaspirate.

	/k ^h ə-p ^h i/	CORR-T↔T CORR-T ^h ↔T ^h	(CC-LIM)	IDENT-CC[sg]	CORR-T↔T ^h
<i>don't correspond be less similar</i>	[☞] k _x əp ^h _y i				*
<i>correspond be less similar</i>	k _x əp ^h _x i		*! (?)	*	
<i>don't correspond be faithful</i>	k ^h _x əp ^h _y i	*!			
<i>correspond be faithful</i>	k ^h _x əp ^h _x i		*!		

In (13), our placeholder (CC-LIMITER) imposes a penalty on {k^hə.p^h} that drives dissimilation, and we arrive at the desired winner, [kə.p^hi]. Our claim here is effectively that dissimilation in a sequence of two aspirates is predicted appropriately, as long as there exists at least one (CC-LIMITER) constraint that can block correspondence within sequences of form {k^hə.p^h} – viz. sequences of stops matching in [+spread glottis] specification. (Note that such a constraint may or may not additionally block correspondence in a sequence of form {kə.p^h} – the analysis remains unchanged in either case.)

This seems reasonable, and well within the purview of Bennett's Limiter constraint set. However, consider now (14), in which an example from (1ii) is considered:

- (14) /k
- ^h
- ə-pəm/: if all rankings and a hypothetical (CC-LIMITER) are retained as (13),
- do not deaspirate!*

	/k ^h ə-pəm/	CORR-T↔T CORR-T ^h ↔T ^h	(CC-LIM)	IDENT-CC[sg]	CORR-T↔T ^h
<i>don't correspond be more similar</i>	k _x əp _y əm	*!			
<i>correspond be more similar</i>	k _x əp _x əm		*!		
<i>don't correspond be faithful</i>	[☞] k ^h _x əp _y əm				*
<i>correspond be faithful</i>	k ^h _x əp _x əm		*!	*	

- (15) /k
- ^h
- ə-pəm/: can we produce a better (CC-LIMITER) than (14)?

	/k ^h ə-pəm/	CORR-T↔T CORR-T ^h ↔T ^h	(CC-LIM)	IDENT-CC[sg]	CORR-T↔T ^h
<i>don't correspond be more similar</i>	k _x əp _y əm	*!			
<i>correspond be more similar</i>	[☞] k _x əp _x əm				
<i>don't correspond be faithful</i>	k ^h _x əp _y əm				*!
<i>correspond be faithful</i>	k ^h _x əp _x əm			*!	

If we recall the data in (1ii), then we expect the winning candidate must be [kə.pəm]; but this loses to [k^hə.pəm] in (14). The situation in (15) seems vastly preferable, and the question of (14) versus (15) entirely dependent on the specification of our placeholder (CC-LIMITER) constraint – (CC-LIMITER) blocks the sequence {kə.p} in (14), but not in (15).

I then pose the question: *is it possible to propose a CC-Limiter constraint that generates (13), but does not have the unwanted behavior of (14)?* Deaspiration in /k^hə-pəm/ can only be accounted for by the same ranking as (13) if the (CC-LIMITER) given in (15) holds: that is, (CC-LIMITER) must in (13) block correspondence in

{k^hə.p^h}, but must in (15) *permit* correspondence in {kə.p}. Note that for both input strings in question /k^hə-p^hi/ and /k^hə-pəm/, morphological boundaries, syllable boundaries, and structural positions of the correspondents are identical – so we would require (CC-LIMITER) to take the form of a constraint on featural identity CC-IDENT[FEATURE] capable of discriminating between segment pairs {k, p} and {k^h, p^h}. Is this placeholder then valid? Certainly no single such constraint exists, and it is not apparent that one may construct some fortuitous coincidence of Limiter constraints that conspires to generate such an effect without simply reimplementing a new mechanism for assimilation⁴.

It's also similarly demonstrable, although beyond the scope of this brief paper, that other approaches in which assimilation and dissimilation derive from the same mechanism will fail with this data for equivalent reasons. Consider the framework of Jurgec 2011, in which both assimilation and dissimilation are derived via conspiracy between various constraints on faithfulness and on alignment: no ordering of such constraints correctly predicts an assimilatory repair in /k^hə-pəm/ and a dissimilatory repair in /k^hə-p^hi/. The theoretical work of Gallagher 2010 is expressly formulated in order to exclude patterns as (4) and thus, this case.

4 Remarks

4.1 Elsewhere I add here a very brief excursus into the situation of closely related languages – this does not necessarily enlighten us as to the robustness of our theoretical commentary, but is of some interest from the point of view of the development of the Tangkhul system. Familiar-seeming alternations in prefixes exist in various other Tibeto-Burman languages of the region, but the TN system is still markedly unusual. Examples are presented in (16) and (17).

(16) Jingpho causative prefix (Sun 1999, Matisoff 2003: 101):

- i. *Sonorant*
 - ʃə.jə 'feed'
 - ʃə.lot 'set free'
- ii. *Unaspirated obstruent*
 - ʃə.dam 'lead astray'
 - ʃə.pəi 'raise'
- iii. *Aspirated obstruent and sibilant*
 - tʃə.k^hrit 'be afraid'
 - tʃə.p^hriŋ 'fill [something]'
 - tʃə.si 'kill'

(17) Atong verbal citation form (van Breugel 2014: 83):

- i. *Sonorant*
 - t^hə.mən 'to ripen'
 - t^hu.nuk 'to show'
- ii. *Voiced obstruent*
 - t^hə.bəjʔ 'to break'
 - t^hə.gəlʔ 'to drop'
- iii. *Voiceless unaspirated obstruent*
 - də.kə.rəŋ 'to make noise on purpose'
 - də.pə.ləŋ 'to flatten'
- iv. *Aspirated obstruent*
 - də.k^həp 'to dress someone'
 - də.t^həj 'to kill'

⁴ Given the discussion in this section, I argue that it is trivially demonstrable by symmetry that the ranking that correctly predicts [kə.pəm] will fail for [kə.p^hi].

In Jingpho (16), the causative prefix is fairly similar in form to the TN in (2), but the environments in which it alternates are not identical, and the alternation is more classically dissimilatory – the prefix surfaces unrepaired before both sonorants and unaspirated obstruents (0 or [–spread glottis]), and dissimilates to (what we assume to be) the [–sg] affricate when followed by an aspirated/[+sg] root onset. In Atong (17), there is a three-way laryngeal contrast, unlike Tangkhul or Jingpho – voiced obstruents and sonorants pattern together in taking the aspirated prefix, and all voiceless obstruents irrespective of [sg] specification take a *voiced* prefix. Both cases differ from the Tangkhul pattern in being more straightforwardly dissimilatory: every repair applied is similarity-decreasing.

4.2 Final remarks I hope to have convinced the reader: that the (somewhat) unexpected laryngeal pattern(s) we find in Tangkhul Naga can be analyzed as a fairly uncomplicated interaction between constraints driving assimilation and constraints driving dissimilation. I suggest also that the facts (while not inherently analytically difficult) are problematic for theories that require assimilation and dissimilation to be non-independent and attributable to the same mechanism. Jurgec (2011) and Gallagher (2010), among others, both suggest that the integration of assimilation and dissimilation is a desirable and necessary theoretical property; I claim here that TN presents not necessarily an insurmountable challenge to this, but a puzzle of some interest.

References

- Ahum, Victor (1997). *Tangkhul-Naga Grammar: A Study of Word Formation*. Jawaharlal Nehru University.
- Alderete, John (1997). Dissimilation as local conjunction. *Proceedings of the North East Linguistics Society*, vol. 27, p. 17–32.
- Arokianathan, S (1987). *Tangkhul Naga Grammar*, vol. 16. Central Institute of Indian Languages.
- Bennett, William (2013). Dissimilation, consonant harmony, and surface correspondence. *New Brunswick, NJ: Rutgers University dissertation*.
- Gallagher, Gillian Elizabeth Scott (2010). *The perceptual basis of long-distance laryngeal restrictions*. Ph.D. thesis, Massachusetts Institute of Technology.
- Goldsmith, John A (1976). *Autosegmental phonology*, vol. 159. Indiana University Linguistics Club Bloomington.
- Hansson, Gunnar Ólafur (2001). *Theoretical and typological issues in consonant harmony*. Ph.D. thesis, University of California, Berkeley.
- Hansson, Gunnar Ólafur (2010). Consonant harmony: long-distance interaction in phonology. *UC Publications in Linguistics*.
- Jurce, Peter (2011). *Feature spreading 2.0: A unified theory of assimilation*. Ph.D. thesis, Universitetet i Tromsø.
- Leben, William Ronald (1973). *Suprasegmental phonology*. Ph.D. thesis, Massachusetts Institute of Technology.
- MacEachern, Margaret R (1999). *Laryngeal cooccurrence restrictions*. Psychology Press.
- Matisoff, James A (2003). *Handbook of Proto-Tibeto-Burman: system and philosophy of Sino-Tibetan reconstruction*, vol. 135. Univ of California Press.
- McCarthy, John J (1986). OCP effects: Gemination and antigemination. *Linguistic Inquiry* 17:2, 207–263.
- Mortensen, David (2003). Comparative Tangkhul. *University of California, Berkeley, ms*.
- Rose, Sharon & Rachel Walker (2004). A typology of consonant agreement as correspondence. *Language* 80:3, 475–531.
- Shosted, Ryan K (2007). A psychoacoustic basis for dissimilation: Evidence from Tangkhul Naga. *Proceedings of ICPHS*, vol. 16, 1937–1940.
- Sun, Hongkai (1999). The category of causative verbs in Tibeto-Burman languages. *Linguistics of the Tibeto-Burman area* 22, 183–199.
- Suzuki, Keiichiro (1998). *A typological investigation of dissimilation*. Ph.D. thesis, University of Arizona.
- Van Breugel, Seino (2014). *A grammar of Atong*. Brill.
- Vaux, Bert (1998). The laryngeal specifications of fricatives. *Linguistic Inquiry* 29:3, 497–511.
- Vaux, Bert & Brett Miller (2011). The representation of fricatives. *The Blackwell Companion to Phonology* 1, 146–171.