1 Introduction

(1) a. **Problem**: In Huishu, a Tibeto-Burman language of Manipur (India) belonging to the Tangkhul group, a sound change occurred which inserted dorsal stop codas after high vowels in open syllables.

b. PTB $\phi$-saw $>$ PTk $>$ $\hat{\gamma}$-thi $>$ Huishu ka tik, 'to die'.

c. This same type of development has occurred independently in a number of different languages and language families.

d. This type of epenthesis seems odd from both a formal and functional standpoint.
   - Epenthesis usually inserts vowels.
   - Consonant epenthesis usually inserts glides (Blevins to appear a), except for elipsis (Hock 1991:122-123).

(2) a. **The Proposal**: This change (and the other changes like it) were not motivated by either formal or function factors.

b. Instead, they result from the conjunction of aerodynamic, acoustic, and perceptual facts, which lead to systematic misperception.

c. Such a model is able to account not only for the general facts of emergent consonants after high vowels, but for specific facts of this phenomenon in Huishu.

---

Figure 1: Approximate geographical locations for some of the languages discussed in this paper.

2 Huishu

(3) a. Huishu is spoken by a few thousand individuals in Huishu village and the surrounding area in Ukhrul District, Manipur State, India.

b. It is a member of the closely related family of languages spoken the Tangkhuls (also called the Tangkhul Nagas).

c. The position of the Tangkhul group within Tibeto-Burman is not yet settled, but some evidence suggests that it may be close to Kuki-Chin, Zeliangrong, or both.
3 The Emergence of Dorsal Stops in Huishu

3.1 Preliminaries

4. a. Proto-Tangkhul (PTk; Mortensen 2003), in addition to nasal codas (*m, *n, and *ŋ) and liquid codas (*r and *l) had the stop codas *p, *t, and *k.

b. In pre-Huishu, all instances of PTk *p and *k became **p, as did *p after low vowels (*a and *e).

c. This left pre-Huishu with a two-way stop-coda contrast between **p and **p.

5. a. Subsequently, dorsal stop codas emerged after high vowels in open syllables. Thus the pre-Huishu rhymes **p and **p (⟨PTk *p, *t⟩ > /k/ [kʰ]) and **p (⟨PTk *k⟩ > /k/ [kʰ])

b. All instances of /k/ in modern Huishu reflect these emergent or epenthetic stops.

c. There are now open syllables containing high vowels, but these are all the result of a (rather complicated) set of later sound changes and they seem never to reflect PTk high vowels.

3.2 The data

6. a. The data showing the development of these stops—a process that is almost perfectly regular, are quite plentiful, since the PTk rhymes *i and *u were among the most common in the language.

b. The following table gives the Huishu data along with cognate forms from Standard Tangkhul and Kachai (another Tangkhul language) and reconstructed forms for PTk1 and Proto-Tibeto-Burman (PTB; Benedict 1972; Matisoff 2003).

<table>
<thead>
<tr>
<th>PTB</th>
<th>PTk</th>
<th>Tangkhul</th>
<th>Kachai</th>
<th>Huishu</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;blood&quot;</td>
<td>*m-p-way</td>
<td>*ʔaˌɪ</td>
<td>ʔaˌɪ</td>
<td>ʔaˌɪ</td>
</tr>
<tr>
<td>&quot;blow&quot;</td>
<td>—</td>
<td>*kaˌmaˌr</td>
<td>hʌˌmaˌr</td>
<td>—</td>
</tr>
<tr>
<td>&quot;comb&quot;</td>
<td>*i</td>
<td>*rikaˌi</td>
<td>rikaˌi</td>
<td>rikaˌi</td>
</tr>
<tr>
<td>&quot;dic&quot;</td>
<td>*sɡ</td>
<td>*kʰɪ</td>
<td>kʰɪ</td>
<td>kʰɪ</td>
</tr>
<tr>
<td>&quot;fear&quot;</td>
<td>*kt</td>
<td>*kaˌi</td>
<td>hʌˌi</td>
<td>hʌˌi</td>
</tr>
<tr>
<td>&quot;four&quot;</td>
<td>*p</td>
<td>*p</td>
<td>p</td>
<td>p</td>
</tr>
<tr>
<td>&quot;horn&quot;</td>
<td>—</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;medicine&quot;</td>
<td>*tʊˌa充分肯定</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;mother-in-law&quot;</td>
<td>—</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;one&quot;</td>
<td>—</td>
<td>*kaˌi</td>
<td>kʰi</td>
<td>kʰi</td>
</tr>
<tr>
<td>&quot;salt&quot;</td>
<td>*tʊˌi</td>
<td>*maˌi</td>
<td>maˌi</td>
<td>maˌi</td>
</tr>
<tr>
<td>&quot;seven&quot;</td>
<td>*nɛi</td>
<td>*ni</td>
<td>ni</td>
<td>ni</td>
</tr>
<tr>
<td>&quot;two&quot;</td>
<td>*ɡə</td>
<td>*k̩ə</td>
<td>k̩ə</td>
<td>k̩ə</td>
</tr>
<tr>
<td>&quot;bone&quot;</td>
<td>*ŋա</td>
<td>*ŋa</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;breast&quot;</td>
<td>*nʊə</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;carry&quot; (on</td>
<td>—</td>
<td>*kaˌi</td>
<td>hʌˌi</td>
<td>hʌˌi</td>
</tr>
<tr>
<td>&quot;grandchild&quot;</td>
<td>—</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;insect&quot;</td>
<td>—</td>
<td>*ʔaˌi</td>
<td>ʔaˌi</td>
<td>ʔaˌi</td>
</tr>
<tr>
<td>&quot;tie&quot;</td>
<td>—</td>
<td>*kaˌs</td>
<td>hʌˌs</td>
<td>hʌˌs</td>
</tr>
<tr>
<td>&quot;dog&quot;</td>
<td>*kʊˌa充分肯定</td>
<td>*hwi</td>
<td>hwi</td>
<td>hwi</td>
</tr>
<tr>
<td>&quot;egg&quot;</td>
<td>*hɛŋ</td>
<td>*hɛŋ</td>
<td>hɛŋ</td>
<td>hɛŋ</td>
</tr>
<tr>
<td>&quot;laugh&quot;</td>
<td>*mʊˌa充分肯定</td>
<td>*kaˌi</td>
<td>kʰaˌi</td>
<td>kʰaˌi</td>
</tr>
<tr>
<td>&quot;water&quot;</td>
<td>*ʊɨ</td>
<td>*k-su</td>
<td>k-su</td>
<td>k-su</td>
</tr>
</tbody>
</table>

3.3 Phonetic details

7. a. The above data gloss over some important phonetic facts about these non-etymological velar stops.

b. Place of Articulation While all of these stops have been transcribed above as /k/, phonetically they differ according to the preceding vowel: /uː/ is realized

The reconstructions given here are identical to those in Mortensen (2003), with one difference: the rhyme previously reconstructed as *[ej] (the reflx of PTB *[e]) is reconstructed here given the more plausible reconstruction *[i].

Table 1: Huishu onset inventory.

Table 2: Huishu rhyme inventory.
with a velar stop, but /ɪk/ is realized with a palatal stop (not unlike the velar stops in English).

c. **Manner** Unlike Huishu /p/ (and, in fact, the coda obstruents of most Tibeto-Burman languages in the India-Burman borderlands region) Huishu dorsal stop codas are produced with an audible release, which—at times—is accompanied by very noticeable frication. They sound rather like the aspirated stops that occur as onsets in Huishu.

4 **Parallel Developments**

4.1 **Lom (Belom)**  

(8) a. Lom is an unclassified Austronesian language of Bangka (an island off the east cost of Sumatra, approximately 200 miles to the south of Singapore; Blust 1994)².

b. In Lom, dorsal stops /c/ and /k/ have intruded after word-final Proto-Austronesian (PAN) high vowels:

<table>
<thead>
<tr>
<th>PAN</th>
<th>Lom</th>
</tr>
</thead>
<tbody>
<tr>
<td>[24] ‘fire’</td>
<td>*saṭap (&gt; api)</td>
</tr>
<tr>
<td>[25] ‘day’</td>
<td>*mari</td>
</tr>
<tr>
<td>[26] ‘liver’</td>
<td>*bāty (&gt; ači)</td>
</tr>
<tr>
<td>[27] ‘pig’</td>
<td>*baṭuy (&gt; bari)</td>
</tr>
<tr>
<td>[28] ‘flesh, meat’</td>
<td>*ši</td>
</tr>
<tr>
<td>[29] ‘rudder’</td>
<td>*kama-(dehi)</td>
</tr>
<tr>
<td>[30] ‘left (side)’</td>
<td>*ka-wiri (&gt; kiri)</td>
</tr>
<tr>
<td>[31] ‘husband; male’</td>
<td>*šakı</td>
</tr>
<tr>
<td>[32] ‘floor’</td>
<td>Malay lantai</td>
</tr>
<tr>
<td>[33] ‘to run’</td>
<td>*laři</td>
</tr>
<tr>
<td>[34] ‘to die’</td>
<td>*mačay (&gt; mači)</td>
</tr>
<tr>
<td>[35] ‘to buy’</td>
<td>*beši</td>
</tr>
<tr>
<td>[36] ‘rice plant’</td>
<td>*ṣašay</td>
</tr>
<tr>
<td>[37] ‘clothing’</td>
<td>Malay pakai-san</td>
</tr>
<tr>
<td>[38] ‘beach’</td>
<td>Malay pantai</td>
</tr>
<tr>
<td>[39] ‘excrement’</td>
<td>*čäqi</td>
</tr>
<tr>
<td>[40] ‘rope’</td>
<td>*Callaš</td>
</tr>
<tr>
<td>[41] ‘ash’</td>
<td>*qabu</td>
</tr>
</tbody>
</table>

4.2 **Singhi**

(9) a. Singhi, also an Austronesian language, is a Land Dyak language of Sarawak on Borneo.

b. In Singhi, obstruents have also developed after word final high vowels, but there are fricatives rather than stops.

c. Pre-Singhi #a > Singhi /i/ which Pre-Singhi #i > /a/ (Blust 1994).

<table>
<thead>
<tr>
<th>PAN</th>
<th>Singh</th>
</tr>
</thead>
<tbody>
<tr>
<td>[58] ‘white’</td>
<td>*pahiq</td>
</tr>
<tr>
<td>[59] ‘yam’</td>
<td>*qahi</td>
</tr>
<tr>
<td>[60] ‘iron’</td>
<td>*besi</td>
</tr>
<tr>
<td>[61] ‘behind’</td>
<td>*deši</td>
</tr>
<tr>
<td>[62] ‘this’</td>
<td>*ti</td>
</tr>
<tr>
<td>[63] ‘we (excl.)’</td>
<td>*kami</td>
</tr>
<tr>
<td>[64] ‘dig’</td>
<td>*kali</td>
</tr>
<tr>
<td>[65] ‘buy’</td>
<td>*bili</td>
</tr>
<tr>
<td>[66] ‘demand (a debt)’</td>
<td>*qagiq</td>
</tr>
<tr>
<td>[67] ‘forbidden (by custom)’</td>
<td>*paš-šini</td>
</tr>
</tbody>
</table>

²Thanks to Juliette Blevins for directing me to Blust (1994), where Lom and Singhi are discussed.
GrassfieldslanguagefromtheNgembagroup,aretakenfromaGrassfieldsWorkingGroupnotebook,also
TheFomopeadataaretakenfromLarryHyman'sunpublishedfieldnotes.ThedatafromBafut,a
ThankstoLarryHymanforalertingmetotheexistenceofthiscaseandthatofFomopea.

Atsi(Burling1966),WrittenBurmese(WB),andPTB(Matisoff2003):

<table>
<thead>
<tr>
<th>PTB</th>
<th>WB</th>
<th>Atsi</th>
<th>Maru</th>
</tr>
</thead>
<tbody>
<tr>
<td>'dung'</td>
<td>ᵜlory</td>
<td>khyi</td>
<td>khy'k</td>
</tr>
<tr>
<td>'smoke'</td>
<td>ᵕlory</td>
<td>khyī</td>
<td>khy'k</td>
</tr>
<tr>
<td>'mouth'</td>
<td>ᵜlory</td>
<td>ᵕlory</td>
<td>ᵕlory</td>
</tr>
<tr>
<td>'dog'</td>
<td>ᵕlory</td>
<td>ᵕlory</td>
<td>ᵕlory</td>
</tr>
</tbody>
</table>

4.3 Maru (Langsu)

(10) a. Maru (known in the Chinese literature as Langsu) is a Burmish language of Northern Burma (Kachin State) and Southern China (Yunnan Province).

b. Burling (1966) argued persuasively, on tonal evidence, that some of the stop codas of Maru (which he transcribed as /l/ and /k/) were a secondary development.

c. This same argument was made earlier by Benedict (1948) and was hinted at somewhat earlier by Karlgren (1931:56ff).

(11) a. Burling’s /l/ and /k/ developed regularly after the reflexes of Proto-Tibeto-Burman (PTB) *lory and *kory, which appear to have become the high vowels *l and *k in pre-Maru.

b. See the following comparisons between Maru, the closely related language Atsi (Burling 1966), Written Burmese (WB), and PTB (Matisoff 2003):

<table>
<thead>
<tr>
<th>PTB</th>
<th>WB</th>
<th>Atsi</th>
<th>Maru</th>
</tr>
</thead>
<tbody>
<tr>
<td>'die'</td>
<td>ᵕlory</td>
<td>se</td>
<td>āl</td>
</tr>
</tbody>
</table>

4.4 Momo and Fomopea

(13) a. The Momo group of Grassfields Bantu languages display an innovation similar to the others discussed here (Stallcup 1978:124-132)².

b. Epenthetic /s/ appear after what must have been, historically, high vowels.

c. The same development occurred (apparently independently) in Fomopea, a language from the core of the Bamileke group.

d. Take the following examples from Proto-Grassfield Bantu (PGB) (Hyman 1979/1993), Fomopea³, and Moghamo (Stallcup 1978):

<table>
<thead>
<tr>
<th>PGB</th>
<th>Bafut</th>
<th>Fomopea</th>
<th>Moghamo</th>
</tr>
</thead>
<tbody>
<tr>
<td>'head'</td>
<td>ᵕḷa</td>
<td>ᵕḷa</td>
<td>a-ḷk</td>
</tr>
<tr>
<td>'mouth'</td>
<td>ᵕḷa</td>
<td>ᵕḷa</td>
<td>a-ḷk</td>
</tr>
<tr>
<td>'dog'</td>
<td>ᵕḷa</td>
<td>ᵕḷa</td>
<td>a-ḷk</td>
</tr>
</tbody>
</table>

²Thanks to Larry Hyman for alerting me to the existence of this case and that of Fomopea.

³The Fomopea data are taken from Larry Hyman’s unpublished field notes. The data from Bafut, a Grassfield Bantu language from the Ngembagroup,are taken from a Grassfield Bantu Working Group notebook, also graciously provided by Larry Hyman.
in Ohala (1993).

fortition, depending on the details of the specific case. It should be noted that Blust (1994) argues both for and against epenthetic stops resulting from glide fortition, depending on the details of the specific case.

Pre-Momo

[103] 'fall' *gpa — — 
[104] 'eat' *le — — jok
[105] 'moon' *mnu — — — lomik
[106] 'knife' *be — — lomik
[107] 'stone' *ti — — aik
[108] 'tree' *ti — diti 

(14) a. It is not immediately evident that these data parallel the data from Huishu, Maru, Singh, and Lom, since the “high-vowel” conditioning environment is not evident in either the Proto-Grassfields Bantu reconstructions or the Moghamo forms.

b. However, there is external evidence, from languages like Bafut which reflect these vowels as /i/, /i/, and /u/ and from the aspiration of stops in Bamileke languages, that high vowels were the environment for /k/ epenthesis (Hyman 1972:23-24; Stallcup 1978).

c. Applying the inductive hypothesis (without taking the reconstructed phonetics too seriously), we might suppose that there were three contrasting high vowels in Pre-Momo: a high front vowel that became Moghamo /e/, a high back vowel that became Moghamo /o/, and a high mid vowel that became Moghamo /o/:

<table>
<thead>
<tr>
<th>Pre-Momo</th>
<th>Pre-Momo'</th>
<th>Proto-Momo, Moghamo</th>
</tr>
</thead>
<tbody>
<tr>
<td>*a_i</td>
<td>*a_i</td>
<td>*a_k</td>
</tr>
<tr>
<td>*a_i</td>
<td>*a_i</td>
<td>*a_k</td>
</tr>
<tr>
<td>*a_i</td>
<td>*a_i</td>
<td>*a_k</td>
</tr>
</tbody>
</table>

4.5 Rhaeto-Romance

(15) Possibly related may be the Verschärfung seen in the Surmeiran and Puter varieties of Rhaeto-Romance (Haiman 1988:352-353):

In syllables closed by /i/…inherited /i/ becomes [ik] or [e], possibly via *[i]. Thus DÖRMIRE becomes [durikere] ‘to sleep’. That this change is subphonemic is reflected in the fact that it is not indicated in the standard orthography of either dialect, and is apparently stigmatised by speakers as ‘uncouth’.

4.6 Synopsis

Huishu PTK *s_i > Huishu *s_k /s_k/

PTK *s_a > *s_k /s_k/

Lom PAN *i > Lom /e/, /i/, /a/

PAN *a > Lom /e/, /a/,

Singh Pre-Singh *s_i > Singh /s/ Pre-Singh *a > Singh /a/,

Maru PTB *u > Pre-Maru *u > Maru /a/ or /a/ (i.e. /a/?)

Maru PTB *u > Pre-Maru *(a) > Maru /a/+

Momo Pre-Momo *s_i > Mogham /e/ Pre-Momo *a > Mogham /a/

Pre-Momo *a > Mogham /a/

5 Competing Accounts

(16) a. Four desiderata: There are four things that an account of dorsal stop epenthesis in Huishu and other languages should explain.

(17) a. Mechanism The mechanism through which the change took place.

b. Environment Why high vowels seem robustly to form the environment for this type of epenthesis.

c. Motivation Why this sound change converts a “less marked” structure into a “more marked” structure.

d. Substance Why the epenthetic obstruents have the place and manner features that they do.

(18) Five points: Explain the odd release of the Huishu dorsal stops.

5.1 Diphthogization plus glide fortition

(19) a. One possible account for the type of phenomena described here was given by Blust (1994)—that the emergence of these stops was a two-part process:

1. The vowels diphthongized.
2. The off-glide was then fortified to become an obstruent.

b. Blust notes that there are clear cases of glide fortition word-initially and word-medially in Austronesian languages (Blust 1994:112-113).

c. This seems plausible for the case of Lom, where the quality of the reflexes of word-final PAN *a has changed to become /e/ (in exactly those cases where it is followed by the intrusive /k/).

It should be noted that Blust (1994) argues both for and against epenthetic stops resulting from glide fortition, depending on the details of the specific case.
d. But in Tangkhul family, there is no external evidence for diphthongization in the affected rhymes. Rather, evidence suggests that PTB diphthongs became PTk monophthongs in these words.
e. There are plenty of diphthongs in PTk, and yet only the rhymes which we would otherwise reconstruct as high vowels are affected by the epenthesis.

5.2 Buccalization of glottal stop ("nope-epenthesis")

(20) a. Glottal stops sometimes occur at prosodic boundaries and in positions of prominence (see, for example, Dagbani as described in Hyman 1988).
b. For this reason, En. no! is sometimes realized as [no?] or [now?].
c. Acoustically, this is similar to [nop], accounting for En. nope < [no?] < no!?
d. Parallel development: Earlier En. oh! > En. [ow] ~ [ow2] ~ [owp].
e. This, we may call nope-epenthesis, after the best known example of it.

(21) a. We might, likewise, posit that PTk *u and *i became /ak/ and /ik/ via nope-epenthesis.
b. *u > *u? > /ak/
c. *i > *i? > /ik/

(22) a. Problems: This explanation is problematic for several reasons:
b. Other cases of nope-epenthesis occur in interjections or other words that occur mostly in special prosodic environments (Hock 1991:124); in Huishu, the epenthesis is part of a regular sound change.
c. Nope-epenthesis seems to occur only word-finally; in Huishu, stops are epenthized both word-medially and word finally.
d. Nope-epenthesis should not target one class of vowels preferentially; in Huishu and related cases, it is the high-vowels that form the environment for the epenthesis.
e. An epenthized glottal stop produced by this process would collide with other segments in the inventory:
   Case 1: *p, *t, *k > ? preceded *? > k → there must have been distinct *p and *t, which is possible, but one would have to have been a true glottal stop, and the other, creak. The modern reflex of the buccal stops is a true glottal stop, but creak is not a likely source for /k/.
   Case 2: *? > k preceded *p, *t, *k > ? → there must have distinct *k and *k′. This seems unlikely.

5.3 Constraint against open syllables

(23) a. If sound changes occur in order to enhance the phonotactic well-formedness of the words that contain them, then it would follow that adding coda consonants improves the syllables to which they are added in some way.
b. This cannot be due to a general constraint against open syllables:
   - Open syllables are almost universally assumed to be “less marked” than closed syllables.
   - Open syllables containing high vowels are targeted differentially by this type of epenthesis.
c. Thus, the constraint would have to be against open syllables with high vowel nuclei.
d. Under such a constraint, it seems odd that the epenthetic segment would not be some “minimally marked” segment such as /?/ (which was already a legal coda in the language).
e. Furthermore, positing a universal constraint against syllable final high vowels seems to simply and arbitrarily restate part of the generalization without explaining the phenomenon.
f. Nevertheless, I will argue that there is a (perverse) sense in which this account is true: that open syllables with a high vowel nucleus are a “marked” structure.

5.4 Maintenance of contrasts (push chain)

(24) a. One might conceive of this type of epenthesis as part of a push chain.
b. This account has the advantage of explaining the fact that it is high vowels (and perhaps other peripheral vowels) that are the targets of these epenthetic processes.
c. Peripheral vowels are the most likely to be crowded uncomfortably by encroaching vowels because they have, as it were, no place to run.
d. The distinctions made by such vowels can only be maintained, we might argue, by something drastic like epenthesis.
e. We may also note, referring to the other languages in which the process has been observed, that it never seems to result in mergers.

(25) a. The impression that this was a kind of chain shift grows if we look at the changes that occurred the monophthongal rhymes between PTk and Huishu, schematized in Figure 2.

Footnotes:
7For an alternative analysis of this phenomenon, see Hock (1991:124).
8This observation is due to Larry Hyman, p.c.
Figure 2: The development of Huishu monophthongs.

b. Considering only this data, it might seem plausible that Huishu developed ve-
lar stops in order to keep the high-vowel rhymes from merging with reflexes
of PTk *a, and *o, which were creeping up from below.

(26) a. This illusion is shattered quite decisively, however, if we look at a larger
subset of the sound changes that occurred in rhymes between PTk and Huishu
(Figure 3).

Figure 3: The development of Huishu monophthongal and diphthongal rhymes from
PTk rhymes.

b. In the motivation for the development of dorsal stop codas in Huishu was
to preserve lexical contrasts, it is odd that so many mergers seemed to have
occurred in the language at about the same.

c. Huishu /u/ reflects no less than four PTk rhymes, including two very common
diphthongs (PTk *ej and *aj).

d. In light of this evidence, the push chain hypothesis seems contrived.

5.5 Maximal use of phonological space (drag chain)

(27) a. But what if, instead of a push chain, the development of dorsal consonants
was part of a drag chain?

b. The *l, *k > /r/ sound change left a gap in the coda-inventory of Huishu.

c. The epenthesis of dorsal codas helped fill this gap.

d. Other rhymes then shifted to fill the place of the high-vowel rhymes.

e. Still other rhymes shifted to fill these gaps, thus accounting for the apparent
counter-feeding interactions between pre-Huishu sound changes.

(28) a. **Problem:** If these sound changes were meant to give Huishu a more balanced
inventory that makes better use of the available phonological space, they have
failed bitterly.

b. Huishu is left not only with a somewhat odd inventory of rhymes (see Table
28b) but with a situation where a disproportionately small number of words
contain low vowels.

c. Huishu is an apparent counter-example to Kiparsky’s (1995:663) claim that
there do not seem to be any languages that display “across-the-board” raising
of all vowels.

d. In fact, what seems to have happened is that a language with a rather sym-
metrical vowel and rhyme inventory (PTk) has suffered a dramatic reduction
in this symmetry.

e. This hypothesis has the further disadvantage of providing no good explana-
tion for the fact that the high vowel rhymes are the target of the stop epenthe-
sis.

\[^9\text{However, this is true only in open syllables. In closed syllables, the developments are not so clearly}
\text{parallel.}\]
5.6 Syllable isochrony

(29) a. The insertion of dorsal stops after high vowels could be intended to bring about syllable isochrony (ensuring that all syllables are about the same length).

b. High vowels are typically shorter than non-high vowels, so something extra would have to be added to syllables with high-vowel nuclei in order to bring them into sync with the rest of the system.

c. Thus, enter the obstruents.

(30) a. This would explain why the process targets high vowels as opposed to other vowels—it’s about duration.

b. This could also explain the aspiration of the dorsal stops (as opposed to /p/, which only appears after mid-vowels)—the aspiration prolongs the syllable.

31 a. Problems still persist:

b. This account does not explain why plosives are such a common outcome for this type of process (although their velarity could be explained by through the proposal of Carvalho 2004 that velars have the feature [high]) when [h] or the lengthening of the vowel would do the job just as well.

c. Syllable isochrony seems to overgenerate. It would seem to also predict the possible deletion of coda sonorants after low vowels, but these were in fact retained.

d. Further, this hypothesis seems helpless to explain the raising of /eʃ/ to /eə/ subsequent to dorsal stop eponthesis.

6 Proposal

32 a. Principle Language-change is the result of mistaken inferences.

b. Corollary Sound-change is the result of misperception10.

33 a. Overview High vowels are particularly susceptible to devoicing for aerodynamic reasons. A devoiced high vowel is phonetically a fricative. In Huisha and other languages that have developed intrusive obstruents after high vowels, the accidental fricatives resulting from HVD (high vowel devoicing) have been parsed by perceivers as intentional fricatives or stops11.

34 a. HVD phenomena are widely known and fairly easy to explain from a phonetic standpoint.

b. Since high vowels involve a relatively tight constriction (compared to other vowels) and are correlated with a small oral cavity, the supraglottal pressure is likely to be higher for high vowels than for non-high vowels.

c. It follows that the pressure drop across the glottis should be relatively lower for these vowels than for other vowels.

d. Thus, the aerodynamic conditions coincident with the articulation of high vowels are less favorable for voicing that those for non-high vowels, and we would predict that unintentional devoicing should occur more frequently in high vowels than in low vowels.

e. When devoiced, high vowels become weak dorsal (palatal to velar) fricatives.

6.1 High Vowel Devoicing (HVD)

35 a. This tendency for high vowels to become partially devoiced has been phonologized (or, at least, made part of the language-specific phonetic implementation of high vowels) in some cases.

b. A particularly well know example of this is Parisian French, where word-final high vowels devoice to become weak fricatives (Fónagy 1989:247)12.

36 a. The fricative codas of Singhi represent a further development of the same type of pattern as is found in French.

b. Speakers reinterpreted devoiced vowels as vowels followed by homorganic fricatives.

c. Speakers may have subsequently attributed the palatality of the fricative after /h/ to the vowel, and thus posited /h/ rather than /eʃ/ as the correct form for this coda.

---

10For related views, see (Ohala 1993; Blevins to appear b; etc.)

11The general outline of this proposal was inspired by a conversation with John Ohala, and some of the ideas (but none of the errors) present in it should be credited to him.

---

(32) a. Principle Language-change is the result of mistaken inferences.

b. Corollary Sound-change is the result of misperception10.

33 a. Overview High vowels are particularly susceptible to devoicing for aerodynamic reasons. A devoiced high vowel is phonetically a fricative. In Huisha and other languages that have developed intrusive obstruents after high vowels, the accidental fricatives resulting from HVD (high vowel devoicing) have been parsed by perceivers as intentional fricatives or stops11.

---

12Other (non-high) vowels devoice in similar contexts, but with less frequency (Fagyal and Moisset 1999; Smith 2003).
6.3  (Mis)perceiving a stop

(37)  a. Explaining the emergence of stop codas from these fricative codas is somewhat more challenging.

b. It is clear that the fricative was “fortified” to become a stop, but this is a label for the process, not an explanation.

c. The clues for one explanation lie in the phonetics of Huishu (and help us answer the five-point bonus question):
   - Generally, stop codas in Tangkhul and related languages are unreleased, and etymological stop codas in Huishu are no exception.
   - Huishu emergent dorsal stop codas have a strongly audible release—even aspiration.

\[
\begin{array}{c|c|c|c}
  p & t & k & ? \\
  \text{ph} & \text{th} & \text{kh} & \text{h} \\
  \text{b/s} & [\text{b/s}] & \text{h} & \text{h} \\
  s & \text{f/s} & \text{h} & \text{h} \\
  v & r & j & j \\
  m & n & y & y \\
\end{array}
\]

Table 4: Huishu onset inventory: what is the mystery segment?

(38)  a. Suppose a pre-Huishu speaker hears the phonetic implementation that has been assigned to high vowels—a voiceless vowel or a vowel with a fricative coda. She notices the friction at the end of the word.

b. She mistakenly parses this friction as an attempt at another segment rather than as an aspect of the implementation of the vowel.

c. What segment could it be?

**Velar fricative?** She does know about velar or palatal fricatives. They do not occur in the consonant inventory (see Table 4).

**Palatal fricative?** Same story.

**Some other fricative?** The fricative in the inventory ([s] and [h]) do not have the right acoustic properties, and none of them occur in coda positions.

**Aspirated velar stop?** Yes! It has a noisy phase like the one she is hearing.
   Furthermore, it is a stop, and Huishu phonotactics do feature stops in coda position.

d. So, she assumes that the noise in the vowel was a defective attempt to produce /k̩/ which she then “restores” in her own speech.

e. Repeated enough times, this results in the observed sound change.

7  Discussion and Conclusions

(39)  a. The seeds of obstruent epenthesis after high vowels are aerodynamic and articulatory.

b. These phonetic seeds take root and grow in the soil of language specific perception.

(40)  a. The emergence of dorsal obstruents after high vowels does not require a grammar-internal or otherwise teleological explanation:

b. The fundamental facts of about this type of epenthetic segments fall out cleanly from a perceptual-articulatory model of sound change:

**mechanism** The change occurred because of a set of mistaken inferences. Aerodynamically and articulatorily induced variation was mistakenly attributed to speaker intent.

**environment** The process occurred in high vowels because they are more prone to devoicing than low vowels.

**motivation** The new form was on the winning side in a lop-sided perceptual battle. Open syllables with only high vowels are relatively more “marked” than open syllables with low vowels to the extent that processes like this one are more likely to close them.

**substance** The articulatory properties of emergent obstruent proceed directly from the articulatory properties of the vowel its source.

7.1  Tying things together

(41)  a. My account of dorsal stop epenthesis has the added benefit of explaining the fact that, in Grassfields Bantu languages, stop epenthesis and spontaneous aspiration have the same conditioning factor—high vowels.

b. The devoicing in extra-high vowels could be attributed to a preceding aspirated stop as well as to a trailing obstruent.

c. Thus, this aspiration process can be seen as an assimilation to the same environment implicated in the epenthesis process.

7.2  Contributions

(42)  a. Identified an under-recognized cluster of empirical phenomena—the emergence of non-etymological dorsal obstruents after high vowels.

b. Added to the repertoire of perceptual/articulatory accounts of sound change an (apparently novel) explanation of this class of developments.

C. Argued that grammatical competence (specifically, phonotactic knowledge) plays a significant role in the (mis)perception of speech sounds but argued against teleological accounts of sound change.
References


