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Elicitation as Experimental Phonology: Thlantlang Lai Tonology

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ABSTRACT

This paper argues that elicitation is not only still needed, but is in fact a form of experimental phonology. A tonal investigation of Thlantlang Lai (Tibeto-Burman, Kuki-Chin subgroup) demonstrates the value of this old methodology and the discovery of a tone system of considerable typological interest.

Key words: tone spreading, contour simplification, duration, naturalness, field methodology

1. Introduction

The field of phonology has changed a great deal over the past several decades not just conceptually, but also in terms of methodology. Throughout the structuralist and generative eras it was not only acceptable but, in fact, standard for phonologists to acquire their information from two sources: (i) Primary data derived from the field or "informant sessions"; (ii) Secondary data derived from written sources, most likely based in turn on the same kind of primary data.

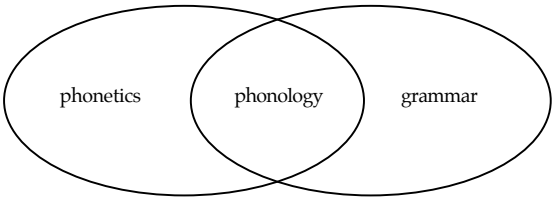
Starting in the 1970s, John Ohala argued for a more "experimental phonology", whereby phonological hypotheses would be rigorously tested in a laboratory setting—thereby making phonological research much more like phonetics, psychology, and other experimental sciences. As can be seen by what is going on in current research, the field has become dramatically transformed: Whether phonetically and/or psycholinguistically grounded, phonologists have recognized that the methods required to solve the kind of questions in which they are interested often require more than deductive reasoning and a face-to-face analysis with an informant.

In fact, the bar has been considerably raised: An old-style tonal analysis, for example, which would have been accepted based on the word of an informant worker, might now instead be met by demands to see pitch tracings—and I myself constantly demand quantitative distributions based on an extensive lexical database. Within the context of optimality theory, with

its preoccupation with universality and its orientation towards surface outputs, there has been a distinct move away from doing the kind of thick description and theoretically-informed "deep" phonology for which generative grammar gave us the first adequate tools.

It is convenient to view phonology as in (1).

(1) Phonology = "the intersection of phonetics and grammar"



Phonetics accounts for the historical phonologization process, but once something passes into the structured phonology, it can take on a life of its own—which I'll call grammatical. Of course not every structured property implies a productive phonological rule or speaker awareness of the pattern. One method to test for the "psychological reality" of phonological relations is through controlled experiments (Ohala 1987, Ohala & Jaeger 1986). Another method is through direct elicitation, which I will argue to be another form of experimental phonology. Either way there is a shared belief that there is something called phonology which, although often stated in terms of grounded rules or constraints, is distinguishable from phonetics.

This belief contrasts with recent attempts to integrate phonetics further into phonology. This view takes a number of forms. For some, deep phonology still exists, but it has to be described in strictly phonetic terms. For others, deep phonology doesn't exist at all. Thus, some surface-oriented phonologists have entertained the possibility that there are no underlying forms, just correspondences between surface outputs. From the perspective of the history of the field, this move is particularly subversive: If asked to state what was the principal contribution of generative phonology, I would say that it gave us a way to do morphophonemics—what I'm calling "deep phonology". However, a belief has been expressed that there isn't much of that either. Consider the view expressed by Hayes (1995:67-68) in (2).

(2) Where have all the phonemes gone?

> ...*all* phonology might ultimately be redistributed between the theory of phonetic rules and the theory of lexical organization.... insofar as rules apply postlexically, they are phonetic and gradient, and insofar as they treat discrete categories, they are part of the lexicon rather than applying to the output of syntax.

Of the Ilokano rules [I] studied... either they seemed phonetic in character, so that my conventional phonetic transcription represented an overidealized categorization of continuous data, or they struck me as not fully productive, lexicalized rules. At the time I occasionally wondered, "Where is the normal phonology that I was trained to study?"

By "normal phonology" Hayes has in mind the lessons of *the Sound Pattern of English* (Chomsky & Halle 1968) and post-*SPE* generative phonology that one might have learned, for example, from Kenstowicz & Kisseberth (1979).

Hayes has two concerns. First, word-level phonology largely consists of lexical patterns and irregularities which cannot be captured by fully general rules, e.g., the [k] ~ [s] alternation in words like *cyclic* vs. *cyclicity*. Second, what passes for phonological rules at the phrase level is instead quite phoneticky. Claimed to be (almost) missing are the two classes of phenomena:

(3) a. word-level phonology that is completely regular
b. phrase-level phonology that is not broad phonetics

The more phonology is not completely regular, but is subject to phonetic variation, the more need there will be for large databases, instrumentation, and controlled experimentation—i.e., raising-of-the-bar, as referred to above. But can one assume lesser roles for deductive reasoning and face-to-face elicitations with an informant? It is thus appropriate to raise the question: What is left of the "old" methodology?

In the next section (§2) I will respond to the claimed absence in (3b) and present a systematic source of phrasal phonology that is clearly not "an overidealized categorization of continuous data". In §3 I consider the phonology-phonetics working relation. In §4 I conclude that "normal phonology" does exist and that elicitation, a traditional approach to phonology, is a form of "experimental phonology".

2. Thlantlang Lai tonology

As will be seen in this section, tone provides an excellent source of material through which to examine the claims in (3). Phrasal tonology in particular has propertites that directly contradict Hayes' "impression". The postlexical input-output (I/O) relations I shall discuss are completely regular in the language. Their morphophonemic and opacity-producing properties show that they are not "phonetic and gradient". Since these I/O relations hold across words, they are also quite distinct from the notion of lexical organization which Hayes attributes to word-internal phonology.

The data to be discussed here come from the Thlantlang dialect of Lai, spoken in Chin State, Burma, which I was able to elicit with a speaker over a six-hour period, given my previous experience with other Kuki-Chin languages. The exposition to follow will thus demonstrate both productive phrasal morphophonemics, as well as the "old" methods of working with an informant.

As seen in (4), Thlantlang is a monosyllabic language whose words have the unusual property of being limited to either falling or rising tone in isolation (*Ch* = aspiration; *ng* = [ŋ]):

(4) Thlantlang Lai words in isolation

a.	F	lûng	'rock	hnâa	'ear'	tlâang	'mountain'
	[ˆ]	lâm	'road'	zôong	'monkey'	râal	'enemy'
		mêy	'fire, tail'	zûu	'beer'	rûul	'snake'
b.	F	mân	'price'	vôk	'pig'	kôoy	'friend'
	[ˆ]	kêe	'leg'	kût	'hand'	tsâan	'time'
		kûm	'year'	mît	'eye'	thlâan	'grave'
c.	R	săa	'animal'	zŭu	'mouse'	bŏoy	'chief'
	[ˇ]	mĭi	'person'	kăl	'kidney'	tsĕep	'beetle'
		bŭu	'nest'	sĕy	'basket'	hnăak	'rib'

The reason for distinguishing two falling tones in (4a,b) can be seen in (5).

(5) Isolation tones compared to those found after *ká* 'my' (F = falling, R = rising)

a.	F	lûng	'rock'	F	ká lûng	'my rock'
		lâm	'road'		ká lâm	'my road'
		mêy	'fire, tail'		ká mêy	'my fire, tail'
b.	F	mân	'price'	R	ká <u>măn</u>	'my price'
		kêe	'leg'		ká <u>kĕe</u>	'my leg'
		kûm	'year'		ká <u>kŭm</u>	'my year'
c.	R	săa	'animal'	R	ká săa	'my animal'
		mĭi	'person'		ká mĭi	'my person'
		bŭu	'nest'		ká bŭu	'my nest'

The falling tone nouns in (5a) remain falling when following (high tone) pronominal proclitics such as *ká* 'my', while those in (5b) change to rising tone. This was the first alternation I discovered, and it was quite puzzling. Let's call these F/R words, as indicated in (6).

(6) Four F/R nouns

a.	F	vôk	'pig'	R	ká vŏk	'my pig'
b.	F	kôoy	'friend'	R	ká kŏoy	'my friend'
c.	F	thlâan	'grave'	R	ká thlăan	'my grave'
d.	F	mân	'price'	R	ká măn	'my price'

In order to see how the above alternation might be accounted for, we must first determine how the tone of F/R nouns should be represented underlyingly. In (7) we observe what happens when we take strings of two, three, and four F/R words in sequence:

(7) Sequences of F/R nouns

a.	H-HL	vók kôoy	'pig's friend'
b.	H-H-HL	vók kóoy thlâan	'pig's friend's grave'
c.	H-H-H-HL	vók kóoy thláan mân	'pig's friend's grave's price'

In (7) I have represented the output tones in terms of H (high) vs. L (low) tonal features, where [ˊ] = H tone. The generalization is clear: the F/R tone words all have H tone except for the last which has a H to L falling tone. Since the nouns in (5a) have a HL falling tone both in isolation and after *ká*, we can assume that they are underlyingly /HL/. The underlying representation of F/R nouns therefore cannot be /HL/. The data in (7) are straightforwardly accounted for if we adopt the hypotheses in (8).

(8) a. F/R words are underlyingly /H/

b. H → HL / __ pause

Now let us take a look at so-called rising tone nouns such as those in (9).

(9) Four R nouns

a.	R	bŏoy	'chief'	R	ká bŏoy	'my chief'
b.	R	tsĕep	'beetle'	R	ká tsĕep	'my beetle'
c.	R	kăl	'kidney'	R	ká kăl	'my kidney'
d.	R	sĕy	'basket'	R	ká sĕy	'my basket'

When we put these four nouns in sequence in (10), we find exactly the inverted situation of the previous set: R tone words all have L tone [ˋ] except for the last, which has a L to H rising tone:

(10) Sequences of R nouns

a.	L-LH	bòoy tsĕep	'chief's beetle'
b.	L-L-LH	bòoy tsèep kăl	'chief's beetle's kidney'
c.	L-L-L-LH	bòoy tsèep kàl sĕy	'chief's beetle's kidney basket'

I therefore adopt the second set of hypotheses in (11).

(11) a. R words are underlyingly /L/

b. L → LH / __ pause

Although not as common in the world's languages, (11b) is at least parallel to (8b): both underlying level tones become contour tones before pause.

Consider now F tone words like those in (12).

(12) Four F nouns

a.	F	zôong	'monkey'	F	ká zôong	'my monkey'
b.	F	râal	'enemy'	F	ká râal	'my enemy'
c.	F	rûul	'snake'	F	ká rûul	'my snake'
d.	F	hnâa	'ear'	F	ká hnâa	'my ear'

When F nouns are sequenced, we get the outputs in (13).

(13) Sequences of F nouns

a.	H-LH	zóong răal	'monkey's enemy'
b.	H-L-LH	zóong ràal rŭul	'monkey's enemy's snake'
c.	H-L-L-LH	zóong ràal rùul hnăa	'monkey's enemy's snake's ear'

In this case, the surface generalizations are those in (14).

(14) a. the first word is realized H
b. the last word is realized LH
c. intervening words are realized L i.e., H-L*-LH

Given the presentation in (14), one might ask whether the previous two hypotheses in (8) and (11) might instead be reformulated as the parallel surface generalizations in (15) and (16).

(15) /H/ nouns in sequence (cf. "F/R" forms in (7))

a. the first word is realized H
b. the last word is realized HL
c. intervening words are realized H i.e. H-H*-HL

(16) /L/ nouns in sequence (cf. "R" forms in (10))

a. the first word is realized L
b. the last word is realized LH
c. intervening words are realized L i.e. L-L*-LH

Whereas the surface generalizations in (15) and (16) can be straightforwardly derived from the underlying forms, /H/ and /L/, respectively, plus a pre-pausal contouring rule, the outputs of sequences of F nouns in (13) require more. Two competing hypotheses are stated in (17).

(17) a. there is some kind of mapping algorithm (cf. Yip's 1988 edge-in association)
b. the outputs are derived by local tone rules

How do we decide? I suggest that we have to call up the "old methods" and look at more data, specifically look at sequences of unlike tones. We have to do this rigorously and systematically, considering all of the logically contrasting inputs, as in (18):

(18) a. two words: 3 x 3 = 9
b. three words: 3 x 3 x 3 = 27
c. four words: 3 x 3 x 3 x 3 = 81 etc.

These combinations should be studied and presented in a grid-like fashion, making sure that nothing is overlooked. The forms in (19) thus illustrate the nine possible combinations of noun + noun (N_1 + N_2) sequences:

(19) 3 x 3 grid of tone patterns plotted in noun + adjectival verb combinations

		HL		**H**		**L**	
a.	**HL**	ráal	zǒong	ráal	vǒk	ráal	rǎng
b.	**H**	kóoy	zôong	kóoy	vôk	kóoy	rǎng
c.	**L**	bòoy	zǒong	bòoy	vǒk	bòoy	rǎng
		'enemy's monkey'		'enemy's pig'		'enemy's horse'	
		'friend's monkey'		'friend's pig'		'friend's horse'	
		'chief's monkey'		'chief's pig'		'chief's horse'	

The output tones are summarized in (20), where we clearly see that there are only three output sequences: H-LH, H-HL and L-LH:

(20) Summary of N_1 + N_2 tonal alternations

		HL		**H**		**L**	
a.	**HL**	H	LH	H	LH	H	LH
b.	**H**	H	HL	H	HL	H	LH
c.	**L**	L	LH	L	LH	L	LH

As a second illustration, all 27 combinations of three-word phrases are given in (21) and their tonal summary in (22).

(21) Combinations of N1 + N2 + N3

a.	râal	+	zôong	+	hmâa	→	ráal	zòong	hmǎa	'enemy's monkey's wound'
	râal	+	zôong	+	kée	→	ráal	zòong	kěe	'enemy's monkey's leg'
	râal	+	zôong	+	bùu	→	ráal	zòong	bǔu	'enemy's monkey's nest'

b.	râal	+	vók	+	hmâa	→	ráal	vòk	hmâa	‘enemy’s pig’s wound’
	râal	+	vók	+	kée	→	ráal	vòk	kêe	‘enemy’s pig’s leg’
	râal	+	vók	+	bùu	→	ráal	vòk	bŭu	‘enemy’s pig’s nest’
c.	râal	+	ràng	+	hmâa	→	ráal	ràng	hmăa	‘enemy’s horse’s wound’
	râal	+	ràng	+	kée	→	ráal	ràng	kĕe	‘enemy’s horse’s leg’
	râal	+	ràng	+	bùu	→	ráal	ràng	bŭu	‘enemy’s horse’s nest’
d.	kóoy	+	zôong	+	hmâa	→	kóoy	zóong	hmăa	‘friend’s monkey’s wound’
	kóoy	+	zôong	+	kée	→	kóoy	zóong	kĕe	‘friend’s monkey’s leg’
	kóoy	+	zôong	+	bùu	→	kóoy	zóong	bŭu	‘friend’s monkey’s nest’
e.	kóoy	+	vók	+	hmâa	→	kóoy	vók	hmâa	‘friend’s pig’s wound’
	kóoy	+	vók	+	kée	→	kóoy	vók	kêe	‘friend’s pig’s leg’
	kóoy	+	vók	+	bùu	→	kóoy	vók	bŭu	‘friend’s pig’s nest’
f.	kóoy	+	ràng	+	hmâa	→	kóoy	ràng	hmăa	‘friend’s horse’s wound’
	kóoy	+	ràng	+	kée	→	kóoy	ràng	kĕe	‘friend’s horse’s leg’
	kóoy	+	ràng	+	bùu	→	kóoy	ràng	bŭu	‘friend’s horse’s nest’
g.	bòoy	+	zôong	+	hmâa	→	bòoy	zòong	hmăa	‘chief’s monkey’s wound’
	bòoy	+	zôong	+	kée	→	bòoy	zòong	kĕe	‘chief’s monkey’s leg’
	bòoy	+	zôong	+	bùu	→	bòoy	zòong	bŭu	‘chief’s monkey’s nest’
h.	bòoy	+	vók	+	hmâa	→	bòoy	vòk	hmâa	‘chief’s pig’s wound’
	bòoy	+	vók	+	kée	→	bòoy	vòk	kêe	‘chief’s pig’s leg’
	bòoy	+	vók	+	bùu	→	bòoy	vòk	bŭu	‘chief’s pig’s nest’
i.	bòoy	+	ràng	+	hmâa	→	bòoy	ràng	hmăa	‘chief’s horse’s wound’
	bòoy	+	ràng	+	kée	→	bòoy	ràng	kĕe	‘chief’s horse’s leg’
	bòoy	+	ràng	+	bùu	→	bòoy	ràng	bŭu	‘chief’s horse’s nest’

(22) Summary of tones of $N_1 + N_2 + N_3$ sequences

a.	HL	+	HL	+	HL	→	H-L-LH	f.	H	+	L	+	HL	→	H-L-LH
	HL	+	HL	+	H	→	H-L-LH		H	+	L	+	H	→	H-L-LH
	HL	+	HL	+	L	→	H-L-LH		H	+	L	+	L	→	H-L-LH
b.	HL	+	H	+	HL	→	H-L-HL	g.	L	+	HL	+	HL	→	L-L-LH
	HL	+	H	+	H	→	H-L-HL		L	+	HL	+	H	→	L-L-LH
	HL	+	H	+	L	→	H-L-LH		L	+	HL	+	L	→	L-L-LH
c.	HL	+	L	+	HL	→	H-L-LH	h.	L	+	H	+	HL	→	L-L-HL
	HL	+	L	+	H	→	H-L-LH		L	+	H	+	H	→	L-L-HL
	HL	+	L	+	L	→	H-L-LH		L	+	H	+	L	→	L-L-LH
d.	H	+	HL	+	HL	→	H-H-LH	i.	L	+	L	+	HL	→	L-L-LH
	H	+	HL	+	H	→	H-H-LH		L	+	L	+	H	→	L-L-LH
	H	+	HL	+	L	→	H-H-LH		L	+	L	+	L	→	L-L-LH

e. H + H + HL → H-H-HL
H + H + H → H-H-HL
H + H + L → H-H-LH

As seen, there are only six output sequences: H-L-LH, H-L-HL, H-H-LH, H-H-HL, L-L-LH, L-L-HL.

There are two striking facts about the outputs in the above tables. First, all non-final tones must be either H or L. This accords with the fact that contour tones are often restricted to final position (Clark 1983, Zhang 2001). Second, and less commonly attested, all final tones must be either falling or rising. In Thlantlang we thus have a complete complementarity: prefinal syllable tones must be level (H, L), while final syllable tones must be contours (HL, LH). Any prefinal contour tone must therefore be simplified to a level tone, and any final level tone must acquire a following [-αT] "polar boundary tone": H% after final /L/, L% after final /H/, where % = pause boundary. When /HL/ is realized as a falling contour, it does not acquire a boundary tone.

The above tables also reveal that a H feature is lost whenever it immediately follows a L feature. (23) demonstrates that both /H/ and /HL/ are potentially affected:

(23) A H feature is lost following a L feature

a.	L	+	H	→	L-LH	bòoy vŏk	'chief's pig'
b.	L	+	HL	→	L-LH	bòoy zhŏong	'chief's monkey'

As shown in (24), a reasonable analysis involves left-to-right L tone spreading.

(24) a. L-H → L-LH

σ σ
| ⟋ |
L H

b. L-HL → L-LH

σ σ
| ⟋ |≒
L H L

Whether L tone spreading applies to a following /H/ or /HL/ syllable, a LH rising tone is observed before pause. We might try to motivate L tone spreading in one of two ways. First, by a constraint LAG-IO(L) (cf. Bickmore's 2000 EXTEND):

(25) LAG-IO (L) : An input L tone should extend onto the following syllable

A second way to motivate L tone spreading is by a static output constraint such as (29), which prohibits a jump up from L to H across syllables (cf. Hyman & VanBik's (2004) constraint NOJUMP proposed for closely related Hakha Lai):

(26) *JUMP(UP)

```
*  σ   σ
   |   |
   L   H
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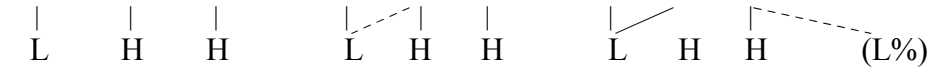
This constraint rules out *L-H and *L-HL, as well as *HL-H and *HL-HL, although these latter two sequences are also ruled out by a constraint that prohibits contours on prefinal syllables.

While the I/O relation in (25) is exceptionless, the output constraint in (26) is readily violated, e.g., when /L-H-H/ is realized [L-L-H] (~ [L-L-HL] before pause) :

(27) A L to H "jump up" is observed when "intermediate" LH-H is simpified to L-H



In a derivational approach, one might propose that L tone spreading first produces a LH rising tone, which then must be simplified to L because contour tones are only allowed in final position. This first way of interpreting L tone spreading or LAG (L) is schematized in (28a).

(28) Two of the ways of interpreting LAG-IO(L)

a. LAG creates L-LH, which is simplified to L-L medially

Rule 1: L-H → L-LH also L-HL → L-LH
Rule 2: L-LH → L-L / __ X

b. LAG creates L-L, which is contoured to L-LH finally

Rule 1: L-H → L-L also L-HL → L-L
Rule 2: L-L → L-LH / __ %

A second interpretation in (28b), however, is that LAG produces a L-L sequence everywhere, i.e. when the L spreads into a following /H/ or /HL/ syllable, the H automatically delinks. By rule 2 L tone will contour to a LH rising tone phrase-finally (%). I know of no way to choose between the two interpretations which make the same empirical predictions.

With the above understanding of Thlantlang tonology, we are now in a position to address the following non-resolved question: Why is /H/ realized LH after *ka*= 'my'? We saw in (6) that /H/ (= "F/R") nouns are realized HL in isolation, but as LH after proclitics: *vôk* 'pig' *ká vǒk* 'my pig'. For this reason such nouns were originally designated as F/R. In fact, depending on the context, /H/ nouns are pronounced with any of the four surface tones in Thlantlang:

(29) a.	HL	:	vô̲k	'pig'	/H/
	H	:	vók kêe	'pig's leg'	/H + H/
b.	LH	:	bòoy vǒ̲k	'chief's pig'	/L + H/
	L	:	bòoy vòk kêe	'chief's pig's leg'	/L + H + H/

Turning to *ká vǒk* 'my pig', it can be verified in the table in (20) that there are exactly four input sequences which surface as H-LH before pause: /HL + HL/, /HL + L/, /H + L/, /HL + H/. We can eliminate the first three inputs for *ká vǒk*, since we know that /vók/ is underlyingly /H/. The underlying /H/ is further verified in phrases such as *ká vòk kêe* 'my pig's leg', where the derived L of [vòk] has not conditioned L tone spreading on /kée/ 'leg' (cf. (27)). But why is this /H/ realized as [LH] (nonfinally, [L]) when preceded by *ká*= '1st person' (or the other pronominal proclitics *ná*= '2nd person' and *á*= 'third person')? While the utlimate explanation is undoubtedly a historical one, the synchronic analysis requires one or another form of allomorphy. It is undesirable to say that /H/ nouns have a /LH/ allomorph after pronominal proclitics, since underlying /LH/ does not otherwise exist in the language. This leaves us with the alternative of attributing the tonal allomorphy to the proclitics, as in (30).

(30) a. /ká/ : before /HL/ or /L/

/ká + râal/	→	ká râal	'my enemy'
/ká + bòoy/	→	ká bǒoy	'my chief'

b. /kâ/ : before /H/

/kâ + kóoy /	→	ká kǒoy	'my friend'

Whereas proclitic /H/ has no effect, the L of proclitic /HL/ causes the following /H/ to undergo L tone spreading. With this accomplished we now consider how the Thlantlang analysis contributes to our understanding of phonology and experimental approaches to it.

3. Phonology and phonetics

In §2 a descriptive analysis was proposed to account for the observed tonal observations. This analysis required us to recognize a process of L tone spreading, as well as constraints on the distribution of contour tones: a prefinal syllable may not carry a HL or LH contour, whereas a final syllable must. This latter observation was accounted for by means of a polar boundary tone (L% ~ H%). Finally, it was necessary to recognize tonal allomorphs in the case of proclitics. The system that emerges from the approach in §2 is an interesting one from which important lessons can be drawn (cf. §4). In this section I discuss how the Thlantlang system contributes to the working relation between phonetics and phonology.

We are all accustomed to the notion that phonetics informs phonology. What is "natural" in phonology is "deeply grounded in the universal phonetic properties of speech" (Hyman 1975a:171). In fact, the relation is bidirectional: By pinpointing and defining the problem, phonology informs phonetics. The LAG(L) process in Thlantlang is clearly an example of Hyman

& Schuh's (1974:88) tone spreading: "Spreading is an assimilatory process of the progressive or perseverative type, rather than of the regressive or anticipatory type. That is, the earlier tone appears to last too long, rather than the later tone starting too early." Hyman & Schuh speculated that the perseverative bias of tone-spreading probably has an articulatory basis (cf. Xu 2004), whereas Javkin (1979) and Silverman (1997) have instead sought perceptual accounts. Either way, it was on the basis of PHONOLOGICAL patterning that Hyman & Schuh (1974:104) extrapolated a phonetic basis: "...the rightward principle was conceived as a purely phonetic one, i.e. as motivated by nothing more than the juxtaposition of nonidentical tones...." Subsequent instrumental studies of both tone and intonation have confirmed that "...the f0 target for a single static tone tends to occur at the (temporal) end of the associated phonetic region...." (Akinlabi & Liberman 2000:5).

The Hyman & Schuh's perseverative generalization represents the first step of "structure-first research" in (31).

(31) a. discover linguistically significant generalizations based on the structural properties of sound systems

b. hypothesize possible motivations for these generalizations

c. seek evidence to support these hypotheses—i.e. do experimental phonology and phonetics!

i. measure "intrinsic" variation that may feed into the "phonologization" process

ii. conduct perceptual experiments etc.

(see Ohala 1987, 1989, 1993, etc.)

Traditionally, phonologists have stopped short, doing just (31a), or perhaps (31a,b). This correlates with what I have referred to as the "old" methods. But how far can we get by doing this?

Let's return to Thlantlang Lai. Up to now non-final contour simplification has been indicated with an "X", as in (32).

(32) a. LH simplification: LH → L / ___ X

b. HL simplification: HL → H / ___ X

But what is this X, about which I have been deliberately vague? As shown in (33), one can distinguish two different interpretations of non-final contour simplification:

(33) a. Contour tones are simplified when followed by another syllable (σ)

i. σ σ ii. σ σ

/ ≒ / ≒

L H H L

b. Contour tones are simplified when followed by another tone (T)

i. σ ii. σ
/ ≒ / ≒
L H T H L T

As Clark (1983) originally pointed out, many languages are like Thlantlang in restricting contour tones to the final syllable. The usual assumption in (33a) is that non-final contour simplification is conditioned by the presence of a following syllable. However, as indicated in (33b), another possible interpretation is that contour simplification is conditioned by a following TONE.

In most cases the two interpretations will be empirically equivalent. The difference comes from cases where a contour is followed by a toneless syllable, as in Luganda. The prediction of (33a) is that contour simplification will occur, while the prediction of (33b) is that it will not. Rather than citing the evidence that (33b) is needed for Luganda, let's work backwards from Thlantlang in (34) to see if we can't reach the same conclusion.

(34) Structure-first research: the example of contour simplification

a. discover the linguistically significant generalization that many languages restrict contour tones to the final syllable (Clark 1983, Gordon 2001, Zhang 2001)

b. hypothesize possible motivations for these generalizations

c. seek evidence to support these hypotheses

i. phonetic approach: test against articulatory and perceptual generalizations
ii. phonological approach: test against structural generalizations

What are the phonetic properties which might be at play in non-final contour simplification? One approach, cited in (35), correlates the cross-linguistic distribution of contour tones with the phonetic properties of syllables or syllable rimes:

(35) a. Gordon (2001), based on a survey of 105 languages

"[there is] an implicational hierarchy of tone bearing ability, whereby long vowels are most likely to carry contour tones, followed by syllables containing a short vowel plus a sonorant coda, followed by syllables containing a short vowel plus an obstruent coda, followed by open syllables containing a short vowel...." (p.405)

b. Zhang (2001), based on a survey of 187 languages

"...the distribution of contour tones is found to correlate closely with the duration and sonority of the rime. Syllables with longer rime duration, e.g., those that are long-vowelled, sonorant-closed, stressed, prosodic-final, or in a shorter word, are more likely to carry contour tones." (pp. xiv-xv)

Especially important is the role of duration, which may be sensitive to position; cf. the phenomena of "final lengthening" (Lehiste 1970, Beckman & Edwards 1990) and "anticipatory shortening" (Lehiste 1970, Nooteboom 1995).

The alternative in (36) is that contours are harder to implement when followed by another tone. I refer to this as "the principle of ups and downs" (Hyman 1978:261):

(36) "Tonally induced changes tend to minimize the number of ups and downs over a given stretch. In the case of contour simplification, the 'stretch' may be as short as a syllable.... The principle of ups and downs not only accounts for most instances of vertical assimilations and contour levelings, but also predicts that change will occur first where the ups and downs are the most complex. Thus, a H-LH or HL-H sequence is much more likely to undergo change than a L-LH or HL-L sequence."

As discussed in Hyman (2004), the situation is more complex than this: Some languages permit LH-L, but not *LH-H; other languages permit LH-H, but not *LH-L. The proposal is that LH-L is preferred to LH-H in terms of the perceptibility of the contour, but dispreferred in terms of the articulatory complexity imposed by the drop to L that follows it—cf. (41) below.

The first hypothesis has to do with rime duration: Thlantlang must simplify non-final contours because their rimes are shorter in that position than finally. That this is not likely is seen in (39).

(39) Presentation of the tones by syllable structure (R = sonorant; T = stop; glosses in (4))

	"Smooth syllables"			"Stopped Syllables"	
	CVV	**CVR**	**CVVR**	**CVT**	**CVVT**
/HL/	zûu tîi	lûng mêy	tlâang râal		
/H/	kée tháa 'good'	mán kúm	tsáan kóoy	vók kút	
/L/	sàa bùu	kàl sèy	bòoy pòol 'gray'		tsèep hnàak

As indicated, Thlantlang has an underlying vowel length contrast only in closed syllables. All three tones contrast on so-called smooth syllables which are either open or end in a sonorant consonant. On the other hand, short stopped syllables are underlyingly /H/ tone while long stopped syllables are underlyingly /L/. While syllable structure affects tone in this way, there is no glottalization or breathiness associated with the underlying or surface tones.

Despite the lack of tonal contrast on /CVT/, and despite the restricted duration of the vowel in short stopped syllables, we saw in (29) that words such as /vók/ 'pig' can bear all four phonetic tones. On the other hand, as seen in (40), quite long, sonorous rimes fail to carry contour tones when they are not in final position:

(40) a.	HL	:	râal	'enemy'	/HL/
	H	:	ráal kăl	'enemy's kidney'	/HL + L/
b.	L H	:	bòoy kŏoy	'chief's friend'	/L + H/
	L	:	bòoy kòoy kăl	'chief's friend's kidney'	/L + H + L/

The two underlined forms in (40) show that a falling or rising tone will be simplified even though the rime is both long and sonorous—clearly longer than [vôk] and [vŏk] in (29).

The data in (40) show that we can't predict the distribution of contour tones based solely on duration. Note that Gordon and Zhang attribute the restriction of contour tones to final syllables to the phenomenon of final lengthening. However, there is no way that the vowels in final [vôk] and [vŏk] can be lengthened to surpass the long underlined vowels in (40a,b). While we know that final lengthening and anticipatory shortening are widespread phenomena, they don't predict the facts in Thlantlang.

I therefore conclude that the alternative view in (33b) is correct: Tonal contours are not allowed to be followed by another tone in Thlantlang. In fact, when we look at contours in terms of the tonal contexts in which they occur, we find the typology in (41).

(41) Typology of contour distribution by following tone

	[LH-H]	**[LH-L]**	**Language**	
Type I	*	✓	Falam Lai	contour disallowed before like tone
Type II	✓	*	Hakha Lai	contour disallowed before unlike tone
Type III	*	*	Thlantlang Lai	contour disallowed before any tone

Type I is illustrated from Falam Lai in (42).

(42) Falam Lai: only LH tones change (Osburne 1975; examples from my informant work)

a. LH → L / ___ {H, $\widehat{\text{HL}}$} (tone absorption)

e.g., tlăang + lám → tlàang lám 'mountain road'
LH H L H

b. LH + L → no change if L occurs on a smooth syllable

e.g., tlăang + sèer → tlăang sèer 'mountain lemon'
LH L LH H

In (42a) the H of a rising is absorbed into the following H or HL tone. There is no change in (42b), when the rising tone is followed by a L on a smooth syllable. However, as seen in (43), the H of the rising tone will shift to the right if followed by a L on a CV or CVT syllable:

(43) Falam Lai: LH + Ľ → L-H

a. tlăang + sàrìʔ → tlàang sá̱rìʔ ‘seven mountains’

b. tlăang + vòk → tlàang vó̱k ‘mountain pig’

tlăang + khàt → tlàang khá̱t ‘one mountain’

This appears to indicate that a LH requires greater duration on a FOLLOWING L tone rime! This follows from the principle of ups and downs, but not from Zhang’s local requirement that contour syllables require longer rimes. In fact, anticipatory shortening might also make the wrong prediction, if the longer sonorous rimes of smooth syllables cause greater anticipatory shortening than CV or CVT syllables. I contend that it is the shortness of the L tone CV or CVT syllable which makes the LH-L sequence problematic.

This is not to say that duration isn’t a or the determining factor in accounting for surface contour tone distribution in other cases. Both Gordon (2001) and (Zhang (2001) have documented scores of languages in which contour tones are prohibited on rimes of restricted sonority or duration. The present study attempts to show that both (33a) and (33b) are needed. While Zhang (2005) appears to allow that more may be involved (see below), he defends the durational account by citing the realization of Tone 3 in Standard Beijing Mandarin, which has the following realizations (Chao 1968):

(44) Realizations of Standard Beijing Mandarin Third Tone (1 = lowest, 5 = highest pitch)

a. 214 : before pause (also characterized as 213 or 315)

b. 21 : before Tone 1 (55), Tone 2 (35), Tone 4 (51)

c. 35 : before another Tone 3 (i.e. 214 + 214 → 35 + 214)

d. 21 : before neutral (Ø) tone (i.e. 214 + 0 → 21-4)

Assuming that the starting point is some featural representation of /214/, i.e. a falling-rising tone, two changes are needed: In (44b) the endpoint of the rise [4] is “absorbed” into a phonetically similar [3] or [5] pitch. In (44c), the same [4] level, which is wedged between relatively low pitches, fuses with the preceding [21] to create a [35] rising tone (similar or identical to Tone 2). In my review of Cheng’s (1973) characterization of these processes, I noted that “the result is that the number of ups and downs is decreased”, but cautioned that “while contour simplification provides the primary motivation for the tone sandhi rule, the role of duration should not be overlooked” (Hyman 1975b:94). A full [214] contour before pause is quite long, especially when emphatic and when the is vowel rearticulated, e.g., [ma.a] ‘horse’. Only Tone 3 can have this “superheavy” property—and only before pause. On the other hand, it is markedly shorter (normal) in non-final position, where the /214/ is obligatorily simplified.

As seen from the above, there is a clear relationship between rime duration and the realization of contour tones, which has been recognized for decades. It is, however, harder to see this relationship in the Thlantlang Lai tone system where contrasting long CVVR syllables lose their contour tones in pre-final position, but contrastively short CVT syllables keep their contour in final position. Zhang (2005:59) responds to this situation by introducing the constraint REALIZE-HL, which expresses "the intuition... that a non-final HL can be manifested by other means, such as downstepping the following H, or realizing the L tone on the following syllable, but a final HL does not have such options." Among others, he cites the examples in (45a,b).

(45) Tone spreading and tone preservation

a.	râal + vók HL H	→	ráal vǒk H LH	'enemy's pig'
b.	râal + ràng HL_1 L_2	→	ráal rǎng H $L_{1,2}$H%	'enemy's horse'
c.	/bòoy + vók + bùu/ L H L	→	bòoy vòk bŭu L L L H%	'chief's pig's nest'

As seen, the HL of /râal/ 'enemy' is simplified as a H tone, but the L of the HL fall spreads onto /vók/ 'pig' to create a rising tone in (45a). As indicated by the subscripts, the L of the HL fall fuses with the L of /ràŋ/ 'horse' in (45b). All of the input tones are thus preserved, thereby satisfying Zhang's constraint REALIZE-HL ("realize the HL contour in some fashion"). Because a final short HL does not have the option to realize its L on the following syllable, it will surface even on a short and less sonorous rime, e.g., *vôk* 'pig', from /H+L%/.

While Zhang's main illustration comes from Kɔnni, he adds, "I suspect that the Thlantlang Lai data can [be] similarly interpreted. The disyllabic sandhi pattern documents in [the current paper] supports this suspicion..." (p.61). In Thlantlang Lai we have seen that both prefinal HL and LH contours have to be simplified (to H and L, respectively), hence, I assume Zhang would introduce the analogous constraint REALIZE-LH. However, trisyllabic sandhi patterns, to which Zhang also had access, show that this approach cannot work. The output of the phrase in (45c) reveals that the /H/ of /vók/ is not realized. Although L tone spreading has applied, we do not get a rising tone on *[vǒk]. The H is knocked off, and we obtain [vòk]. Rather than REALIZE-CONTOUR contraints (which may be needed elsewhere), Thlantlang Lai (and related tone systems) are effectively analyzed by having the REALIZE (or MAX) constraints refer directly to the individual tone features. Given that a L tone feature is never lost in Thlantlang Lai, we can assume that MAX(L) is inviolable, while MAX(H) is low-ranked. The relevant ranking therefore is MAX(L) >> SPREAD(L) >> MAX(H).

Further support for this approach is observed in Kuki-Thaadow, another Kuki-Chin language which doesn't allow prefinal contours:

(46) Properties of L tone spreading in Kuki-Thaadow

a.	hùon	+	zóong		→	hùon	zǒong			'garden monkeys'
	L		H			L	LH			
b.	hùon	+	zóong	+ gùup	→	hùon	zòong	gûup		'six garden monkeys'
	L		H	L		L	L	HL		
c.	hùon	+	zóong	+ gîet	→	hùon	zóong	gîet		'eight garden monkeys'
	L		H	HL		L	H	HL		
d.	hùon	+	zóong	+ thúm	→	hùon	zóong	thúm		'three garden monkeys'
	L		H	H		L	H	H		

In (46a) we see that Kuki-Thaadow also has L tone spreading. (46b) shows the combined operation of L tone and H tone spreading: The L of /hùon/ 'garden' spreads onto the H of /zóoŋ/ 'monkey', which in turn spreads onto the L of /gùup/ 'six'. As also seen, 'monkey' is realized L because a LH contour is not tolerated on a prefinal syllable.

What is particularly striking are the facts in (46c,d). Here L tone spreading does not apply, and /zóoŋ/ is realized H on the surface. To understand why, consider how these phrases would have to be realized if L tone spreading did apply: If the /L-H/ sequence of /hùon zóoŋ/ became L-LH, the H would have to be delinked because the LH contour is not in final position in (46c,d). In (46b) this was no problem, because the H can combine with the L on the final syllable of /gùup/ 'six'. In (46c,d) the final syllable begins H. Because (46c,d) cannot surface as L-L-HL and L-L-H, respectively, we can conclude that the fusion option, $H_{1,2}$, is not available to satisfy MAX (H). L tone spreading is effectively blocked by the ranking MAX(H) >> SPREAD(L) >> MAX(L), i.e. the opposite ranking of Thlantlang Lai.

It is not my purpose here to develop a full constraint-based account of Thlantlang Lai (or the related Kuki-Chin tone systems cited above), but rather to show that more is involved than the durational generalizations. Zhang seems to agree when he writes that "the Luganda example indicates that there might be other non-durationally-based conditions that must be taken into consideration for a full account of contour tone licensing..." (p.58). As I have shown, his REALIZE-CONTOUR "intuition" fails to account for the Thlantlang Lai facts. Given his commitment to phonetically grounded constraints, it is hard to understand Zhang's resistance to (33b) and the principle of ups and downs. As I have demonstrated elsewhere (Hyman 2004), expanding on Hyman & Schuh (1974), some contour simplifications are sensitive to the preceding and/or following tone. The summary in (41) shows that Thlantlang Lai falls into a natural typology if we assume that the prohibition against prefinal contours in Kuki-Chin tone systems is not motivated by durational considerations but by the tendency to simplify contours when followed by either an identical tone, a non-identical tone, or both.

4. Conclusions

The above treatments of Thlantlang and Falam tonology reveal that a structure-first approach is successful as a means of identifying important issues in the phonetics-phonology relation. More specifically, the phonological patterning on which the approach relies can provide important clues concerning phonetic mechanisms which feed into phonologization. There are two other conclusions that can be drawn from this study:

(i) Regular phonology exists

The tonal properties examined in §2 are completely regular. All of the tonal alternations illustrated with combinations of nouns are exactly duplicated elsewhere in the noun phrase, within the verb phrase, and in simple and complex clauses. As in the other Kuki-Chin languages I have investigated (Hakha Lai, Falam Lai, Kuki-Thaadow), the relevent prosodic domain is the intonational phrase within which the tonal alternations occur without exception. Recall Hayes' view in (2) that "*...all* phonology might ultimately be redistributed between the theory of phonetic rules and the theory of lexical organization.". It should be clear, however, that the L tone spreading rule of Thlantlang fails both tests. Being regular and applying across words, L tone spreading has nothing to do with lexical organization. L tone spreading is also not a phonetic rule. We can see this from the fact that it is not surface true: Examples such as *bòoy vòk kêe* 'chief's pig's leg' in (27) show that the *JUMP prohibition against transsyllabic L + H as was at first hypothesized in (26) is not surface-true. Rather, L tone spreading must be approached either as a derivational rule or as the consequence of a two-level constraint, LAG-IO(L), as envisioned in (25).

(ii) Elicitation is experimental phonology

I've tried to make the case that there is still a lot to learn from the old methods. In a 1970s course description prepared for Linguistics 210 "Methods of Phonological Analysis", John Ohala wrote: "This course will provide the student with practice in the methods of gathering and analyzing phonological data: field methods, laboratory methods, and paper-and-pencil methods. Those enrolled will be required to 'try their hand' at all three methodologies." While one might accept or modify the above characterization, the distinctions have become fused over recent decades—e.g., some colleagues have taught courses in field phonetics or field laboratory methods. Similarly, I suggest that one might refer to informant work as experimental elicitation. All of the data presented in the preceding sections were obtained by direct elicitation with a single speaker of Thlantlang (or Falam). The "methodology" to a large extent consisted of asking, "How do you say X?" Clearly the speaker had never heard or conceptualized noun phrases such as those in (47).

(47) a. 'pig's friend's grave's price' (cf. (7c))

b. 'chief's beetle's kidney basket' (cf. (10c))

c. 'monkey's enemy's snake's ear' (cf. (13c))

It wouldn't impress any psychologist, and it would definitely horrify an anthropologist, but who else but an experimental linguist could present such stimuli? As an informant worker I do not PREFER semantically odd collocations such as those in (47). However, when I need to get 3 x 3 x 3 x 3 = 81 tonal combinations to test my rules, the available data may be limited, or the language may make it difficult to find certain tone combinations. I am personally thankful that speakers of Kuki-Chin languages are willing to entertain such imaginary notions. It is most significant that the novel utterances are produced with the appropriate application of tone rules. If the goal is to test the linguistic knowledge of speakers, our finding is that the proposed tone rules have what phonologists used to call "psychological reality." The experimental nature of elicitation should therefore not be underestimated.*

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