Autosegmental phonology

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1 *Autosegmental Phonology* 1976: 2 proposals

Proposal 1: Geometry of phonological representations

1. Phonological representations consist of parallel tiers of linearly organized segments.
2. Pairs of tiers are organized by association lines between segments on facing tiers.
3. Restructuring (by addition and deletion of association lines) is simpler than *changing* phonological specifications.
4. Tone offers an excellent test case for this hypothesis.

Proposal 2: Structural targets, constraints, rules, and well-formedness

1. Well-formedness of phonological representations is important, and it is distinct from the set of rules in a language.
2. The geometry of phonological representations is important for understanding what constitutes a well-formed phonological representation.
3. In the case of tone, the well-formedness condition requires association lines for certain subsets of (auto)segment types.
4. Phonology is in some respects goal oriented: the theory adds or deletes associations in a miniimal way in order to minimize the number of violations of the well-formedness condition(s).

Proposal 3: Well-formedness condition

1. All vowels are associated to (at least) one tone.
2. All tones are associated to (at least) one vowel.
3. Association lines do not cross.

Proposal 4: Interpretation of Well-formedness condition

Add or delete association lines in a minimal way in order to maximally satisfy the Well-formedness condition.

2 *Principal arguments*

1: Principal arguments

1. Contour-specified features
2. Floating segments form morphemes
3. Stability
4. Unbounded spreading up to an an association lines = assimilation over unspecified domain. Consequence: if features are binary, segments may be specified in three ways.
5. The notion of locality is modified due to geometry.
6. Morphological definition of a subset of features (subpart of gestures): tones; skeletal tier.

1: English

(1)

2: Kirundi

(2)

aba-gore ba-ra-rim-a — "women (pl.) hoe": underlying and surface form.

umu-gore a-ra-rim-a — "woman (sg.) hoes": underlying form.

umu-gor a-ra-rim-a — "woman (sg.) hoes": surface form.

3 *Contour tones: Nupe*

Isaac George, "Nupe tonology," *Studies in African Linguistics* 1:1. pp. 100-122.

à Low tone
a Mid tone
á High tone
ǎ Rising tone
â Falling tone

(3) u ló kata
he entered house
he entered the house.

(4) u lo dzukó
he went market
He went to the market

(5) u lò bise
he untied chicken
He untied the chicken

(6) etsú gí nãkɛ̃́
rat ate meat
A rat ate the meat

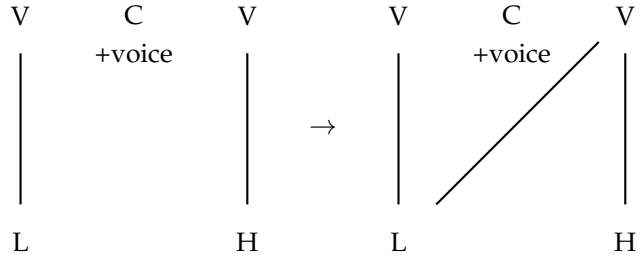
(7) etsú à gɛ̃̌ nãkɛ̃́
rat will ate meat
A rat will eat the meat

(8) gbìgbì tí
owl hooted
An owl hooted.

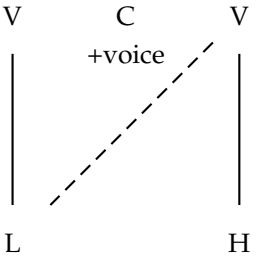
(9) gbìgbì ètí
owl hooting
An owl is hooting.

Nouns commonly begin with a vowel prefix, Low or Mid in tome:

èdu	yam
èdù	the Niger
edú	fish
edu	thigh
edù	deer
ètú	parasite
èkó	shea-butter nut
èkpá	length
èfú	honey
èdě	cloth
èdŭ	taxes
ègbă	border on a garment
èbě	pumpkin
èbŭ	cross
ègŏ	name of a town
èdzǎ	sash
èleě	past



or



4 *Association and syncopation: Kikuyu*

	SUBJECT MARKER		OBJECT MARKER		ROOT	FINAL VOWEL
(10)	*tu*	1 pl.	*mo*	3 sg.	*tom* send	*irɛ*
	ma	3 pl.	*ma*	3 pl.	*rɔr* look at	

(11)

Root	Subject *to* we	Subject *ma* they
rɔ̀r	tò rɔ̀r ì-ré	má rɔ́r ì-ré
	tò mò rɔ̀r ì-ré	má mó rɔ̀r ì-ré
	tò mà rɔ́r ì-ré	má má rɔ́r ì-ré
tom	tò tòm í-ré	má tóm í-ré
	tò mò tòm í-ré	má mó tòm í-ré
	tò mà tóm í-ré	má má tóm í-ré

If we take away the consonants and all of the vowels but leave the tone marked on each vowel, we find that (11) can be converted into the following surface pattern of Low and High tones:

(12) Tonal patterns

low subject marker					high subject marker				
L		L	L	H	H		H	L	H
L	L	L	L	H	H	H	L	L	H
L	L	H	L	H	H	H	H	L	H
L		L	H	H	H		H	H	H
L	L	L	H	H	H	H	L	H	H
L	L	H	H	H	H	H	H	H	H

Two generalization jump out: first, we see that the first two tones of each word are always the same. In the left hand column, the first two vowels are both on a Low tone; in the right hand column, the first two vowels are both on a High tone. In addition, the final vowel in all twelve cases is High.

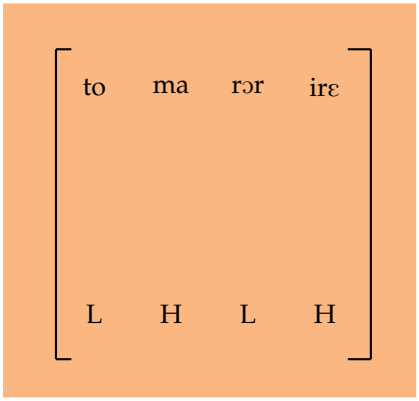
Furthermore, we see that in the top six cases—those involving the root *rɔr* —the penultimate vowel (the *i* of *irɛ)* is always Low in tone. In the lower six cases, involving the root *tom*, the *i* of *irɛ* is always High. That is, in both cases, the verb root controls the tone of the vowel that immediately follows it, but not its own tone. Finally, the tone of the vowel following the Object Marker *mo* is always Low; the tone of the vowel following the Object Marker *ma* is always High. All of these generalizations observed in the tonal patterns will become comprehensible if we assume each morpheme to contribute a tone to the tone melody of the word as a whole, but without necessarily being associated to that morpheme. That is, let us analyze the morphemes in (4) with the following underlying tones:

(13)

to	ma	mo	ma	rɔr	tom	irɛ
L	H	L	H	L	H	H

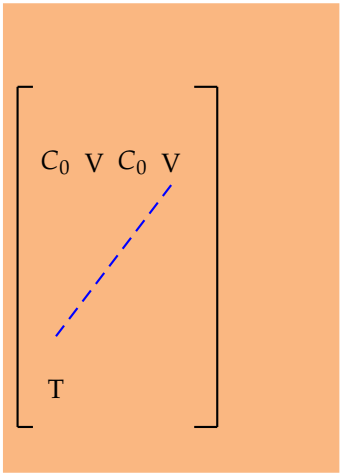
However, these tones are underlying unassociated, and remain so until the morphology has concatenated the morphemes to form a word:

(14)



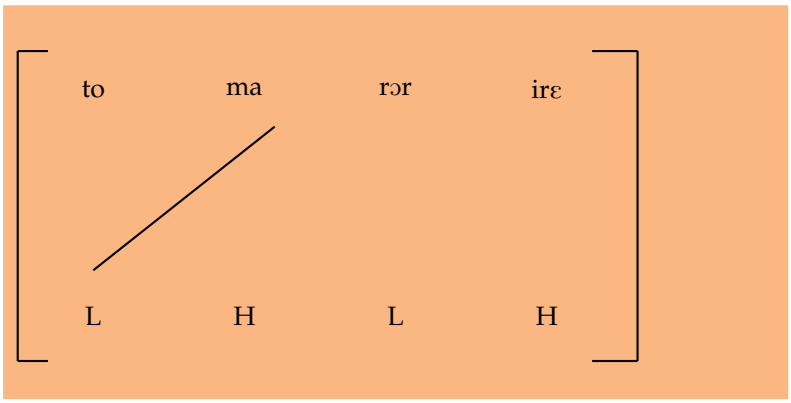
At this point, a rule applies that associates the first tone to the second syllable of the word. This rule is given in (15). This rule illustrates several notational conventions of autosegmental rules. A dotted association line represents a structural change of a rule; the effect of the rule will be to add such an association line to the representation. The other material in this rule is the structural description of the rule, and serves to identify structures to which the rule can apply.

(15)



(15) will associate the first tone of the word to the second syllable, and will convert (14) to (16).

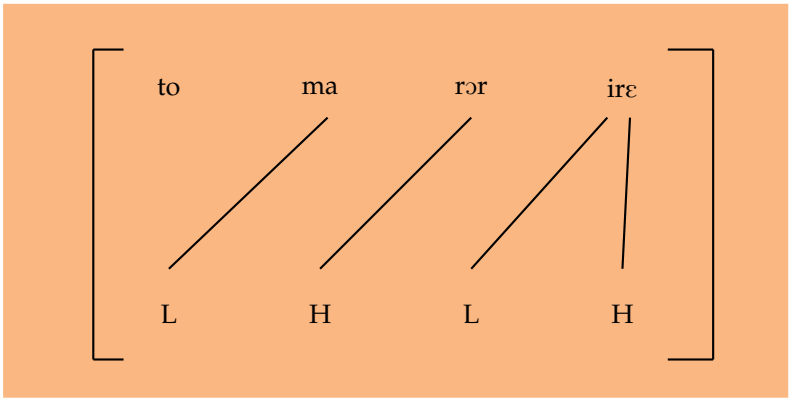
(16)



At this point, an important device in autosegmental theory comes into play to associate the rest of the tones. The Association Convention has an effect on any representations that are not totally unassociated (that is, it may affect a representation if it has at least one association line). As we will present it here, the Association Convention adds association lines outward in a one to one fashion from the already present association line, associating from either tier only elements that are currently unassociated. The Association Convention will then convert (16) to (20).[1]

(17) Association Convention
When unassociated vowels and tones appear on the same side of an association line, they will be automatically associated in a one-to-one fashion, radiating outward from the association line.

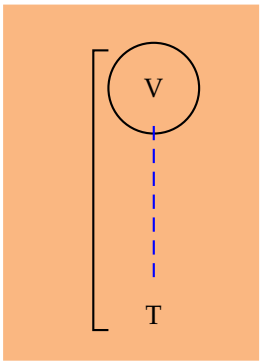
(18)



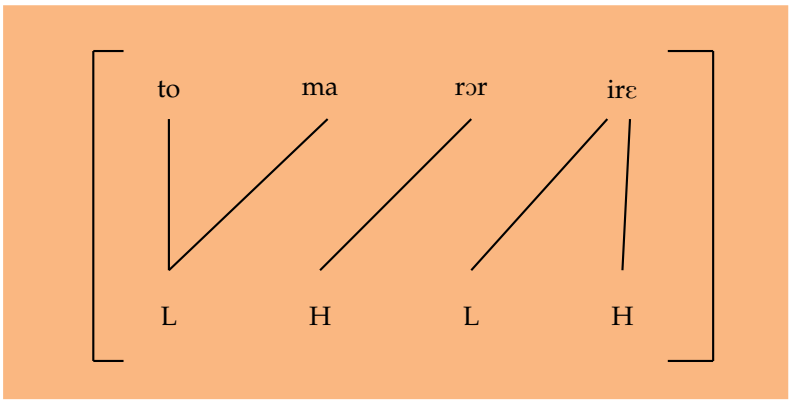
After the Association Convention has created the structure in (20), the first vowel is still toneless. When the verb is not preceded by another word, rule (19) will apply, to give us the correct and final form, given in (**??**). (19) introduces another useful notation convention whereby a circle around a segment in a rule marks a segment which is not associated to another segment on the facing autosegmental tier (in this case, a vowel without a tone, or a tone without a vowel). Thus (19) applies only to associate toneless initial vowels.

[1]See Goldsmith(1979), Haraguchi(1977), Clements and Ford (1979), and Goldsmith (1984b).

(19)



(20)



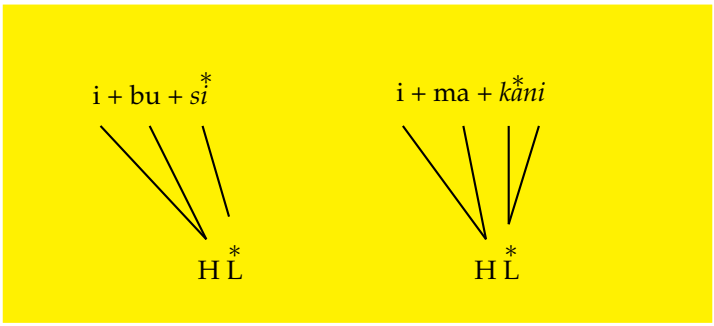
5 *Tonga*

Tonga is a major Bantu language spoken in Zambia.

5.1 *Nouns*

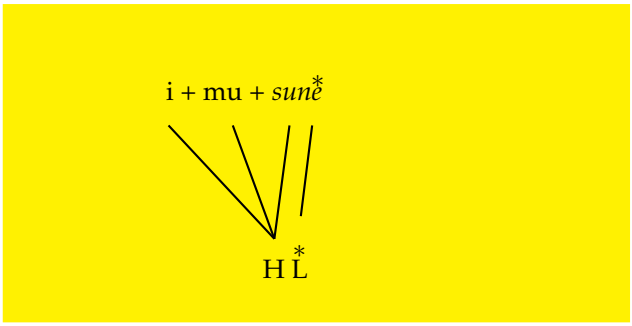
(21)

Nouns: Class A		
Monosyllabic stems		
í + bú + *si*	smoke	(noun class 14)
í + kú +*pa*	to give	(noun class 15)
Bisyllabic stems		
í + má + *kani*	news, affairs	(noun class 6)
í + mó + *ombe*	edge	(noun class 3)



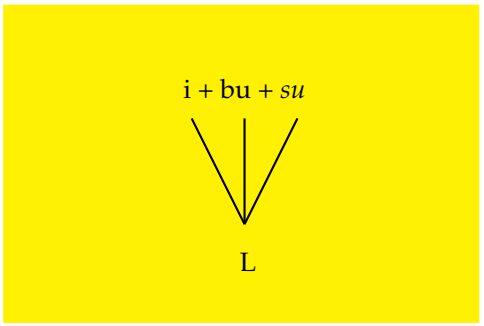
(22)

Nouns: Class B2		
Bisyllabic stems		
í + mú + *súne*	ox	(noun class 1)
í + mó + *ómbe*	calf	(noun class 1)



(23)

Nouns: Class C		
ibu + su	meal, flour	(noun class 14)
iku + ti + a	to pour	(noun class 15)
ima + tongo	ruins	(noun class 6)
ico + olwe	good fortune	(noun class 7)



5.2 *Infinitives*

úkú-bon-a to see
uku-lang-a to look at

5.2.1 *Present*

(24)

Subject Marker		Tense Marker	Object Marker		Stem	Final Vowel
ndi	1 sg.	*la*	*ndi*	1 sg.	*bon* see	a
u	2 sg.		*ku*	2 sg.		
u	3 sg.		*mu*	3 sg.		
tu	1 pl.		*tu*	1 pl.		
mu	2 pl.		*mu*	2 pl.		
ba	3 pl.		*ba*	3 pl.	*lang* look at	

(25)

Present indicative (tone)		
Unaccented stems		
No Object Marker	Unaccented Object Marker	Accented Object Marker
tu la lang a	tu la ku lang a	tu la **ba** lang a
tu la tobel a	tu la ku tobel a	tu la **ba** tobel a
tu la yandaul a	tu la ku yandaul a	tu la **ba** yandaul a
ba la lang a	**ba** la ku lang a	**ba** lá **ba** lang a
ba la tobe1 a	**ba** la ku tobel a	**ba** lá **ba** tobel a
ba la yandaul a	**ba** la ku yandaul a	**ba** lá **ba** yandaul a
Accented stems		
tu la **bon** a	tu la ku **bon** a	tu la **ba bon** a
tu la **silik** a	tu la ku **silik** a	tu la **ba silik** a
tu la **swiilil** a	tu la ku **swiilil** a	tu la **ba** swiilil a
ba lá **bon** a	**ba** lá ndí **bon** a	**ba** lá **ba bon** a
ba lá **silik** a	**ba** lá ndí **silik** a	**ba** lá **ba silik** a
ba lá **swiilil** a	**ba** lá ndí **swiilil** a	**ba** lá **ba swiilil** a

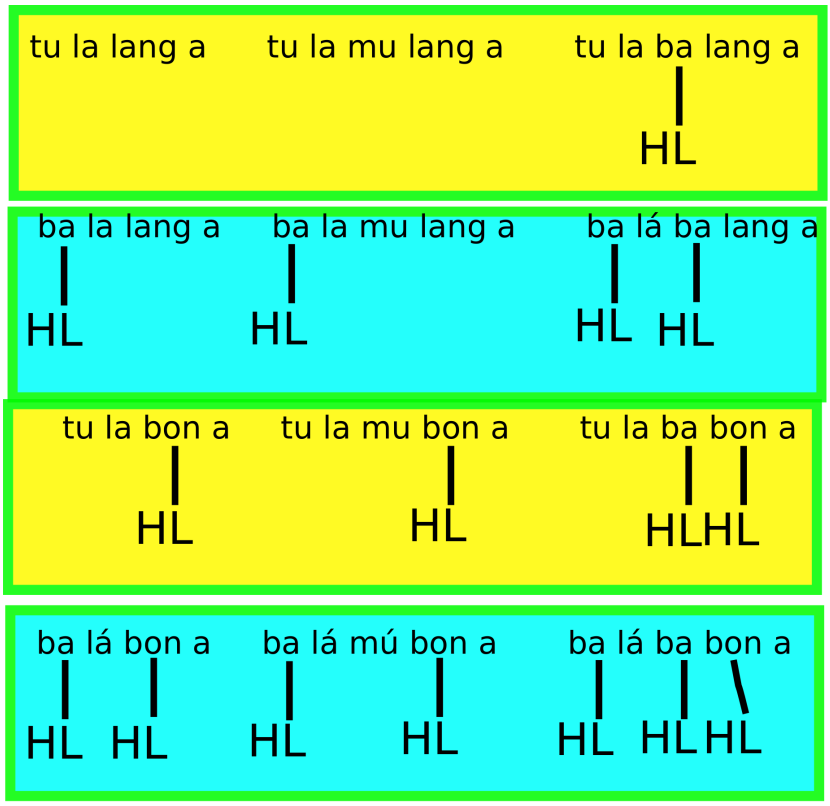
By assigning underlying accent to 3rd person subjects and to plural object markers, as well as to stems such as **bon**, we find accent patterns as in (**??** 36). The superscripted circles indicate accents that are deleted by Meeussen's Rule (33).

(26)

Present indicative: accent

No Object Marker	Unaccented Object Marker	Accented Object Marker
Unaccented stems		
tu la lang a	tu la ku lang a	tu la **bǎ** lang a
tu la tobel a	tu la ku tobel a	tu la **bǎ** tobel a
tu la yandaul a	tu la ku yandaul a	tu la **bǎ** yandaul a
bǎ la lang a	**bǎ** la ku lang a	**bǎ** la **bǎ** lang a
bǎ la tobe1 a	**bǎ** la ku tobel a	**bǎ** la **bǎ** tobel a
bǎ la yandaul a	**bǎ** la ku yandaul a	**bǎ** la **bǎ** yandaul a
Accented stems		
tu la **bǒn** a	tu la ku **bǒn** a	tu la **bǎ bon** a
tu la **sílik**	a tu la ku **sílik** a	tu la **bǎ silik** a
tu la **swíilil**	a tu la ku **swíilil** a	tu la **bǎ swiilil** a
bǎ la **bǒn** a	**bǎ** la ndi **bǒn** a	**bǎ** la **bǎ bon** a
bǎ la **sílik** a	**bǎ** la ndi **sílik** a	**bǎ** la **bǎ silik** a
bǎ la **swíilil** a	**bǎ** la ndi **swíilil** a	**bǎ** la **bǎ swiilil** a

(27)



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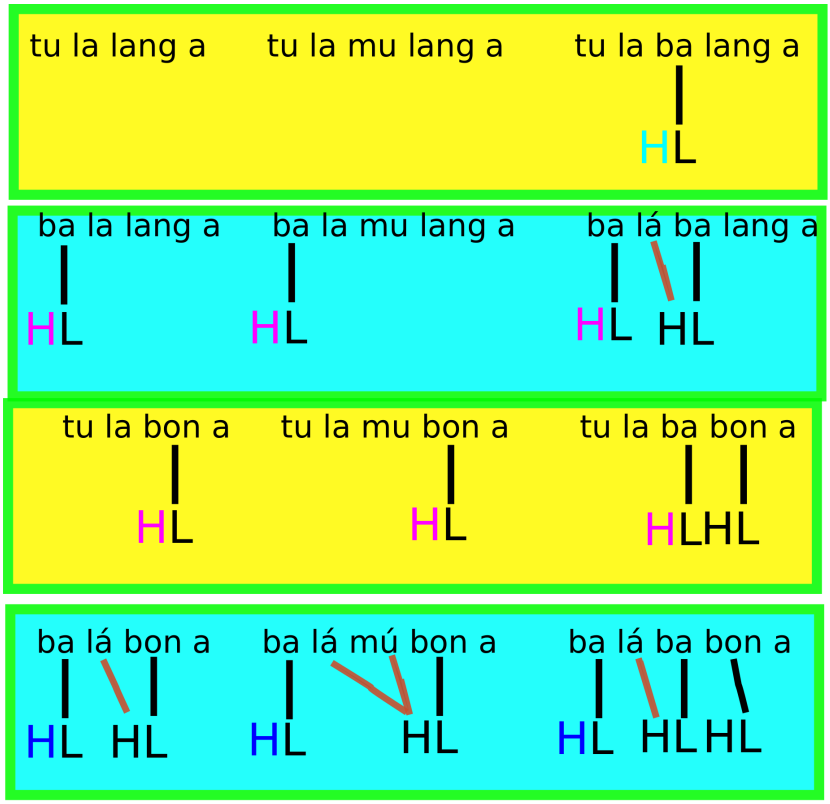
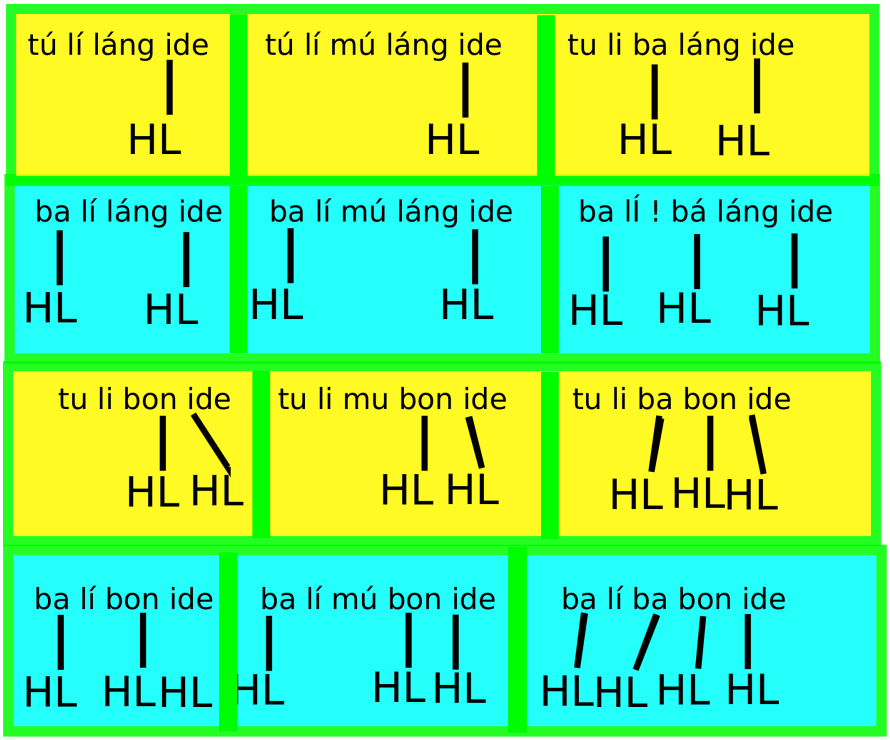


5.2.2 Present perfect

Present perfect			
SUBJECT MARKER	NO OBJECT MARKER	TYPE 1 (PLAIN) OBJECT MARKER	TYPE 2 (BOLD) OBJECT MARKER
1st sg.	**ndí lí láng** ide	**ndí lí** mú **láng** ide	**ndi li ba láng** ide
3rd pl.	**ba lí láng** ide	**ba lí** mú **láng** ide	**ba lí** ! **bá láng** ide
1st sg.	**ndi li bon** ide	**ndi li mu bon** ide	**ndi li ba bon** ide
3rd pl.	**ba lí bon** ide	**ba lí mú bon** ide	**ba lí ba bon** ide

(29)


tú lí láng ide
HL
tú lí mú láng ide
HL
tu li ba láng ide
HL HL
ba lí láng ide
HL HL
ba lí mú láng ide
HL HL
ba lÍ ! bá láng ide
HL HL HL
tu li bon ide
HL HL
tu li mu bon ide
HL HL
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ba lí ba bon ide
HL HL HL HL

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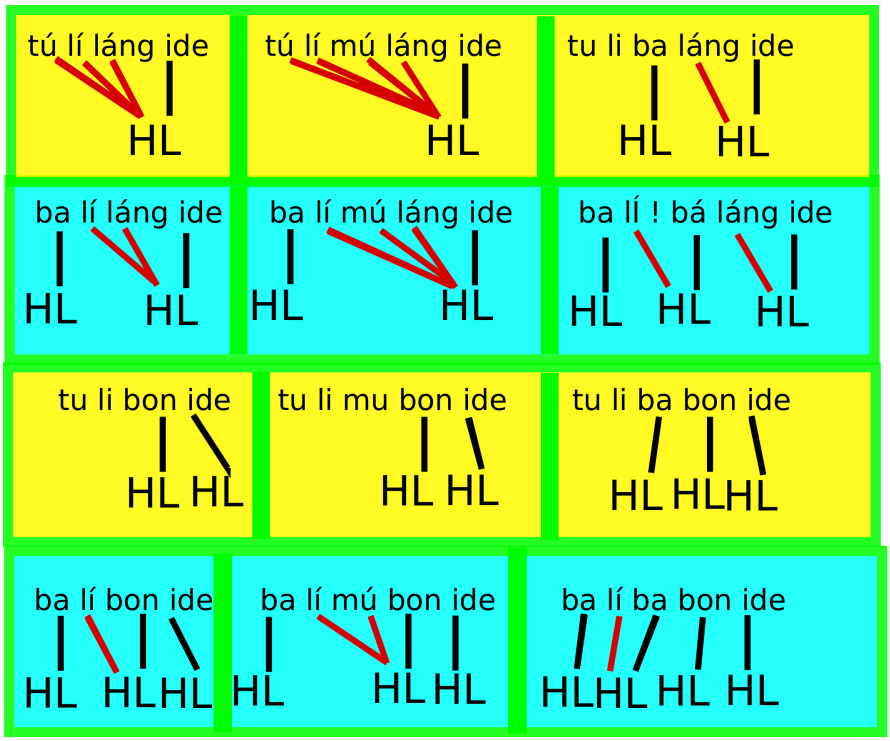
tú lí láng ide
HL
tú lí mú láng ide
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tu li ba láng ide
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ba lí mú láng ide
HL HL
ba lÍ ! bá láng ide
HL HL HL
tu li bon ide
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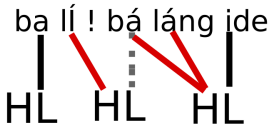
ba lÍ ! bá láng ide
HL HL HL

Proposal 5: Harmonic Phonology: from *Autosegmental and Metrical Phonology* 1989

- It should be clear that the tripartite nature of the Well-formedness Condition with its implementation algorithm simply did not fit into the picture of phonological derivations of classical generative phonology. If accepted, it had to be viewed as something overlain upon the true phonological rules, a universal mechanism that stood outside the set of phonological rules that constitute the phonological grammar of the language. More than for any other reason, this was because phonological rules in the clasical generative picture were not conceived of as applying or not applying in a fashion dependent on whether or not their output achieved a specifiable output structure. But that was precisely what governed the implementation of the association line addition demanded by the Well-formedness Condition. ...

- This suggest the following reconstruction of the organization of phonology. A phonological level will be defined as a set of phonotactics placed on representations. The *word-level* in a particular language, for example, will consist of a set of phonotactics, or well-formedness conditions, that apply to phonological representations in that language. A general theory of word-level phonotactics will constraint the technical language in which such phonotactics can be specified, and the work discussed in this book suggests the following hypothesis: language-particular word-level phonotactics consists entirely of syllable structure-conditions, including autosegmental licensing specifications and autosegmental restrictions on the minimum/maximum number of associations. Other word-level phonotactics are universal. We return to some cases of this sort below.

  Along with a set of (universal and language-particular) phonotactics for the W-level, each language will contain a set of rules that operate as repair strategies, applying just in case their output eliminates the violation of a phonotactic in their input. There is no guarantee that all violations will, in fact, be resolved by the time all the rules have done their work; in fact, it seems quite clear that it will *never* be the case that all such W-level phonotactics are perfectly resolved. Instead, the W-level phonology attempts to achieve a maximal satisfaction of its constraints, subject to the resources that it has for fixing problematic violations...

- With respect to the notion of rules, throughout most of this book we have retained the traditional generative conception, according to which rules come with a structural description and apply if that description is met. As indicated briefly in the last two chapters, and especially in the preceding section, I believe that this notion stands in need of serious revision, although, as we have seen, ongoing research in phonological theory has been able to enunciate a powerful conception of phonological representations, independent of any further changes in the theory of rules. Now, however, with this new theory in hand, we may proceed to a novel and even more compelling picture of the nature of phonology, in which rules interact with phonotactic conditions on a small number of levels to develop representation at each level as satisfying the conditions stated there...

  In phonology, the model we arrive at is one that looks much more like a model of chemistry than the models of classical generative phonology, in which the phonological grammar resembled nothing more than a computer program. In the model that is emerging currently, representations have a complex geometrical structure, but relatively few degrees of freedom in the changes they may undergo. Rules define possible changes in the structure of the phonological material, and in each and every case, the changes are motivated by an attempt to achieve a greater statisfcation of well-formedness conditions. This bears a striking similarity to the notion that chemical systems tend toward a lower energy level, consistent with the physical properties they have. The application of this kind of model has been urged elsewhere in cognitive studies by Smolensky (1986), for example, and the convergence of work in phonology with that in other areas of cognitive science offers great hope for continued advances of the sort that we have seen in phonology in the last fifteen years. [End]