Tone

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1 What is tone?

Nearly all languages make use of pitch, but some use pitch to constrast lexical items. Languages are called *tonal* if pitch is contrastive in the language. English is not a tonal language, but many other languages are.

The figure below from illustrates phonemic tonal contrasts in Igbo (Hayes, 2009, p.292). Igbo is Benue-Congo language spoken in Nigeria.

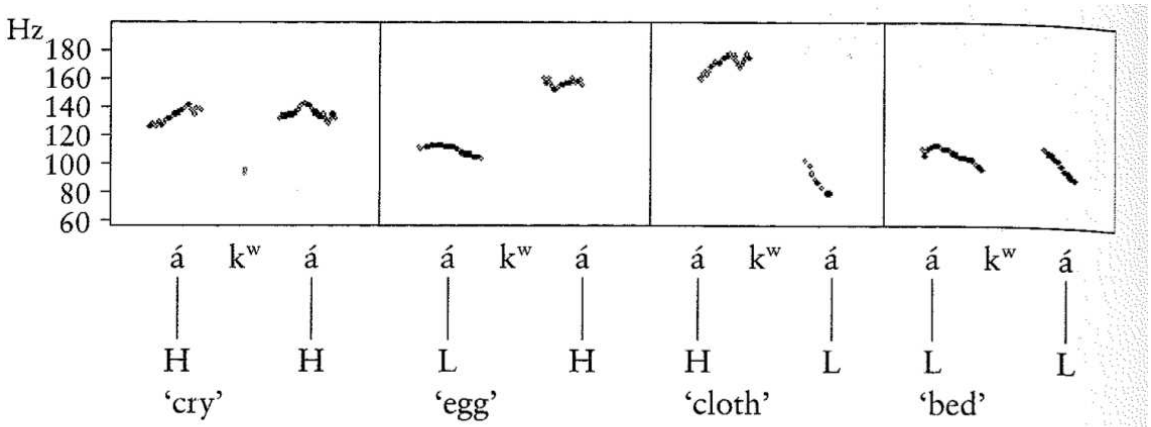


Figure 15.1 Phonemic tone in Igbo

2 Kikuyu

Kikuyu is a Niger-Congo language from Kenya with about 5.3 million speakers. The data here is discussed in Goldsmith (1990) and was originally presented in Clements (1984).

tò **rɔ̀r** ìrɛ́	'we looked at'	má **rɔ́r** ìrɛ́	'they looked at'
tò mɔ̀ **rɔ̀r** ìrɛ́	'we looked at him'	má mɔ́ **rɔ̀r** ìrɛ́	'they looked at him'
tò mà **rɔ́r** ìrɛ́	'we looked at them'	má má **rɔ́r** ìrɛ́	'they looked at them
tò **tòm** írɛ́	'we sent'	má **tóm** írɛ́	'they sent'
tò mɔ̀ **tòm** írɛ́	'we sent him'	má mɔ́ **tòm** írɛ́	'they sent him'
tò mà **tóm** írɛ́	'we sent them'	má má **tóm** írɛ́	'they sent them'

Take a minute to ascertain the basic facts.

1. On what does the tone of the tense suffix ìrɛ́/írɛ́ depend?
2. On what do the tones of the two verb roots (in bold) depend?
3. On what do the tones of the object suffixes (underlined) depend?
4. Assuming a feature [hi tone], how would this be accounted for this with SPE-style or OT grammars??

3 Representations

3.1 Representing words with features

So far we have worked with linear representations, where words are strings of feature bundles. So [mãj̃ãb] =

+nas	+nas	+nas	+nas	-nas
+cons	-cons	-cons	-cons	+cons
+lab	+low	+high	+low	-labial
...	...	...	...	...

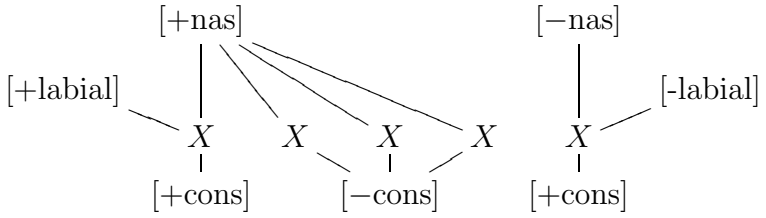
However there are other logically possible ways we might represent words. For example, we might put the feature [nasal] on it's own 'tier'.

+nas				-nas
+cons	-cons	-cons	-cons	+cons
+lab	+low	+high	+low	-labial
...	...	...	...	...

We might put every feature on its own tier.

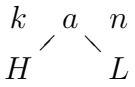
+nas				-nas
+cons	-cons			+cons
+lab				-labial
	+low	-low	+low	
	-high	+high	-high	

We might even adopt a skeletal structure like the following:

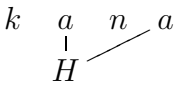


When we adopt representations like the ones above, we have to be able to interpret representations like the following.

In the context of tone, where H indicates a high tone and L a low tone, what could the following representation mean?



How about this one?



3.2 How can we decide?

If we adopt these sorts of representations, we need to be able to be able to state our rules and constraints in terms of them.

For instance for the rule-based theory, changing the theory in this way is a good idea only if the new theory does a better job than the old one at making the more common or natural processes simpler or more economical.

A common idea in phonological theory is that formalisms can be compared in terms of how 'simply' they express the relevant generalizations. So if a formalism A expresses a generalization more simply than formalism B then, all things being equal, A is the better formalism. So, we are interested in

- formalizations of generalizations that look relatively complicated (relative to other formalizations, that is) in the old theory but whose formalizaion is relatively simple in the new one.
- formalizations of generalizations that look relatively simple in the old theory but whose formalizaion is relatively complicated in the new one.

3.3 Some History

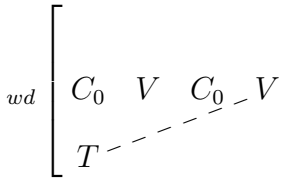
Theories that invoke the kinds of representations above are often called "Autosegmental" because the tiers are autonomous to the central tier which anchors the timing of the word (the X tier above). It was first called this by John Goldsmith in his 1976 dissertation, who was the first to invoke such autosegmental representations to describe tonal patterns. Tones were on a tier separate from the segmental tier.

The theory where each feature is on its own tier has been called the *Bottlebrush* theory (Hayes 1988?), presumably because words begin to resemble bottlebrushes, where the features and associations all radiate outwards from the center line of the bottle brush.

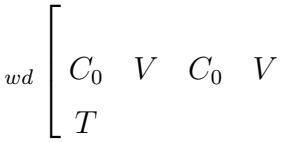
3.4 Tonal Association

In the "autosegmental" notation proposed by Goldsmith, we can write a rule thus ("T" stands for any tone, such as H or L in this language):

peninitial association



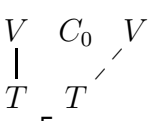
Yes, this is a rule! Its structural description is



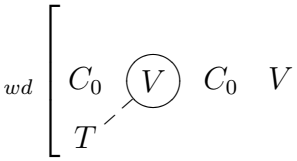
(i.e., everything except the dashed line) and the structural change it requires is insertion of the association line.

We need two more rules for the rest of the tones:

association convention



initial association



The circle is part of the structural description, and means "not associated to anything on the other tier".

For Goldsmith, association conventions actually derive from universal principles, and don't need to be specified on a language-particular basis.

Let's apply this grammar fragment to derive [tò <u>mà</u> **rɔ́r** ìrɛ́]'we looked at them' in Kikuyu.

All three rules are typical of the kind of thing you see in tone languages, and all three rules are some of the simplest that could be written in this notation.

Compare this to the linear analysis we developed above: do the linear rules look simple compared to other, less plausible linear tone rules we could write?

Here is a summary of autosegmental representation of tone.

- Tonal features exist on a 'tier' separate from the words.
- They are associated with particular vowels by virtue of being 'linked' with them.
- One facet of this representation is that an element on a tier can be linked to more than one element on another tier.

3.5 General aspects of Autosegmental Analysis

To the extent possible, all association lines are determined by rules. I.e. in the UR, tones are linked to individual vowels only if it is otherwise unpredictable from the (language-particular) association conventions.

There are two famous constraints.

No-Crossing Constraint. Association lines are not allowed to cross.

The Obligatory Contour Principle. Identical adjacent elements are prohibited.

3.6 Implications of Autosegmental Analysis

Supose tones are *autonomous* from segments; i.e. they are autosegmental.

1. What kinds of consequences might we expect for phonological processes like deletion or epenthesis that target tone-bearing units?
2. If the tone is autonomous, would it delete when the vowel it is associated with deletes?

Autosegmental analyses are not limited to tone.

1. What does autosegmental analysis mean for segmental processes?
2. What could assimilation look like?

4 Mende

The data below (from Leben 1973, Rialland and Badjimé 1989) illustrate the all possible tonal patterns for one-, two-, and three-syllable noun stems in Mende (A Niger-Congo language with about 1.5 million speakers in Sierra Leone). Let's develop an analysis that derives the surface tonal patterns from an underlying tonal specification. Make sure your analysis answers each of the following questions. In (e) below [mb̀â] has a rising-falling pitch contour.

- List the inventory of tonal patterns.
- What descriptive generalizations can be made about the surface evince forms?
- Provide a set of autosegmental rules deriving the surface forms from URs.
- What justification can be given for fixing the direction of tonal association?
- What role does the OCP play in the analysis?
- How are the data in (p-v) relevant?
- How does your analysis account for the descriptive generalizations you made above?

	monosyllables			disyllables			trisyllables	
a.	kɔ́	'war'	f.	pɛ́lɛ́	'house'	k.	háwámá	'waist'
b.	kpà	'debt'	g.	bɛ̀lɛ̀	'pants'	l.	kpàkàlì	'3-legged chair'
c.	mbû	'owl'	h.	ngílà	'dog'	m.	félàmà	'junction'
d.	mbă	'rice'	i.	fàndé	'cotton'	n.	ndàvúlá	'sling'
e.	mbâ	'companion'	j.	nyàhâ	'woman'	o.	nìkílì	'peanut'

	noun	noun + ma 'on'
p.	kɔ́	kɔ́-má
q.	mbû	mbú-mà
r.	mbă	mbà-má
s.	pɛ́lɛ́	pɛ́lɛ́-má
t.	bɛ̀lɛ̀	bɛ̀lɛ̀-mà
u.	ngílà	ngílà-mà
v.	nyàhâ	nyàhá-mà

References

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Goldsmith, John. 1976. Autosegmental phonology. Doctoral dissertation, MIT, Cambridge, MA.

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Hayes, Bruce. 2009. *Introductory Phonology*. Wiley-Blackwell.