

TONE ANALYSIS AND TONE ORTHOGRAPHY

Joseph Mfonyam
S.I.L., Yaoundé, Cameroon

What is the best way to represent tone in the orthography? Using autosegmental theory as background, this study follows both a generative and a phonemic approach for the analysis of tone in a number of (Bantu) Cameroonian languages. The result is a model which provides the basis for establishing sound principles in setting up a good tone orthography.

Quelle serait la meilleur façon de représenter le ton dans l'orthographe? Cette étude qui se base sur un modèle autosegmental, analyse le ton de plusieurs langues (bantou) camerounaises des points de vue génératif et phonémique. Le modèle qui en résulte offre un moyen d'établir des principes sains dans la formation d'une bonne orthographe du ton.

1. INTRODUCTION

Literacy in African languages is a key issue in national development. The functional load of tone in many African languages is very important and so any attempt to solve the reading and writing problems in African languages must take the problem of tone representation and tone orthography into consideration. The development of an efficient tone orthography is crucial in the bid to find a solution to literacy problems in African languages.

We undertook a study to find out the best way to represent tone in orthography (Mfonyam, 1989)¹. The tone systems of a number of Cameroonian languages were studied. These included Eastern Grassfields Bantu languages: Bafut, Bambili, Bambui, Mankon, Nkwen (from the Ngemba sub-group), Limbum (from the Northern sub-group), Yemba (Bamileke sub-group) and Northern Equatorial Bantu languages: Basaa and Bagyeli. These languages were selected to reflect a wide spectrum of the Bantu languages of Cameroon. We conducted experiments in Bafut (Mfonyam, 1982) and Limbum, (Mfonyam, 1989) testing several tone marking systems in order to find out which of them would be the most efficient way of representing tone in orthography.

In our study we have proposed a model which describes the approach used in the study of tone representation. Although we are going to present a model that describes several levels of tone representation, our main goal is the orthographic representation of tone.

2.0 TONE ANALYSIS

As regards the representation of tone, we have adopted some principles of the suprasegmental theory as presented by Leben (1973a, 1973b, 1980) and Fromkin (1974).

There is, in the behaviour of tones in Bafut and the other languages that we have studied, more which suggests that the representation of tone is best handled within the theory of suprasegmental phonology than that which suggests doing so within a segmental theoretical frame. Apart from the fact that tone in Bafut may be viewed either as a property of the syllable or of the morpheme (or even of the word), there are some other points that have motivated our treatment of tone as a suprasegmental

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feature, i.e. a feature that is realizable on phonological units greater than the segment. So far in our study we have not noticed any case where tone is affected by surrounding segments per se. Our T-rules are stated without reference to segmental phonemes and these rules operate irrespective of the features of the segments, consonants or vowels.

Although we have not specifically followed the autosegmental approach in our treatment of tone in Bafut, the autosegmental theory proposed by Goldsmith (1976) serves in the background. The existence of floating tones and tonal morphemes without segments (such as those that mark tense) and toneless morphemes, not only argue for a suprasegmental but also for an autosegmental treatment of tone in some of the languages studied.

2.1 GENERATIVE APPROACH

The approach that is central in our tonal analysis is, in general, the framework of generative phonology along the lines of Hyman and Schuh (1974), Hyman (1976, 1979), Hyman and Tadadjeu (1976) and Schuh (1978).

Within the framework of generative phonology, we have worked at both systematic phonemic and systematic phonetic levels.

At the systematic phonemic level, we have worked with two underlying tones, H and L. Using the system of tone rules (T-rules) in the language we arrive at the systematic phonetic level. Thus the representation of the tones of an utterance or construction is at two levels: the systematic phonemic level, i.e. the underlying tones, and the systematic phonetic level, i.e. the surface tones. This can be illustrated in the following examples from Nkwen:

- | | | | | | | |
|-----|----|---------|------|--------|----|------------------|
| (1) | a. | à kwésó | ` ^ | ' | => | [à kwèsō] |
| | | he help | PAST | INTERR | | 'has he helped?' |
| | b. | à kwésó | ` ^ | | => | [à kwèsō] |
| | | he help | PAST | | | 'he has helped' |
| | c. | àtyé | ' | 'mó | => | [àtyé' 'mô] |
| | | head | AM | child | | 'head of child' |
| | d. | nìbyè | ' | 'zé | => | [nìbyè zē] |
| | | fish | AM | our | | 'our fish' |

Here, the representation of the tones of the string to the left of the arrow is at the systematic phonemic level, while the representation of the tones to the right of the arrow is at the systematic phonetic level.

The difference between (1a) and (1b) is made solely by tone; (1a) is a question while (1b) is a statement. The distinguishing tone is the last tone of the utterance in (a). This tone is an example of a grammatical tone. A grammatical tone marks grammatical constructions or forms and thus contributes a grammatical meaning to the construction in question. This tone or tone pattern is thus a marker of the construction.

In (1c) the floating H tone is the associative marker (AM) of the noun class of the first noun /àtyé/ 'head'. This noun belongs to noun class 7 and so its associative marker is a grammatical H tone. The floating L tones belong to the preceding and following nouns.

In the representation of the tones of an utterance, there is an input string (to the left of the arrow), and an output string (to the right of the arrow). The link between the

input string, (the underlying tones) and the output string (the surface tones) consists of the set or system of rules.

T-rules therefore work on the underlying forms at the systematic phonemic level to produce the surface tones at the systematic phonetic level. This will be illustrated in the derivation of the surface tones of (1c) as follows:

- | | | | | |
|-----|----|---------|------|----------------------------|
| (2) | a. | àtyé`´ | `mó` | underlying |
| | b. | àtyê`´ | `mó` | tone grounding to the left |
| | c. | àtyé`´ | `mó` | tone grounding to the left |
| | d. | àtyé'´ | `mó` | simplification and DS |
| | e. | àtyé' ^ | mó` | tone grounding |
| | f. | àtyé'´ | 'mó` | simplification and DS |
| | g. | àtyé'´ | 'mó | tone grounding |

In (2a) the underlying tones are given. In b. the floating tone of N1 grounds and creates the HL contour tone on the noun stem. In c. the grammatical floating H tone grounds to the left onto the lexical tones of N1 of the construction where it creates a complex HLH contour tone. In d. the HLH contour tone simplifies to a H'H contour tone. In e. the floating L tone of the N2 prefix grounds to the left on the N1 where it also creates a complex H'HL contour tone. In f. this contour tone simplifies and causes the following H tone to downstep. In g. the floating tone of the N2 stem grounds and creates a HL contour tone on the noun stem.

In (1d) the tone of the possessive interacts with the lexical tone of the noun. The derivation of (1d) is as follows:

- | | | | | |
|-----|----|---------|-----|-------------------------------|
| (3) | a. | ǹbyè`´ | `zé | underlying tones |
| | b. | ǹbyé`´ | `zé | tone grounding |
| | c. | ǹbyé | `zé | tone grounding and absorption |
| | d. | ǹbyè | `zé | tone lowering |
| | e. | ǹbyé | zé | tone grounding to the left |
| | f. | ǹbyé | zē | tone lowering |

In (3a) the underlying tones are given. Here the second floating H tone is the possessive marker for the class of the noun /ǹbyè`´/, which belongs to noun class 5. The floating L tone is the underlying tone of the possessive concord prefix. In b. the floating tone of the noun grounds and creates the LH contour tone on it. In c. the H tone of the marker grounds to the left where it is absorbed into the H tone part of the LH tone on the noun stem. In d. the LH tone of the noun stem is lowered to LM. In e. the floating L tone of the possessive concord prefix grounds to the left on the noun stem where it creates a LML complex contour tone. In f. the L tone part of LML contour lowers the H tone of the possessive stem to M.

2.2 PHONEMIC APPROACH

Given the practical side of our work, we have adopted some aspects of the traditional phonemic approach which generative phonologists have termed taxonomic or autonomous phonemic level (cf. Schane, 1973:6-7). From this theoretical frame, we have adopted the principle of establishing the phonemic tones of the language on the basis of phonemic contrasts. For each language that we have studied, we have first of all sought to establish the different phonemic tones. The following examples illustrate how we sought to establish the phonemic tones of Bafut:

The three phonemic tones in Bafut contrast in the following lexical set:

(4)	H H báá 'additional measure of oil'	M M bāā 'focus marker'	L L bàà 'a kind of tree'
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The above lexical set and their tones also contrast in the following constructions:

(5)	a. báá tǎà wā à nīn lǒ āā fǒ?	'where did father's measure of oil come from?'
	b. bāā tǎà wā à nīn lǒ āā fǒ?	'where did the father come from?'
	c. bàà tǎà wā à nīn lǒ āā fǒ?	'where did father's (kind of) tree come from?'

The constructions in example (5) above are distinguished solely by tone. This example shows not only the contrasts between the phonemic tones, but also the importance of tone in the language. These tones are further contrasted in the following frame:

(6)a.	à nī máà ghà	'it is my grandmother'
	b. à nī tǎà ghà	'it is my father'
	c. à nī bàà ghà	'it is my <u>baa</u> tree'

In our analysis we have recognized a phonemic M tone in some of the languages we have studied. However, in our analysis M tone is not treated as an underlying tone. Mid tone, historically and synchronically, is derived from underlying H and L or from a sequence of H and L. Thus, in our analysis, all the tones are reduceable to the two underlying tones, H and L.

Although M is not treated as an underlying tone, we have treated it as having full phonemic status in the Ngemba languages and in Limbum. This is why we consider Limbum, Bambili, Bambui, Nkwen, Mankon and Bafut as languages each with a three-tone system.

The fact that loan words are assigned the M tone, for example, /cōr/ 'church' (in Limbum), and /trēn/ 'train' (in Bafut), shows that M tone has a strong psychological reality for the speakers of these languages.

3.0 ORTHOGRAPHIC REPRESENTATION OF TONE

In view of our concern with orthographical questions we have had to consider another level of tone representation, which we have termed the systematic orthographic level. The systematic orthographic level is fed immediately by the systematic phonetic level and remotely by the systematic phonemic level. The relationship between the systematic phonemic level and the systematic orthographic level is established by the systematic phonetic level. This is so because, as already stated, the systematic phonemic level feeds the systematic phonetic level, which in turn feeds the systematic orthographic level.

The orthographic level is more directly related to the traditional phonemic (or taxonomic) level. The traditional phonemic approach is more crucial for orthography since it establishes the phonemic contrasts that the systematic orthographic level uses.

Thus the orthographic level requires both the generative phonology approach and the classical phonemic approach. This is why we have adopted both theories and adapted them wherever necessary.

The systematic orthographic approach seeks to represent tone in a systematic way at the orthographic level. People have often proposed orthographies in which tone is marked in a non-systematic way. A tone orthography that marks tone only where there is potential ambiguity is not systematic. A tone orthography should be systematic in relation to the tones, i.e., it should mark the tones in a systematic and consistent way. If it is decided that only grammatical tones should be marked, for example, then all grammatical tones should be marked. If, on the other hand, it is better to mark lexical tones, these should be marked consistently.

The systematic orthographic level in turn consists of three levels, zero representation, minimal representation, and full representation.

3.1 ZERO REPRESENTATION

In the zero representation option tone is not marked at all. Until recently, tone was not marked in most African languages. Tone was either ignored or thought too complicated a matter to be considered in the orthography. Even now some people still resist marking tone even though its functional load is reasonably important.

We ruled out a priori any system that did not mark tone because we were dealing with tone languages.

‘A tone language is a language in which both pitch phonemes and segmental phonemes enter into the composition of at least some morphemes.’ (Welmers 1973:80)

In view of the above definition we will be ignoring the function of tone if we do not consider writing it in the orthography. In the Grassfields languages the functional load of tone is so important that it would be unreasonable to ignore tone completely. If the tones are not marked, it would be difficult to read because of the risk of ambiguity. Miller (1970:43) argues strongly against the assumption that people could read without tone marks:

‘... I think that those who say that native speakers can understand writing without diacritical marks do not take into account the almost infinite possibilities of expression.’

Those who support the fact that tone should not be marked are influenced by the alphabet of some major language such as English. They want their language to look like English. Here again it stands to reason that we cannot sacrifice meaning for aesthetics.

A near zero representation level is a situation where people choose not to mark tone except in selected areas of potential ambiguity. This is not a convenient choice in general because people do not always think contrastively. When we write, we are not always conscious of potential ambiguities. For example, after marking potential ambiguities in the reading test and in other texts used in the Bafut experiment, we were surprised to discover some more cases of ambiguities as the students read. It is obvious that we had not been aware of these.

Another argument against this system of tone representation is the fact that it is not systematic. Tone needs to be represented systematically in order to facilitate not only teaching, but also the reading and writing of a tone language. One of the systems of

tone marking that was tested in the Bafut experiment was very much like what we have just described here. The results of the experiment showed that this way of representing tone is not efficient.

3.2 FULL REPRESENTATION

The full representation option aims at representing orthographically all the tones that contrast at the systematic phonetic level. The full representation level would involve the representation of the following tones in Bafut:

(7)	Tones	H	'H	M	↑L	L	H'H	HL	'HL	ML	LM	LML
	Orth.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11

In the above diagram, S1-S11 represent the tonemes for which orthographic symbols need to be chosen to represent the tones identified at the systematic phonetic level. S1-S11 will then constitute a full representation at the systematic orthographic level. Usually in such a system one tone is left unmarked, which is still equivalent to full marking.

This system is not very efficient for people learning to read or write the language. Too many tone marks discourage the learner and thus make both the teaching and learning process difficult. Too many tone marks hinder rather than facilitate reading and writing the language. This fact was confirmed by the two experiments that we conducted.

3.3 MINIMAL REPRESENTATION

The orthographic minimal representation option consists of the representation of the minimum number of tones from the taxonomic phonemic representation level that are required to make the necessary meaning distinctions in the language. The systematic orthographic minimal representation strikes a balance between too many and too few tone marks. The minimal representation level enables us to represent just the right number of tones orthographically in the writing system. The concept of minimal representation is a construct which lies somewhere between full representation and zero representation. This is the optimal representation of tone in the orthography for the native speaker or those with competence in the language.

Even though the minimal representation level is a theoretical construct, it is a point in a continuum to which we should move and eventually attain. The need for the minimal representation level arises from the desire for a system that enables efficient decoding of the full meaning encoded and which also ensures an effective tone pedagogy in both a teaching and learning situation. Semantic and pedagogical factors determine the minimal representation level. We thus see that the minimal representation level is not determined arbitrarily. It is a point along a continuum and is language specific.

In view of the above motivating factors the orthographic minimal representation should be determined in a systematic and scientific way.

The minimal representation level is selected from the taxonomic phonemic level on the basis of field tests or through an experiment like the one that we conducted for Bafut and Limbum. However, on the basis of a good analysis and a sound knowledge of the tone system and of the rules that produce the systematic phonetic level, one could arrive at a tentative minimal orthographic representation level. This has then to be tried out in the field before it is established and accepted as the orthographic minimal representation.

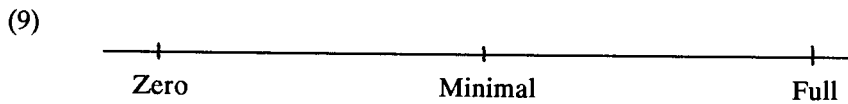
As in the approach adopted in both the Bafut and Limbum situations, we may have to investigate various alternatives before eventually establishing the minimal representation level. In the Bafut case, we proposed various representations ranging from a more or less full representation to a near zero representation. From a range of four proposals, the minimal representation was chosen.

The orthographic minimal representation level in Bafut, for example, would represent the following tones:

(8)	Tones	H	'H	M	↑L	L	H'H	HL	'HL	ML	LM	LML
	Orth.				S1	S1		S2	S2	S2	S3	S3

We notice that the minimal representation level reduces the whole tone system to three symbols, S1, S2 and S3. S1-S3 represent the orthographic symbols chosen to represent the tones in the language. Thus S1-3 has to be interpreted in terms of the specific symbols used in the orthography. For Bafut, S1 is symbolized /ˊ/, S2 is symbolized /ˋ/ and S3 is symbolized /ˊˋ/.

As already stated, the systematic orthographic approach is a continuum wherein one level of representation shades into the other. There are thus three theoretical levels within the orthographic level: full representation, minimal representation and zero representation. The full range of the systematic orthographic level can be captured by the following diagram:

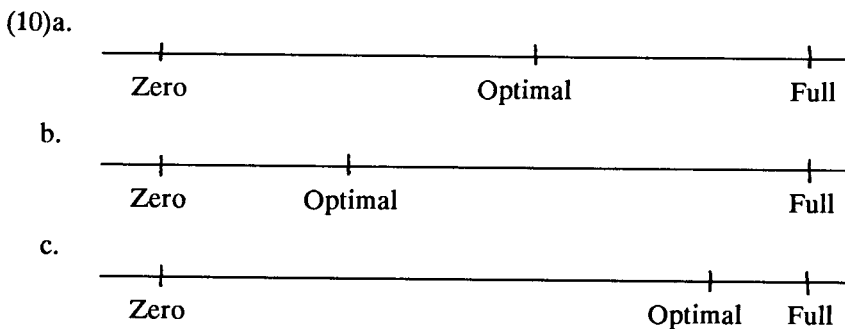


In the Bafut experiment, as we have said above, one of the tone marking systems was near zero representation. In our study we have not concerned ourselves much with this level because it is an extreme case that would not serve our purpose.

In the search for the minimal representation, the two extremes, full representation and zero representation, should be avoided. Still in the Bafut experiment another tone marking system was near full representation. It did not represent all the tones in (7) above, i.e. in a way such that each tone would have a different orthographic symbol. Raised L tone (↑L) and downstepped H tone ('H), for example, were unmarked orthographically.

3.4 OPTIMAL REPRESENTATION

It is crucial to note that in the systematic orthographic representation, the optimal representation is relative since it is always related to the language and to the users. For foreigners learning the language, e.g. linguists, the full representation is the optimal while the minimal representation is the optimal representation for native speakers and all others who function competently in the language. The diagrams in (10) show the relative nature of optimal representation:



Although in our study we have found that, in all the cases, the zero representation level is not really an option, it might be that for some languages where the function of tone is not very important, the optimal representation could be zero.

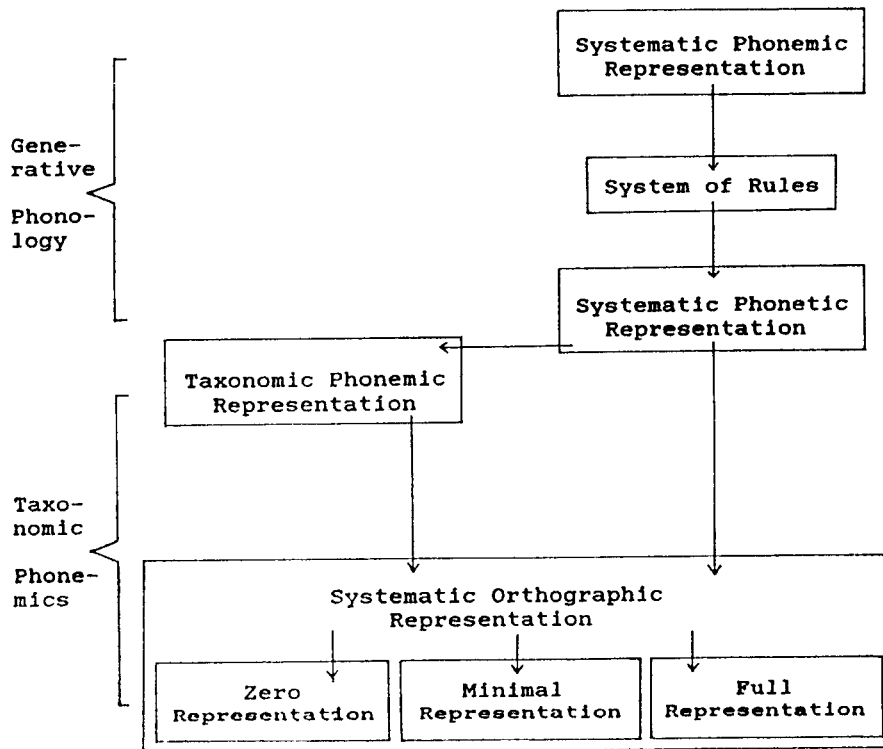
In seeking the optimal representation of tone a number of factors relating to the number and types of symbols chosen should be take into consideration. If the symbols are many, more learning will be required and where these are few less learning will be required. Regarding essential semantic distinctions carried by tone, we are working on the basis of a number assumptions. First, we have assumed that not all tone markings are needed to decode utterances due to redundancy in language. It should be noted that where there is more marking, there will be less ambiguity. Where there is less marking, there will be more ambiguity. Therefore the fewer the tones marked the more chances there will be for ambiguity. We assume here that there is a threshold beyond which it will be extremely difficult to interpret sentences due to the lack of sufficient clues provided by tone marks. This threshold may be reached sooner or later depending on the language. This is also related to the fact, as shown in (10) above, that the optimal representation is relative, depending on both the language and user.

In our study we were primarily concerned with the native speaker and his needs. As a result, we concentrated on finding the minimal representation level for the native speaker since this is the optimal to be sought after. In our study we have discussed the various options and shown why the minimal representation level is the ideal tone orthographic representation for the native speaker or the competent user of the language.

6. MODEL

The model that we have adopted in the study can be summarized in the following diagram:

(11)

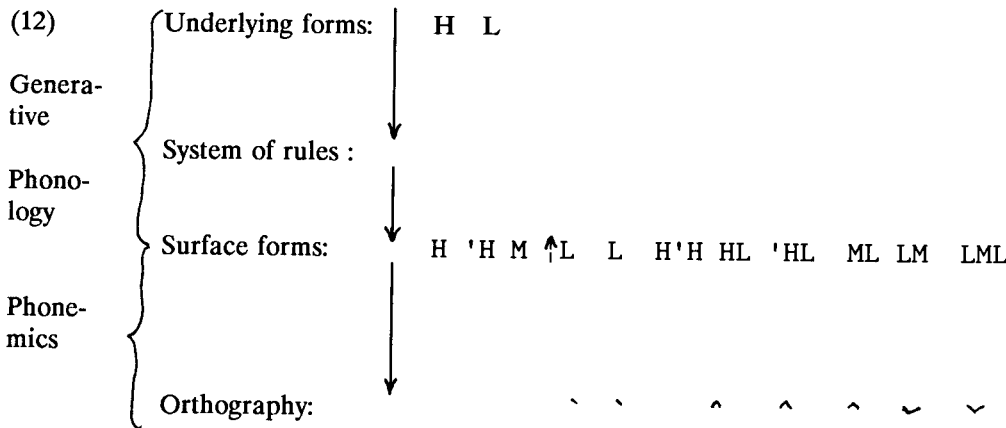


The relationships that exist between levels are indicated by the arrows. The orthographic representation level is fed by both the systematic phonetic and taxonomic phonemic levels of representation.

The systematic phonetic representation and the traditional phonemic representation are two different ways of looking at the same linguistic reality. These are the surface realizations of the same underlying realities. The taxonomic phonemic representation is a different way of looking at the contrasts produced by the system of rules that result in the systematic phonetic level. The taxonomic phonemic representation is more abstract than the systematic phonetic representation. The systematic phonetic representation includes such details as allophones or allotones whereas the taxonomic phonemic representation represents phonemes or tonemes.

The essential difference between the generative phonology approach and the phonemic approach is that generative phonology looks at tone processes in a syntagmatic relationship whereas the phonemic theory looks at the contrasts produced by tone process in a paradigmatic relation. In traditional phonemic theory such relations as H and M are representations of the different ways in which native speakers react to these realities as distinctive units.

Another way of looking at the model in (11) above is as follows:



The above diagram shows in a general way a progressive or derivational relationship between the various theories used in the model. From underlying forms we use the system of rules to derive the surface forms. From the surface forms we go to the orthographic level. The generative phonology approach and the traditional or taxonomic phonemic approach meet at the level of the surface forms which directly feed the orthographic systematic level.

One of the issues we deal with concerns the question of surface representation of tones versus underlying representation of tones in orthography. Generative phonology has argued for a more abstract representation, which in essence actually favours underlying representation. In this light it recognizes only H and L as phonemic tones but not M. Traditional phonemics on the other hand favours a surface representation of contrasts, which is less abstract in view of the many more contrasts that are represented at this level.

At the level of orthographic representation, our approach favours a surface representation of tones rather than a more abstract representation of underlying tones. In this light, we are more on the side of traditional phonemics. We argue against the

writing of M or 'H, for example. This, it might be argued, seems to favour and thus prove the point of generative phonology, which, in general, favours a more abstract representation. However, this is actually not the case. Our minimal representation approach does not mean that such contrasts as M and 'H are not represented. In our approach, H and 'H are both marked by the absence of a tone mark, i.e. the absence of an orthographic symbol. Also in our system, one orthographic symbol might represent more than one tone, as for example, in Limbum the orthographic symbol /ʌ/ represents both level L and extra L.

Thus out of a desire to find solutions to practical problems we have resorted to an eclectic approach. We have used the generative phonology model for the basic analysis. What we have taken from the suprasegmental and autosegmental viewpoints is the fact that tone is autosegmental, i.e. tone can be represented at a different tier in relation to segments per se. However, we have not adopted the Well-formedness Condition. We have used the system of rules typical of generative phonology. The taxonomic phonemic approach was crucial for our orthographic representation.

Another question concerns the contribution of generative phonology to the systematic orthography level. Since the taxonomic phonemic level seems to be more crucial to the orthographic level than the other levels of representation, could we not move from there directly into the systematic orthographic level without having to start with the systematic phonemic level and passing through the system of rules and the systematic phonetic level? Indeed, it is possible to ignore the generative component. This is what the traditional phonemic phonologists have done ever since. Our approach has been motivated, among other things, by the fact that neither the taxonomic phonemic approach nor the generative phonology approach, taken separately, could deal adequately with orthographic problems. Our approach benefits from both these approaches.

In diagram (11) above, one of the arrows from the systematic phonetic level goes directly to the systematic orthographic level. There is a direct link between generative phonology and the orthographic level. The full representation level is fed crucially by the systematic phonetic level, just as the minimal representation level is fed mainly by the taxonomic phonemic level.

A major contribution of generative phonology to the systematic orthographic level is the system of rules that enable us to go from underlying tones to the surface tones. This enables us to explain the surface realizations. The generative phonology approach helps us to account for the representation options at the systematic orthographic level. We should be able to explain why we have chosen a given orthographic representation. The generative component of our model helps, to a great extent, to explain our choices. The tone lowering rule (our T-rule 2), for example, gives one of the major reasons for the choice of marking L tone in Bafut instead of H or M tone. We need to know the underlying tones of the strings given in (1d) and the rules applying to yield the surface tones (cf. (3)), in order to decide on the tones to mark. It is on the basis of the underlying tones and the rules involved in the derivation of the surface tones in (3) that we have chosen to represent the complex contour tone LML (of the string [nɪbyɛ̃ zɛ̃]) orthographically as /ʌ/ rather than as /ʌ/. This illustrates not only the need to study the underlying tones but also the importance of a sound analysis of the tone system in the design of a good tone orthography.

Since the question of orthography is a key issue in language, a good tone orthography has to be founded on good principles. A good tone orthography should

have as its foundation a sound and adequate analysis of the tone system. This is why we have been motivated throughout our analysis by the principles of descriptive adequacy and explanatory adequacy. We have tried to explain the processes of the tone systems that we have studied. The purpose of the derivations in our study has been to explain the processes involved in the tone systems of the languages studied. Understanding the tone system of a language helps us to establish a good orthographic system for it. Where it has not been possible to give an adequate explanation of any processes, our aim has been to give an adequate description of them.

The advantage of our model is that it is not only explanatory, but also goes beyond this and aims at solving the practical problems of tone orthography. Our model still stands on the basic claim that orthographical questions are best handled at the surface level where we establish our contrasts, i.e. at the traditional phonemic level, whereas generative phonology, whether along the lines proposed by suprasegmental phonology, autosegmental phonology or lexical phonology, seems to look at tone representation basically from the more abstract underlying level and thus more at the lexical level.

4. PRINCIPLES OF A GOOD TONE ORTHOGRAPHY

As a result of our studies, we have come developed a number of guiding principles and hypotheses regarding a good tone orthography. In our research we have constantly kept these guiding principles and hypotheses in view:

1. A tone orthography should be designed mainly with the native speaker in view. The users of the language are in the main native speakers, who are also the ones to decide eventually on the destiny of the language.
2. In a tone orthography tones should be marked in a systematic and consistent way. The orthography should be designed on principles that apply all the time. This would facilitate both the teaching and learning of the orthography.
3. Surface tones should be marked rather than underlying tones. This means that, in an utterance, tone changes will be marked since in some cases the underlying or lexical tones of words change when used in grammatical constructions. It is less practical to write underlying tones in some languages, for example, in Grassfields languages because the underlying forms are sometimes far removed from the surface forms. The fact that there are a lot of floating tones in Grassfields languages makes the writing of underlying tones very impractical. For example, it will be difficult and awkward to represent the underlying tones as shown in (1) (2) and (3) above. It would often not be convenient to enter words in the dictionary with a string of underlying tones, especially when some of them have no tone bearing segments. It is not advisable to write underlying tones because the learner will find it difficult to determine the underlying tones of many words. It took considerable effort for us to establish the underlying tones of some of the morphemes.
4. Marking many tones should be avoided. An ideal orthography would be one that strikes a balance between too many tone marks and too few tone marks.
5. The more stable level tone should be marked. This means that the tone whose pitch value changes much should not be marked.

6. Since most of the tone systems that we are dealing with have developed basically from two tones, L and H, our choice of which tone to mark should begin with L and H.
7. In Bantu languages L tone is relatively more stable than H tone.
8. In Bantu languages L tone is more easily perceived by the native speaker who is learning to read and write tone.
9. Since L tone is more stable and more easily perceived by the native speaker, it should be marked rather than H tone.
10. The frequency of tones should be taken into consideration in the choice of which tone to mark. The more frequent tone should not be marked.

In our study we have been motivated by the need to establish an efficient tone orthography. After all that we have done so far, we still feel there is a need to develop an objective and reliable method of evaluating the efficiency of tone orthographies. This method should enable us to say which orthography proposal introduces the least neutralisation of crucial meaning distinctions.

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