

A tone orthography typology

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Abstract: Discussions about tone orthography have long been hampered by imprecise terminology. This article aims to bring clarity by means of an explicit typology composed of six parameters. Each parameter is defined by a choice: domain, target, symbol, position, density and depth. The orthographer assesses each typological aspect individually, while always bearing in mind that the six parameters together generate a complex matrix of responses. The result is a precise and informative character profile for any Roman script tone orthography.

Keywords: typology; tone; orthography; orthographic depth

1 Introduction

Since its earliest days, the debate about tone orthography has suffered from a lack of precise terminology. It is not uncommon for informal discussions amongst fieldworkers engaged in orthography development to be limited to the single question “Should we mark tone or not?” This question is almost impossible to answer briefly because of the assumptions that often accompany it. Firstly, it is often wrongly interpreted as requiring a polar answer, yes or no, leaving no room for graduated and nuanced responses. Secondly, it may assume that tone must be represented by accents or not at all, ignoring the rich diversity of strategies worldwide. Finally, the questioner may have concluded too hastily that the tone system itself must be represented, whereas it is possible to resolve tonal ambiguities in other ways.

2 The six parameters

This state of affairs begs for the development of a typology that can generate a precise and informative character profile for any tone orthography. This article is an attempt to develop such a typology on the basis of six parameters (table 1):

Table 1: Tone orthography typology parameters

1. Domain
2. Target
3. Symbol
4. Position
5. Density
6. Depth

Within each parameter lies a choice, and this is what defines the parameter in question, making it distinct with respect to the others. But to the extent that choices made in one parameter will affect those made elsewhere, all six parameters are interdependent. Separating the parameters permits individual assessment of each aspect of the tone orthography, while bearing in mind that the six parameters together will generate a complex matrix of responses.

The languages cited have been chosen because they exemplify Roman script practice worldwide. However, I will add two caveats. In some cases, the author does not specify whether the orthography in question has been formally adopted, or whether it is merely a proposal. Also, it is possible that tone orthography practice may have changed since the publication of the cited research.

Orthographic data is cited between <chevrons>, phonemic data between /slashes/ and phonetic data between [square brackets]. In the latter, the diacritics [á ā à â ã] indicate H, M, L, HL and LH respectively, and a superscript arrow [[↓]] indicates non-automatic downstep. For languages with more complex tone systems, Chao tone letters [1 1 1 1 1] indicate level tones from H to L and combinations of these indicate contour tones.

2.1 First parameter: Domain

The first parameter is the broadest. It concerns the linguistic domain represented in the orthography. Linguistic domains include the phonology, the grammar and the lexicon. On the one hand, some orthographies take a direct, sound-based, phonographic approach. Whatever symbols are employed, the domain represented is

the tone system itself. There is a direct mapping of graphemes to tones. This is the classic strategy in language after language around the world. On the other hand, there are orthographies (and these are less common) that achieve the same goal by an indirect, meaning-based, semiographic route. Whatever the symbols employed, the domain represented orthographically is the grammar or the lexicon. Potential ambiguity is dealt with indirectly by highlighting the function of tone rather than the tones themselves (Kutsch Lojenga 2008: 5-6; Snider 1992: 29-30). The distinction between these two approaches will become clearer with the help of specific examples in the ensuing discussion of the second and third parameters.

2.2 Second parameter: Target

The second parameter is an extension or sub-category of the first. If we define “target” as the linguistic element that is symbolised orthographically, what should be targeted? This may be the tones themselves (given that the phonographic route is chosen in the first parameter), the grammar or the lexicon (give that the semiographic route is chosen in the first parameter), or a combination of these.

2.2.1 Tones

When the phonographic route is chosen in the first parameter, which tone(s) should be targeted? This is the concern of the second parameter.

Early researchers (Pike 1947: 222) advised noting only the least frequent tone for reasons of graphic economy. This has often been called a minimal representation. However, nowadays, the principle has been so assimilated in practice that it is generally considered to be second only to maximal targeting, i.e. marking every tone.

In a three tone language, one can choose to target either high (H), mid (M) or low (L) tone. Wiesemann et al. (1988: 156) rightly recommend counting tone frequencies in a corpus of natural texts. However, a frequency count does not solve the problem in languages where the distribution of tones is more or less equal, as in Bagyeli (Gyele; Bantu A.80, Cameroon; Mfonyam 1989: 506). We should also note that an orthographer may make this decision on the basis of phonological markedness rather than textual frequency.

Elsewhere, Wiesemann (1989: 16; 1995: 25, 27) recommends indicating L tone with a grave accent and leaving other tones unmarked. This advice was followed in Moghamo (Grassfields, Cameroon; Mbah 2008: 16) (example 1):¹

1	<Mbah bèrǐ gwi titad, ìkub mǎ' tì ìkuŋə ìkwè.>
	[mǎǎʔ bèrǐ gwī títád, ìkūb mǎʔ tì ìkúŋə́ ìkwè]
	<i>Mbah has three goats, a fowl and four pigs.</i>

However, it is still the H tone that is most commonly targeted, as in Bahinemo (Sepik, Papua New Guinea; Dye manuscript) (example 2):

2	<Wabinál fa dínayowa, isiní. Biyál Leitó léfu.>
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¹ Tone was incorrectly marked in this publication. Example 1 shows correct tone marks as they will appear in future publications (Mathaus Njeck, p.c.).

	[wābīnāĺ ɸá 'dīnājōwà īsīnī bījál lāj'tó léɸù] ²
	<i>Wabinal just killed a pig. Who? Leyto the two of them.</i>

Another option is to target the places where the tones rise and fall across the sentence rather than tones themselves. This strategy has not gained wide usage in practical orthographies, in spite of an early proposal for Twi (Kwa, Ghana; Christaller 1875: 15-16).

2.2.2 Grammar

If the semiographic approach is chosen in the first parameter, one can choose to highlight the grammar or the lexicon. If it is the grammar that is chosen, which specific grammatical elements should be targeted? This is the concern of the second parameter.

In spoken Ngangam (Gur, Togo), 70% of verb forms are not differentiated by segmental TAM affixes composed of consonants and/or vowels. Instead, verbal inflexion is tonal. Written Ngangam avoids this problem by choosing the semiographic route in the first parameter. Then, in the second parameter, it chooses to target the imperfective with the letter <h> and the perfective with an apostrophe

² In the IPA transcription, the symbol ['] indicates sentence level stress, expressed as the loudest, longest and highest syllable in that sentence. This is my interpretation of data kindly supplied by Wayne Dye.

<'> (Higdon et al. 2000). This strategy targets all verbal forms, even unambiguous ones (examples 3 - 7):

	Imperative	Perfective	Imperfective	Imperative	Perfective	Imperfective	
3	<bere>	<bere'>	<bereh>	[beɹreɿ]	[beɹreɿ]	[beɹreɿ]	<i>destroy</i>
4	<tuke>	<tuke'>	<tukeh>	[tuɹkeɿ]	[tuɹkeɿ]	[tuɹkeɿ]	<i>carry on head</i>
5	<ɣɔ>	<ɣɔn'>	<ɣɔh>	[ɣɔɿ]	[ɣɔɿ]	[ɣɔɿ]	<i>dance</i>
6	<jie>	<jie'>	<jieh>	[jieɿ]	[jieɿ]	[jieɿ]	<i>cut</i>
7	<cɔke>	<cɔke'>	<cɔkedeh>	[cɔɿkeɿ]	[cɔɿkeɿ]	[cɔɿkəɿdeɿ]	<i>pierce</i>

2.2.3 Lexicon

Again, if the semiographic approach is chosen in the first parameter, the aim may be to highlight the lexicon. In this case, which specific lexical items should be targeted? This choice is dealt with in the second parameter.

The orthographies of some languages target pairs of words that would otherwise be homographs. An important sub-set in this strategy is pronouns, since tonal minimal pairs are surprisingly common among them. In Jur Modo, (Nilo-Saharan, Sudan; Persson 2004), two possessive pronouns are disambiguated by means double of consonants (examples 8 - 9):

8	<nɿ>	[nɿ]	<i>her</i>
9	<nɿnɿ>	[nɿnɿ]	<i>their</i>

2.2.4 Dual strategies

So far, this discussion of the second parameter has identified as possible targets the tones themselves, the grammar and the lexicon. However, it is legitimate to simultaneously target tone and grammar. Such dual strategies can be described as either essentially semiographic whilst being anchored in the phonology, or essentially phonographic whilst paying tribute to the grammar. For example, Karaboro (Gur, Burkina Faso; SIL 2009) adds a hyphen to plurals that have no segmental marker to distinguish them from their singular counterparts (examples 10 - 17). Since these consistently end in L tone, the hyphen can be taught as either representing meaning or sound in this particular context:

10	<dye>	[d'è]	<i>year</i>	11	<d'ε->	[d'ê]	<i>years</i>
12	<kai>	[kāi]	<i>affair</i>	13	<kai->	[kâi]	<i>affairs</i>
14	<joo>	[g'òó]	<i>net</i>	15	<joo->	[g'òò]	<i>nets</i>
16	<saapye>	[sààp'è]	<i>rabbit</i>	17	<saapye->	[sàáp'è]	<i>rabbits</i>

Similar strategies can be found in Mayogo (Ubangi, Democratic Republic of Congo; Sawka 2001), Santa María Zacatepec Mixtec (Oto-Manguen, Mexico; Towne 2005: 6-7) and a proposal for Shilluk (Nilotic, Sudan; Gilley 2004: 11).

Other languages represent the grammar by one means and the lexicon by another. For example Budu (Bantu D.30, Democratic Republic of Congo; Bamata-Subama 1997: 8)

targets future and past tense semiographically by means of punctuation (examples 18 - 20):³

18	<wabenda>	[wàbɛ̀ɛ̀ndà]	<i>You hit</i>
19	<wa=benda>	[wàbɛ̀ɛ̀ndà]	<i>You will hit</i>
20	<wa:benda>	[wǎbɛ̀ɛ̀ndà]	<i>You have hit</i>

But Budu also targets H tone phonographically by means of accents on some tonal minimal pairs (examples 21 - 24):⁴

21	<táya>	[tǎjǎ]	<i>abstain</i>
22	<taya>	[tǎjǎ]	<i>pick up</i>
23	<takanaka>	[tǎkǎnǎkǎ]	<i>dream</i>
24	<tákánaka>	[tǎkǎnǎkǎ]	<i>beg</i>

Other languages target all the lexical items in one category. The representation is phonographic, because the accents signal tone, but it is also semiographic, because the accents draw attention to a specific lexical set. Scollon's Tanacross orthography (Athabaskan, Alaska; Paul 1980: cited in Holton 2003:8) marks level tones, but only on stems. Rangi (Bantu F.33, Tanzania; Stegen 2005: 3) marks lexical H tone, but only on nouns.

³ The IPA transcriptions of examples 18 - 20 are based on recordings of Josué Atikadé kindly supplied by Maryanne Augustin.

⁴ I am grateful to Loren Koehler for providing the phonetic transcriptions for examples 21 - 24. However, he points out that they are written from memory after several years of absence from fieldwork. An attempt to record the data proved unsuccessful.

2.3 Third parameter: Symbol

The foregoing discussion of the second parameter has inevitably made some passing references to the choice of symbol. The third parameter addresses this choice exclusively.

2.3.1 Phonographic representations

Symbol choices vary if the phonographic approach is chosen in the first parameter. Superscript numbers may be used (Bauernschmidt 1980: 17). This strategy is on the decline in Mexico (Barbara Hollenbach, p.c.) though San Juan Lealao Chinantec (Otomanguean, Mexico; Rupp & Rupp 1996: 5) still retains it, targeting four level tones by means of the numbers 1, 2, 3 and 4 respectively, where 1 is H and 4 is L (example 25):⁵

25	<Jay ³ aáy ⁴ bih ¹ dsa ³ ma ³ cueeyh ⁴ ñuúh ⁴ dxaah ¹ ni ³ hi ³ ja ³ na ³ fáyh ⁴ ma ³ jaah ³² á ⁴ .>
	[hãj- á:j- bi?ɿ dsa- ma- k ^w æ:j?- ñú: ?- dʒa: ?ɿ ni- ɿi- hã- na- fáy?- ma- ha: ?- ɿ- á-]
	<i>Because only a few people stayed on at the town hall, that is why I came back home.</i>

Similar strategies are found in the Wade-Giles Romanisation of Mandarin (Sino-Tibetan, China; Coulmas 2003: 106), Iau (Lakes Plain, Indonesia; Bateman manuscript) and Nambiquara (Nambiquaran, Brazil; Kroeker 1996).

⁵ The orthographic acute accent in example 25 represents a ballistic syllable, i.e. one that is slightly shorter and in which the pitch decays more rapidly than usual (Rupp 2009: 19). This convention has been retained in the phonetic transcription.

Another strategy that has been widely adopted in Mexico, for example in Xochapa Mixtec (Oto-Manguenan, Mexico; Stark et al. 2003), is the targeting of L tone with an underscore <_> (example 26):

26	<Ñíí sáta kóó káa xì` ṣinḍikí ṣana_j, ta kóó ka ṣe'e rí kákú.>
	[ni:hi sa.ta ka.ta si:hi si:ndi.ki sa.na] i] ta ko.lo ka se.ʔe.ri ka.lku]
	<i>My cow drank a potion of rattlesnake skin and can no longer give birth.</i>

In Naxi (Tibeto-Burman, China; He & Zhuyi 1985), tone is represented by means of silent consonant graphemes (examples 27 - 30):

27.	<lal>	[la]	<i>to strike</i>
28.	<la>	[la]	<i>tiger</i>
29.	<laq>	[la]	<i>hand</i>
30.	<laf>	[la]	<i>chilli peppers</i>

In fact, this practice is common in all Romanisations of Chinese languages since 1949 (Alexis Michaud, p.c.), and has also been adopted in some neighbouring countries, for example Hmong (Hmongic, Laos; Heimbach 1969).

In the case of contour tones, long vowels are sometimes written in order to avoid the need for complex diacritics. This is particularly appropriate in languages with a large tonal inventory, such as San Jerónimo Mazatec (Oto-Manguenan, Mexico; Baltazar et al. 2002) (examples 31 - 32):

31	<chjoo>	[tʃo:]	<i>egg</i>
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32	<jtsee>	[htse↓]]	guava
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Similar strategies are found in Takum Jukun (Jukunoid, Nigeria; Dykstra et al. 1965) and the Naga languages of India (Baker 1997: 125).

Ivory Coast has its own distinctive tradition when it comes to the third parameter. In many languages punctuation is placed in word initially and finally to signal tone. Each language chooses the symbols it needs from a common inventory, adapting them as necessary. They may be combined in word initial and word final positions to indicate contour tones. This system was first adopted in Dan Blowo (or Yacouba, Mande, Ivory Coast; Bolli 1978, 1991) (example 33):⁶

33	<'Ö -kwε do 'ka bhë, 'ö 'kεεdhe do =va 'gianzë -kë, 'ö =zuan' -ta -yö -kë =ne 'Daandhe -ko 'pian do 'dhö.>
	[ʎ kwe] do↓ ka↓ 6Λ↓ ʎ ke:↓dε]] do↓ va↓ gĩa↓zΛ]] kΛ] ʎ zũã-↓ ta↓ jʎ] kΛ] ne↓ dā:↓dε]] kɔ↓ pĩã↓ do↓ dʎ]]
	<i>One year he prepared a huge peanut field whose ends reached as far as the town limits of Danané.</i>

But the Ivorian strategy has only ever won acceptance locally. In other countries, superscript accents still remain the classic solution for marking tone

⁶ Tone is not written on the second syllables of disyllabic words. As for the word <=zuan'>, the apostrophe exceptionally indicates a M tone, because the system provides no easy way of representing a LM contour. This compromise is possible because LH contours are unattested. No learners ever noted this discrepancy (Margrit Bolli, p.c.).

phonographically. The discussion of the fourth, fifth and sixth parameters will include examples. In the meantime, the comparison of African and Asian practice in table 2 reiterates the importance of distinguishing between target and symbol with reference to diacritics:

Table 2: Same symbols, different targets

	<á	ā	à	â	ǎ>	
African languages:	H	M	L	HL	LH	(Wiesemann et al. 1988: 155)
Mandarin (Pinyin Romanisation):	H rising	H	H falling	-	falling-rising	(Coulmas 1996: 408)

2.3.2 Semiographic representations

A range of symbol choice also exists if the semiographic avenue is taken in the first parameter. In Budu, the colon <:> symbolises the past tense (example 20). But in Sabaot (Nilotic, Kenya; Kutsch Lojenga 1993: 14) the same symbol indicates the subject; in Kwaya (Bantu J.20, Tanzania; Schroeder 2008: 39), the distant past; and in a proposal for Shilluk (Nilotic, Sudan; Gilley 2004: 11), L tone plurals. This demonstrates again why separate parameters are necessary for target and symbol.

Other languages represent grammatical constructions by means of accents. In such cases some kind of phonographic correspondence is usually maintained, as in the Kako (Bantu A.90, Cameroon; Ernst 1996: 3) past negative (example 34) and future negative (example 35). However, there is no reason why the sound-symbol relationship between may not be purely arbitrary, as in the Kako prohibitive (example 36):

34	<A tì bēɲwɛ nyɛ na.>	[à tì bḗɲwḗ nyé nā]	<i>He didn't follow him.</i>
35	<A tí bēɲwɛ nyɛ na.>	[à tí bḗɲwḗ nyé nā]	<i>He won't follow him.</i>
36	<A tî bēɲwɛ nyɛ na!>	[à tí bḗɲwḗ nyé nā]	<i>He mustn't follow him!</i>

Similar strategies are found in Baoulé (Kwa, Côte d'Ivoire; Burmeister 1998: 4-5) and Oroko (Bantu A10, Cameroon; Friesen 2002: 94).

2.4 Fourth parameter: Position

The fourth parameter specifies precisely where the symbol occurs. In classic accentual marking, it is placed above the grapheme that is typically, though not always, a vowel (as in Bahinemo, example 2). But a proposal for Bemba (Bantu M.40, Zambia; Mann 1969: 105) places accents between syllables (examples 37 - 38):

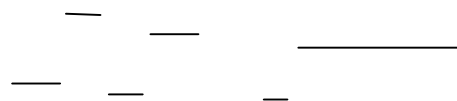
37	<baacilon' dolola>	[báácílóndòlòlà]	<i>They explained earlier today</i>
38	<baká' londolola>	[bákálòndòlòlà]	<i>They will explain</i>

In yet other languages, symbol position is best described in relation to the morpheme (as in Budu, examples 19-20), the word (as in Karaboro, examples 10 - 17), or even the sentence, as in Nawdm (Gur, Togo; ASDN 2004), where the inverted question mark helps the reader to navigate intonation patterns. The automatic downstep of the declarative is suspended in the interrogative until the fall on the final syllable

(examples 39 - 42):⁷

39 <Lag huraa bæɛɾ nnii hía fɔga.>

[làɣ húrà: bɛ́:r^á òní: ʔá fɔgá]

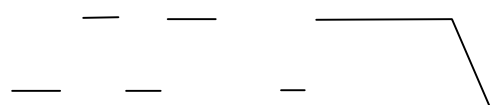


NEG chief daughter it-is PP3s wife

It is not the chief's daughter who is his wife.

40 <¿ Lag huraa bæɛɾ nnii hía fɔga ?>

[làɣ húrà: bɛ́:r^á òní: ʔá fɔgá]



NEG chief daughter it-is PP3s wife

Isn't it the chief's daughter who is his wife?

41 <Ĥá fɔga da nyab tɔgdaa.>

[ʔá fɔgá dá nàb^à tɔyɔdà:]

⁷ In the phonetic transcriptions of examples 39 - 42, the two phonemic tones, H and L, are represented with acute and grave accents respectively. The phonetic contours are reproduced underneath.

PP3s wife past left-PRF day-before-yesterday

His wife left the day before yesterday.

42 <¿ Hâ fôga da nyab tógdaa ? >

[ʔá fógá dá nàb^à tógódà:]

PP3s wife past left-PRF day-before-yesterday

Did his wife leave the day before yesterday?

2.5 Fifth parameter: Density

2.5.1 Introduction

The second parameter (the choice of target) has already referred to graphic economy. This principle, remember, recommends counting the relative frequency of the different tones and choosing to represent the least frequent. The fifth parameter also addresses the issue of quantity, but from another perspective: the choice of tone diacritic density. For example, given the choice of an acute accent to represent the H tone, how many H tones should be represented?

The aim here is not to enumerate the different strategies which lead to a particular level of density; they have been given thorough treatment elsewhere (Bird 1999a; Kutsch Lojenga 1993; Mfonyam 1990; Schroeder 2008; Wiesemann *et al.* 1988). The fifth parameter is only concerned with visual appearance. Tone diacritic density is

precisely quantifiable by calculating the number of tone diacritics in a natural text (100 words is ample) as a percentage of the number of tone bearing units (Bird 1999b: 89).

It could be argued that the parameter of density is qualitatively different from all the other parameters. Since it is merely a statistic, it does not obviously involve a choice on the part of the orthographer. But this point of view belies field realities. Very often orthography stakeholders in the community already have a general idea of the level of density they are aiming at before any linguistic research even begins. In such contexts, the choice of density will drive choices in the other parameters; it is not merely a statistical consequence of them.

The fifth parameter requires a graduated response on a continuum from zero, through partial, to exhaustive density.

2.5.2 Zero density

The orthography of Kafe (Trans New Guinea, Papua New Guinea; Ford 2005) has a tone diacritic density of 0%, which leaves a few minimal pairs dependent on context alone for disambiguation (examples 43 - 45):⁸

⁸ I have transcribed Kafe tones as: low [à], high [ā] and extra-high [á].

43	<ko'>	[kōʔ]	<i>rain</i>	[kōʔ]	<i>surrounding</i>
44	<avi> ⁹	[əví]	<i>urine</i>	[əvī]	<i>seed</i>
45	<avu>	[əvū]	<i>joint</i>	[əvù]	<i>eye</i>

When tone diacritic density is zero, the first two parameters are blank. The first parameter chooses neither the phonographic nor the semiographic route. The second parameter targets neither the phonology nor the grammar. However, the third parameter is still operative, because an *absence* of symbols is still a conscious choice, whatever the sociolinguistic reasons (for the Ghanaian experience, see Cahill 2001). It is even a choice, albeit a passive one, in languages where zero density is the default practice as long as no tone analysis has yet been conducted.

2.5.3 Partial density

Other orthographies choose partial density. Following the phonographic route, Foodo (Kwa, Benin; Zakari & Plunkett 1998) places an acute accent on the first syllable of the word if it is H, but leaves the rest of the word unmarked. This results in a tone diacritic density of 34% (example 46):

⁹ In the paper cited, the orthographic symbol <ä> indicates the schwa [ə]. But the current orthography does not include the diaeresis (Richard Mattocks, p.c.).

46	<Asiibi á nyínda yè ñkem tom ó tíita m̄-kúli la bá naa dísad̄.>
	[àsííbì ányíndá yè ñkém 'tóń ó tíítâ mò kúli là bá nàà díśádì]
	<i>Asiibi decided that everyday she would follow her husband to the field.</i>

But it is important to note that just because two languages make a second parameter choice to target H tone, it does not mean that the density in the fifth parameter will necessarily be similar, because of the number of tones that are excluded. Narak (Trans-New Guinea, Papua New Guinea; Hainsworth 1992: 4) and Tem (Gur, Togo; Craene & Tchagbra 1996) both employ an acute accent to mark H tone. But Narak reports four contrastive tones, so tone diacritic density is extremely low at 9% (example 47):

47	<Ere anggle-ang Jisas ambiyka, gám domoy-kañ emb jiyka, onggimba enem lemoy.>
	[ɛ̄Jrɛ̄J̄ aJ̄ᵑḡJ̄ɛ̄J̄taŋ̄J̄ J̄ᵑḏ̄z̄iJ̄s̄ās̄J̄ aJ̄ᵐbiJ̄kaJ̄ ᵑgam̄J̄ J̄ᵑd̄ɔ̄J̄m̄ɔ̄iJ̄J̄kaŋ̄J̄J̄ ɛ̄ᵐp̄ᵃJ̄ J̄ᵑḏ̄ziJ̄kaJ̄ ɔ̄J̄ᵑgiJ̄ᵐbaJ̄ ɛ̄J̄nɛ̄m̄J̄J̄ J̄ɛ̄J̄m̄ɔ̄iJ̄J̄]
	<i>Jesus touched her hand and the fever left her, and she got up and began to wait on them.</i>

Tem, on the other hand, has only two contrastive tones, so tone diacritic density is much higher at 42% (example 48):

48	<Yeésu weedekiná inóóni nge waawáa ikoró idò yi kíđjím.>
	[jèésù wèèdèkìná ^h inóónì ñgè wààwáá ikòró ídò jì kíđjím] ¹⁰
	<i>Jesus touched her hand and the fever left her, and she got up and began to wait on them.</i>

As for the semiographic route, it inevitably coincides with partial density, since targets only local ambiguities, as Ngangam (examples 3 - 7) and Jur Modo (examples 8 - 9) demonstrate. The same is true of dual targeting strategies, as in Karaboro (examples 10 - 17) and Budu (examples 18 - 24).¹¹

Lastly, since diacritics are often used for purposes other than marking tone, it is important to distinguish between tone diacritic density and diacritic density in general. Paicî (Oceanic, New Caledonia; CTRDP c. 1980) tone diacritic density is 0%. But it still has an overall diacritic density of 43%, because diacritics are used to mark vowel quality (examples 49 - 52):

49	<puu>	[pú:]	<i>sleep</i>	[pū:]	<i>earth</i>
50	<caa>	[cá:]	<i>land</i>	[cā:]	<i>father</i>
51	<tòo>	[tób:]	<i>tie</i>	[tō:]	<i>burn</i>
52	<tùu>	[tî:]	<i>push towards</i>	[tī:]	<i>prick</i>

¹⁰ I would like to thank Aboubakari Sama for the IPA transcription. The non-automatic downstep [˩] is my own interpretation of the data he provided.

¹¹ It would be misleading to cite tone diacritic density percentages for these languages, because the examples cited only focus on one aspect of the way the orthography deals with tonal issues and do not mention others.

2.5.4 Exhaustive density

Some orthographies represent tone exhaustively, that is to say every tone bearing unit carries a symbol for tone, so tone diacritic density is 100%. The fifth parameter is blind with the regard to the third parameter. It applies whether the symbols are accents (Gbaya, Nilo-Saharan, Sudan; Roberts 2009: 143), numbers (as in San Juan Lealao Chinantec, example 25), letters (as in Naxi, examples 27 - 30) or punctuation.¹²

2.6 Sixth parameter: Depth

2.6.1 Introduction

Of all the parameters, the choice of orthographic depth is the most challenging to grapple with. A first reading of the literature reveals apparently conflicting views amongst prominent researchers. Some argue for a surface representation (Mfonyam 1989: 346, 534; Wiesemann et al. 1988: 157): “*Surface tones should be marked rather than underlying tones.*” Others are persuaded that a phonemic representation is optimal (Koffi 2006: 12): “*Only phonemic tones should be marked because phonetic tones are too elusive.*”

How one reconciles views as apparently divergent as this partly depends on one’s definitions of the terms “surface ~ underlying” and “phonetic ~ phonemic”, because structuralists and generativists use them in different ways. So the two citations above

¹² I have no data for exhaustive tone diacritic density in orthographies that use punctuation to mark tone. The canonical Ivory Coast inventory leaves one tone unmarked.

are not necessarily as opposed to one another as they might first seem. To move beyond these difficulties, we will explore the sixth parameter in its two dimensions: the profile of the orthography on the one hand, and the profile of the tone system on the other.

Regarding the profile of the orthography, the English terms *shallow* and *deep* (Sampson 1985) broadly correspond to *transparent* and *opaque* in the French literature (Jaffré 2003a). But occasionally a researcher writing in English uses the French terminology and vice versa. Koffi (2006) and Schaefer (1992) use “transparent ~ opaque” in English, while Catach (1989: 267) employs “de surface ~ profond” in French.

Definitions remain somewhat imprecise in the literature. Briefly, “shallow” usually refers simply to one extreme on a continuum whereas “transparent”, at least as Jaffré employs it, is more precise. It refers specifically to an orthography that obeys the Phonemic Principle, that is a one-to-one correspondence between grapheme and phoneme.¹³ This does not prevent Jaffré sometimes referring to orthographies as being “more” or “less” transparent (Fayol & Jaffré 2008: 32), but the term itself has an unequivocal meaning.

At the same time as early researchers were describing the phonemic principle for the first time (Matthews 1913; Sweet 1900) others were applying it on the field, for

¹³ Elsewhere, writing in English, Jaffré uses the terms “consistent” (Jaffré & Fayol 2005) and “regular” (Jaffré 2003b).

example in Tswana (Bantu S.30, Botswana; Jones & Platje 1916). An early authority (IIALC 1930) also espouses it. The term was then propagated by the early structuralists (Swadesh 1934: 125). Since then, several generations of scholars have advocated the Phonemic Principle as the bedrock for an optimal orthography (Gudschinsky 1959: 68; Kutsch Lojenga 1993: 2; Pike 1947: 208-209; Wiesemann et al. 1988). Pike applied the same principle to tone languages in a book (1948) which has had a major influence on half a century of research on tone orthography.

At the opposite end of the spectrum is a deep orthography. This describes any representation that does not adhere to the Phonemic Principle (with the exception of a phonetic transcription which is anything but deep). A first reading of Bird (1999b) and Holton (2003) might suggest that they view the sixth parameter solely through the lens of the fifth: a tone orthography with zero density is deep, and one with exhaustive density is shallow. However, discussions with both authors clarified that neither of them equate depth with mere density. Consider a language with many H tones and few L tones. Choosing to mark all H tones will lead to high tone diacritic density, while marking all L tones will lead to low tone diacritic density. Yet the orthography is shallow in both cases, since every tone is indicated (one by the presence and the other by the absence of a diacritic).

Moreover, tone diacritic density is not the only factor which interacts with the deep ~ shallow continuum. If it were, there would be no need to set up separate parameters for density and depth. No, the term “deep” goes beyond mere diacritic density to cover a range of other possibilities. Following Catach (1988), if an orthography highlights the morphology, it is a morphographic representation. If it highlights the

morphology whilst remaining anchored in the phonology, it is a morphonographic representation. And if the symbol represents meaning rather than sound, it is a logographic representation. All these are deep, because they move beyond the Phonemic Principle. So a zero density tone orthography is by definition deep, but not all deep orthographies are necessarily zero density.

Now let us turn to the profile of the tone system. In some languages, such as Kunama (Nilo-saharan, Eritrea; Yip 2002: 140), the melody of a word in context is identical to that of the same word in isolation. In other languages, for example Digo (Bantu E.40, Kenya; Yip 2002: 133-137), the melody of the word varies depending on the context. These morphotonological phenomena are analogous to the morphophonological processes at the segmental level.

Again, the terminology describing this distinction is not yet entirely stable (Jaffré 2001). Yip describes the two tone systems just cited as “immobile” and “mobile”. Mfonyam (1989: 368) describes languages with morphotonological processes as “dynamic”. Bennett (1998: 2) prefers the term “multi-levelled tone system.”

But it is Bird (1999a: 19) who manages to shed new light on the issue. He borrows the same binary terminology “shallow ~ deep” used to describe the orthography profile, and invests them with new meaning to designate the profile of the tone system (cf. Liberman et al. 1980). Deep tone systems are ones that have morphotonological processes; shallow tone systems are ones that do not. Bird contends that the depth of the orthography should match the depth of the tone system it represents: a shallow orthography for a shallow tone system and, more importantly, a deep orthography for

a deep tone system. This approach has already won supporters from Pakistan (Losey 2002: 204-206) to Alaska (Holton 2003) not to mention its influence on orthography theory (Koffi 2006; Sebba 2007: 20-23; Seifart 2006: 292). It has the advantage of keeping one binary terminology for the profiles of both the orthography and the tone system.

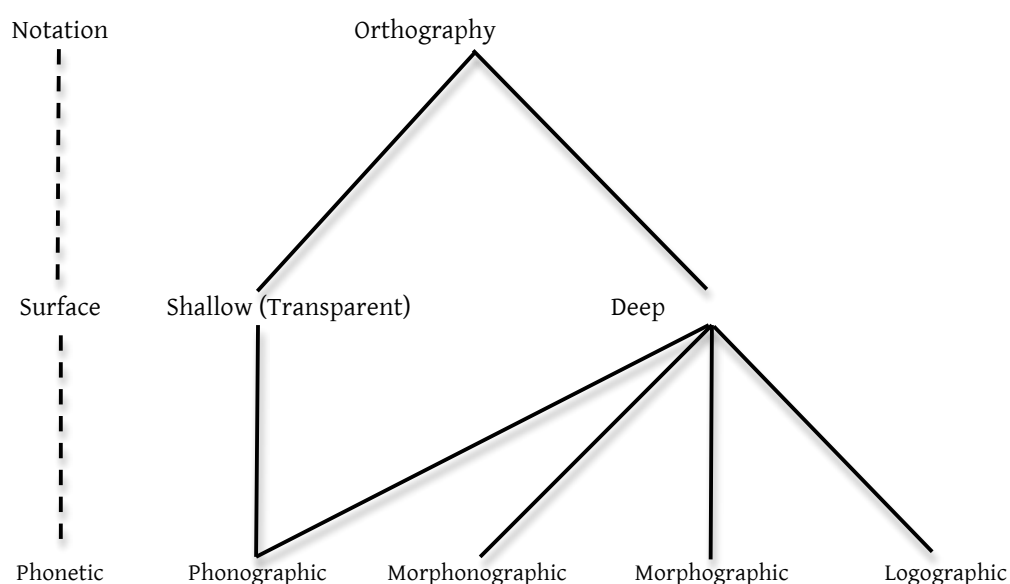
But here, it is important to acknowledge that in some tone orthographies, what many call “shallow” is actually shallower than a one-to-one grapheme phoneme correspondence. Such representations are by no means “transparent”, in Jaffré’s meaning of the term, because they do not obey the Phonemic Principle. Rather, they represent the fine phonetic details of the tone system. Such orthographies, rather than being described as shallow (which we have seen is an imprecise term anyway) would better be described as *surface* representations. Such a representation exceeds the bounds of what can reasonably be called an orthography (Koffi 1994: 58). It is simply a notation, like the International Phonetic Alphabet. I include it in this discussion, not because it is a viable option, but simply because it exists in practice, whether we like it or not.

At this point we are faced with a terminological dilemma. It seems wise to maintain the term “deep”, because of Bird’s insight in linking deep tone systems and deep orthographies. And of course, “shallow” is the logical counterpart to this term. But in the ensuing discussion, we must not lose sight of the fact that the particular level of shallowness that concerns us is a transparent representation, that is, a one to one correspondence between grapheme and phoneme.

To summarise, then, we recognise three levels of written representation: a deep orthography (which may be phonographic, morphonographic, morphographic or logographic); a shallow orthography (which is phonographic and in this paper refers to transparency); and a surface notation (which is merely a phonetic transcription).

Figure 1 summarises these relationships:

Figure 1: The relationship between representations of different depths

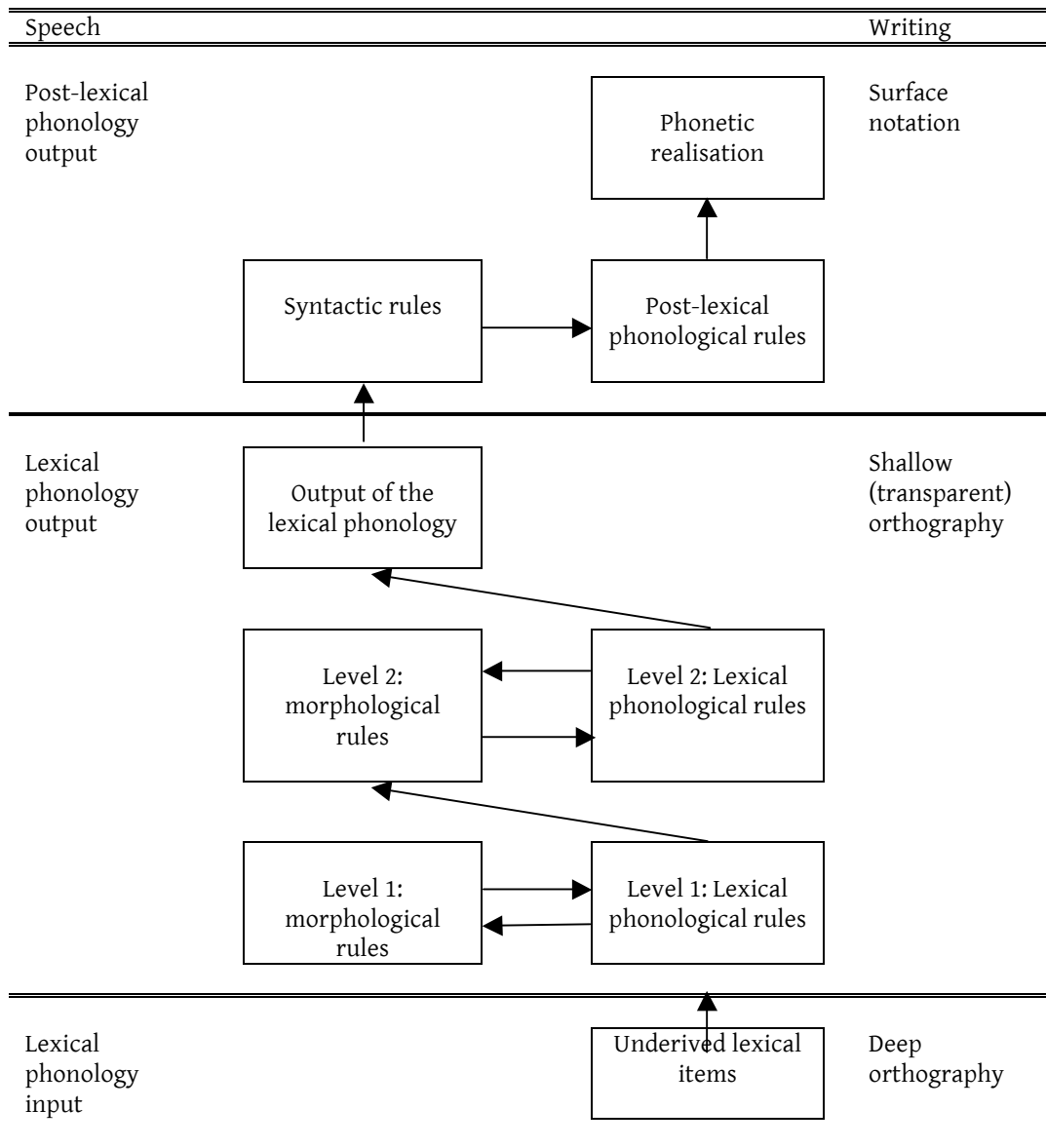


These three levels correspond, taking a brief detour into the land of pure phonology, to the various lexical and syntactic levels as proposed in Kiparsky's (1982) theory of lexical phonology. This theory is no longer widely accepted in its original form, nevertheless certain important insights have remained, and it is these that are pertinent to our discussion.

Lexical phonology is a model of derivation by phonological strata. The different layers correspond to the various stages of formation of an utterance starting from the underived roots. Each layer contains a set of rules. Figure 2 inverts the classic diagram

since, given the need to incorporate in it terms from the Linguistics of Writing, it is metaphorically appealing for “surface” to appear at the top and “deep” at the bottom.

Figure 2: The relationship between phonology and lexical level of representation orthography



Firstly, the phonologically underived radicals are the input of the lexical phonology and correspond to a (phonographic) deep orthography.

Secondly, certain lexical level word formation rules apply towards the beginning of the phonological derivation. They apply cyclically, triggering a process back and forth between morphology and phonology. These are the kind of rules for which there may be lexical exceptions. Native speakers are sometimes aware of these processes. The output of the lexical phonology corresponds to a shallow, transparent orthography.

Thirdly, the post-lexical rules apply at the syntactic level, towards the end of the phonological derivation. They apply once only but wherever they can. They are generally below the awareness threshold of the native speaker (Snider 1999: 14). The output of the post-lexical stage of the phonological derivation corresponds with a surface notation. I will illustrate these three stages with an extended example from Kabiye (Gur, Togo).

From the outset, I should make it clear that I personally favour a meaning-based approach for dealing with the tonal ambiguities in the Kabiye orthography (Roberts 2008a: 244-410). But to test this, I developed a sound-based orthography that marked tone with diacritics (*ibid.*: 411-441) so that the two approaches could be pitched against one another in a formal statistical experiment (*ibid.*: 487-543). Even though this experiment ultimately rejected the sound-based diacritic tone orthography for Kabiye, it will still be instructive to describe the process by which the choice of depth for that orthography was made.

The Kabiye tone system is deep according to Bird's terminology. Tones in context undergo numerous morphotonological processes. This suggests, according to Bird, that it needs a deep orthography. But before reaching that conclusion too hastily, we

will examine the three options: surface, deep and shallow (transparent) representations.

2.6.2 Surface representation

A surface representation of the Kabiye tone system would represent the output of the post-lexical phonology. At first glance, this strategy appears to be advantageous. To write tones as we hear them seems to be intuitively desirable. Teachers would raise learner awareness of the language's melodies, and then make the link between these and their graphic representation. It seems pragmatic too. Deep orthographies require a thorough analysis of the tone system. Yet autosegmental analyses of tone languages (Goldsmith 1976), describing morphotonological processes in all their complexity, are still few and far between. They require specialised training not mastered by the vast majority of linguists (Bird 2001: 21). This lack is not, of course, a reason in itself to adopt a surface representation. But faced with the challenge of developing orthographies for hundreds of as yet unwritten languages, researchers would do well not to lose sight of the limitations of the real world, however unwelcome they may be.

However, a surface representation of Kabiye immediately stumbles into two theoretical problems. First, how should non-automatic downstep (the lowering of tonal register triggered by a floating L tone) be symbolised? Example 53 shows the result if an apostrophe symbolises non-automatic downstep in a surface representation:

Surface Kabiye tone orthography (hypothetical)

53 <Esó 'tíyá tév se kí'ló Píćáká 'wáyí 'né kípası ko-dóǰ 'sótı.>

[ɛsó ˈtíy-á té-ò sè kí-ˈló píćá-ká ˈwáyí ˈné kí-bàs-ı kò-dó-ǰ ˈsót-ò]

God₁ sent-BP rain-3 CNJ SP3s/3-chase_AOR scorpion-5 behind and SP3s/3-diminish-AOR PP3s/3-force-4 venom-9

God sent the rain to chase after the Scorpion and diminish the force of his venom.

Granted, this representation has the advantage of being extremely faithful to the realisation. Someone with no knowledge of Kabiye can pronounce it once familiar with the code. But orthographies are not created primarily for the foreigner. Even if this system is accurate to every last detail, it is far from desirable. A sentence of eleven words and 23 tone bearing units requires five apostrophes, while it is already overloaded by 16 acute accents. Tone diacritic density is 93%.

Moreover, in most cases, non-automatic downstep is perfectly predictable (Lévikaza 1999: 192), given the post-lexical rule stipulating that the underlying melody /HLH/ always surfaces as [H[˩]HH], as examples 54 - 56 demonstrate:

Surface Kabiye tone orthography (hypothetical)

54	<sétı>	[sétò]	<i>thanks</i>
55	<féyí>	[féyí]	<i>there is not</i>
56	<sé'tó féyí>	[sé [˩] tò véyí]	<i>don't mention it!</i>

Since post-lexical phenomena are below the awareness threshold of the mother-tongue speaker, their graphic representation is superfluous. Non-automatic downstep is the real Achilles heel of a surface representation.

Secondly, a surface representation undermines the principle of the fixed word image (Nida 1963), that is that each orthographic word should remain invariable whatever the context. In a surface representation of Kabiye, a single word will have numerous graphic forms depending on the context. In the end, a surface representation is simply a notation. It does not even merit the name ‘orthography’.

2.6.3 Deep representation

At the other end of the spectrum is a deep orthography that represents the underlying forms, the input of the lexical phonology. Numerous researchers advocate this strategy (Dyken & Kutsch Lojenga 1993: 15; Schroeder 2008: 38; Thalmann 1987). From Bird’s perspective, too, a deep tone orthography is the ideal match for a deep tone system.

In a deep orthography, instead of mechanically marking the surface forms generated by non-automatic downstep, the underlying melody /HLH/ which is its source would be written (example 57; cf. example 53):

Deep Kabiye tone orthography (hypothetical)

57 <Èsó tɪyá tɛ̀v se kílo Píçáká wayí ne kípasɪ ko-ɖóŋ sótɔ.>

[Èsó ˈtɪyá tɛ̀v sè kíˈló píçáká ˈwáyí ˈné kíbàsɪ kòɖóŋ ˈsótò]

God sent the rain to chase after the Scorpion and diminish the force of his venom.

The advantage of this strategy is immediately obvious. There are far fewer accents, and the visual identity of the orthographic word is retained. Tone diacritic density is reduced to 48%, half of what a surface representation requires.

As for the apostrophe, it is reserved for the lowering of tonal register immediately before just two grammatical particles, one being the conditional particle [ʼyó] (example 58):

Deep Kabiye tone orthography (hypothetical)

58 <[ʼyáki kpaŋnú lóyúú tó 'yó, sì ñítu kúm.>

[jí-yá-kì kpàŋ)ń-ó lóy-úú tó ʼyó, sì jí-ʼtó kó-mì]

SP2s/CND-buy-IMP horse-3 stomach-3 owner CND know_IPF hay-9 harvest-INF

If you buy a greedy horse, know how to harvest hay.

However, another consideration militates against a deep representation: the phenomenon of L tone spreading. In both the verb phrase and the associative noun phrase, the L tone of a prefix spreads across the root until it is blocked by a singly linked H (Roberts 2004). This process takes place in the lexical stage of the phonological derivation. In a deep tone orthography, the visual form in both the verb phrase and the associative noun phrase is excessively far from the pronunciation (example 59):

Deep Kabiye tone orthography (hypothetical)

59 <Makiye tewélésíná ε-wííyú.>

[màkiyè tè-wèlès-í-nà è-wííy-ú]

PN NEG-listen-AOR-with PP3s/1-teacher-1

Makiye did not listen to his teacher.

It would be a tall order indeed to expect a volunteer literacy teacher to explain this transformation to her class. In any case, different researchers have postulated different underlying lexical tones (Lébiakaza 1999: 215-231; Roberts 2002: 32-42). Which

researcher should the editors of the literacy primer follow? For these reasons, I reject the choice of a deep representation.

2.6.4 Shallow (transparent) representation

So we arrive at a stalemate. At one extreme, a surface representation is not optimal because it leads to graphic density and a loss of fixed word images. At the other, a deep representation is not desirable either, because it leads to graphic forms that are excessively far from the pronunciation.

There remains a third possibility that is a compromise between the two. It is possible to represent an intermediate stage of the derivation, that is, the output of the lexical phonology: a shallow, transparent orthography. In such a representation, any phenomena having their source in the post-lexical stage of the derivation are deemed too superficial to merit being incorporated into the orthography. But any phenomena in the lexical derivation are included. Such a representation maintains a one-to-one correspondence between symbol and sound. It represents each successive tone without becoming overwhelmed by a plethora of superfluous phonetic details.

Applying this strategy to Kabiye, the melody [H[↓]HH] is not represented because it is a surface phenomenon that occurs wherever the context triggers it. Instead, the underlying form /HLH/ is written (example 60; cf. examples 53 and 57):

Shallow, transparent Kabiye tone orthography (hypothetical)

60 <Esó tíyá tév se kílo Píćáká wayí ne kípasi ko-dóŋ sótú.>

[ɛsò ˈtíyá tɛ̀v sɛ̀ kɪˈlɔ̀ píćáká ˈwáyí ˈné kɪbàsɪ kòdóŋ ˈsótù]

God sent the rain to chase after the Scorpion and diminish the force of his venom.

Non-automatic downstep is occasionally written, but only in the case of two particles to which it is underlyingly associated at the lexical level (example 61; cf. example 58):

Shallow, transparent Kabiye tone orthography (hypothetical)

61 <ŋyákɪ kpaŋnó lóyúú tó ʔyó, sɪ ñítv kóm.>

[ŋíyákɪ kpaŋnó lóyúú tó ʔyó, sɪ níˈtɔ̀ kóm]

If you buy a greedy horse, know how to harvest hay.

As for L tone spreading, it is included in the orthography because it is a lexical process that is an integral part of the concatenations of the verb phrase and the associative noun phrase (example 62; cf. example 59):

Shallow, transparent Kabiye tone orthography (hypothetical)

62 <Makiye tewelesína ε-wilyú>

[màkìyè tɛ̀wɛ̀lɛ̀sínà ɛ̀wìlìyó]

Makiye did not listen to his teacher.

If the decision makers in the Kabiye community felt it imperative that a sound-based diacritic tone orthography should be adopted, on balance it is this compromise between two extremes on the sixth parameter that appears to be the optimal choice. It does not follow Bird's advice to the letter, but it is based on his principle that "the depth of the tone system sets a limit to the depth of the tone orthography" (1999a: 25). The Kabiye tone system is deep; but the optimal diacritic tone orthography is shallow.

However, the particular shallow representation in question is a transparent one and this, remember, is already deeper than a surface notation. It is in this sense that the depth of the proposed orthography matches the depth of the tone system. The hypothesis that the output of the lexical phonology is the optimal choice for the sixth parameter has never undergone formal testing in literacy classes. Such an experiment would be a welcome addition to the literature.

3 Conclusion

Table 3 summarises the different choices made within each of the six parameters:

Table 3: A tone orthography typology - summary

Parameter	Choice
1. Domain	Phonographic (sound-based) Semiographic (meaning-based)
2. Target	Tones: H, M, L, contour tones, non-automatic downstep... Grammar: number, gender, tense, aspect, mood... Lexicon: tonal minimal pairs, lexical sets...
3. Symbol	Accents, punctuation, underscoring, silent letters, double letters, numbers...
4. Position	Superscript, subscript, to left, to right... of grapheme, morpheme, word, sentence...
5. Density	Zero – partial – exhaustive
6. Depth	Surface notation (post-lexical phonology output); Shallow, transparent orthography (lexical phonology output); Deep orthography (lexical phonology input).

This permits a concise and precise typology for any tone orthography. For example:¹⁴

- The Karaboro (Gur, Burkina Faso) tone orthography as reported by SIL (2009) is both semiographic and phonographic, targeting L tone plural nouns by means of a hyphen <-> placed word finally. Tone diacritic density is partial and it is a deep representation (examples 10 - 17).
- The Budu (Bantu D.30, Democratic Republic of Congo) verb phrase tone orthography as described by Bamata-Subama (1997: 8) is semiographic, targeting future and past tense by means of punctuation in word medial position. Tone diacritic density is partial and it is a deep representation (examples 18 - 20).
- The San Juan Lealao Chinantec (Oto-Manguean, Mexico) tone orthography as reported by Rupp & Rupp (1996) is phonographic, targeting four level tones by means of the numbers 1, 2, 3 and 4 respectively where 1 is H and 4 is L, in superscript position to the right of the syllable. Tone diacritic density is 100% and it is a surface representation (example 25).
- The Foodo (Kwa, Benin) tone orthography as reported by Zakari & Plunkett (1998) is phonographic, targeting H tone by means of an acute accent placed on the first syllable of the word if that syllable is H. Tone diacritic density is 34% and it is a deep representation (example 46).

¹⁴ It would be misleading to include tone diacritic density percentages in the Karaboro and Budu summary statements, because the examples cited only focus on one aspect of the way the orthography deals with tonal issues and do not mention others.

- The hypothetical Kabiye (Gur, Togo) tone orthography described in this paper is phonographic, targeting H tone with an acute accent placed over the tone bearing unit, and non-automatic downstep with an apostrophe placed before two grammatical particles. Tone diacritic density is 48% and it is a shallow, transparent representation (examples 60 - 62).

In conclusion, I should draw attention to some limitations in the model presented. The most obvious is that the article only cites orthographies based on Roman script. However, in principle there is no reason why the same typology, with further refinement, should not be applied to non-Roman scripts. I have also scrupulously avoided any assessment of the different strategies listed. The only exception is my discussion of orthographic depth, which would be void of meaning without some kind of appraisal of the different levels.

Finally, if the theoretical model presented here is to be of any use to fieldworkers, it must be situated within a wider model of orthography as social practice (Sebba 2007), elevating the issues of decision-making, use and success to their rightful and paramount place.

This article has not concerned itself with the role of the decision makers. Some of the reported tone orthographies are the product of a field linguist who may, for whatever reason, be making unilateral decisions. Is it valid to list these alongside other orthographies that are built on community choices in which all stakeholders have actively participated? They are two radically different approaches, and the second should always be the norm. This article does not distinguish between them.

The level of community participation in decision-making will almost certainly have a direct impact on use. If a language community has never embraced the tone orthography in question, is it valid to list it alongside others that are widely used? I believe it is, so long we realise that the mere listing of it in an academic article does not bequeath it any additional prestige or authority.

Similarly, I have avoided references to the success or failure of any particular tone orthography. There is a dearth of research in this area (Roberts 2008b). But the pressing need for more widespread, systematic evaluation has been temporarily overridden, in this article, by a more fundamental need to develop an adequate typological framework. This done, we will be equipped to address the wider sociolinguistic concerns of decision-making, use and success with greater confidence.¹⁵

¹⁵ I would like to thank Bernard Caron, Philip Davison, Philip King, Constance Kutsch Lojenga and Jacques Nicole for reading a draft version of this article. I have revised several sections in the light of their helpful comments. The section on orthographic depth benefitted enormously from discussions with Jean-Pierre Jaffré and Keith Snider. I am also grateful to numerous colleagues for their help in compiling information about tone orthography practice in Alaska (Gary Holton), Benin (John Berthelette, Joshua Ham, Gray Plunkett), Brazil (David Eberhard, Alan Vogel), Burkina Faso (Lukas Neukom, Madlen Wichser), Cameroon (Stephen Anderson, Philip Davison, Richard Gravina, Mathaus Njeck) Chad (Mary Pearce), China (Alexis Michaud), Democratic Republic of Congo (Maryanne Augustin, Karen Van Otterloo, Loren Koehler, Oliver Rundell), Ethiopia (Andreas Joswig), Ghana (Michael Cahill), Indonesia (Janet Bateman), Ivory Coast (Eddie Arthur, Margaret Bolli, Jonathan Burmeister, Philip Saunders), Liberia (James Laesch), Mali (Thomas Blecke), Mexico (Cindy Williams, Barbara Hollenbach, James Rupp, Sharon Stark, Douglas Towne), Mozambique (John Iseminger, Heidrun Kroeger), New Caledonia (Ian Flaws), Nigeria (Robert Koops, Matthew Harley), Papua New Guinea (Wayne Dye, Lisa Gilliland, Joan Hainsworth, Philip King, Richard Mattocks, Ian Tupper), Sudan (Leoma Gilley, Russell Norton), Tanzania, Uganda (Helen Eaton, Oliver Stegen), Togo (Jacques Nicole, Ntouamé Pakdembé, Jean Reimer, Aboubakari Sama, Andrew Weathers), Vietnam (Dick Watson) and Zambia (Gérard Phillipson). This article is based on a chapter in the author's unpublished PhD thesis, which is in French (Roberts 2008a: 40-62).

Abbreviations

AOR	Aorist
BP	Bound perfective
CND	Conditional
CNJ	Conjunction
H	High tone
INF	Infinitive
IPF	Imperative
L	Low Tone
M	Mid tone
NEG	Negative
PN	Proper Noun
PP	Possessive pronoun
PP	Possessive pronoun
PRF	Perfective
SP	Subject pronoun
TAM	Tense, Aspect, Mood
3s/1	Third person, class one (and likewise for the other persons and classes)

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