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THE TONE PUZZLE OF WOBE

Thomas Bearth and Christa Link

This paper presents evidence for 14 contrasting tones, including rising and falling glides, which occur on short monosyllables in Wobe, a Kru language of Western Ivory Coast. Possible interpretations of the glides are tested in the light of their distributional, realizational, and morphotonemic characteristics. It is shown that only their treatment as unitary tonemes, rather than as sequences of level tones, allows one to account for all the facts in a satisfactory way. Moreover the morphotonemic patterns, concurrently with differences in the realization of tonemes, reveal the existence of a concave feature which plays a pivotal role in the functioning of the system. A comparison with neighbouring Guere provides a plausible hypothesis as to how some of the peculiarities of the Wobe tone system may have originated through tone splitting.

O. Introduction

While the tendency in Kru languages to rely heavily upon pitch for lexical and grammatical distinctions is well known, Wobe is notable among these for its particularly rich range of tonal distinctions.\(^1\) The prevalent syllable structure of open class morphemes in Wobe is: \(C_1(C_2)V_1(V_2)(V_3)\). Be-

\(^1\)The basis for this study is the Tao dialect spoken in the Kouibly area (Western Ivory Coast). The data was collected on the field between 1972 and 1977. We would like to thank our principal informants, Zondet Paul (32), Guei Bozon Paul (31), and Gninhi Denis (27). The results of a previous study, begun in 1963 by Mrs. V. Hadorn, of the Protestant Mission in the town of Man, and Ilse and Thomas Bearth, and based mainly on the speech of the Facobly area, were available to us and constituted a useful point of departure for the present study. For other aspects of Wobe phonology see Hofer and Bearth [1975] and Link [1975]. The present study is a revised and expanded version of an article in French by the same authors entitled "Les tons du wobé - une étude fonctionnelle", to appear in Annales de l'Université d'Abidjan, Série H, vol 11, 1978. We want to thank Miss Lynne Fiore for producing the English translation on which the present article is based;
fore pause, monosyllabic items of type C(C)V have the possibility of 14 different tone patterns, bisyllabic morphemes of type C(C)V₁V₂ twenty-four, and trisyllabic morphemes of type C(C)V₁V₂V₃ twelve. We will tentatively take the vowel as the unit of tone placement. Of the 14 tones possible on CV syllables, four are level tones (but cf. 3.3 and 3.6), five are rising, four falling and one rising-falling. The question arises immediately as to whether the glides are unitary contour tones or whether they are to be interpreted as sequences of more than one level tone. It is the latter solution which is generally preferred in the description of the tonal systems of most West African languages [Meeussen 1970:266]. At first glance, the tones of Wobe seem to conform quite well to this interpretation. It is true that the ending and beginning points of the glides, with the exception of the final point of the falling tones, correspond more or less to one of the four level tones, this being one of the main criteria in favor of assigning tonal contours to sequences of level tones, with a non-significant glide forming the transition between the beginning and ending levels [Pike 1948:12, Martinet 1967:87]. Nevertheless, in what follows, it will be necessary to bring into question the merits of this hypothesis insofar as Wobe is concerned.

We will begin by studying three aspects of Wobe tones: their phonological identity (section 1), their distribution in sequences on the morpheme level (section 2), and their realization (section 3).² Next we will present

²These three aspects correspond to the three "modes" which according to Pike [1967:84 ff.] are necessary for the definition of any linguistic unit: the feature mode, the distribution mode, and the manifestation mode. The study of morphotonology—which in our opinion is indispensable to an understanding of the functioning of the system and consequently the units of which it is composed—can be subsumed under the study of the distribution mode if we look at it from the viewpoint of the organization of linguistic units in "fields" according to their mutual relationships.
instances of morphotonological alternation which throw light on the nature
and function of the tonal system (section 4). Section 5 will be devoted to
observations on the distributional particularities which characterize the
relationship between tones and consonants in Wobe and neighbouring Guere
and which will permit the sketching of a hypothesis concerning the origin
of the numerous tonal distinctions in Wobe. The main facts discussed in
the body of the article are documented by a series of mingograms which are
reproduced in the Appendix.\textsuperscript{3}

1. Tone on C(C)V Morphemes

1.1. Evidence for contrasting tones on short monosyllabic morphemes. We
will give first of all a list of monosyllables which demonstrate the con­
trasts between the 14 tones on C(C)V morphemes (pp. 150-151). The numbers in
the boxes of Table 1 (p. 152), refer to the numbered examples of the list
and will permit the reader to locate the morphemes which demonstrate the
contrast between any pair of tones. We have used the numbers 1 to 5 to
show the pitches of the level tones and the beginning and ending points of
the gliding tones:

\begin{itemize}
  \item [very high] 1  \quad \text{rising tones: } 31, 32, 41, 42, 43
  \item [high] 2  \quad \text{falling tones: } 15, 25, 35, 45
  \item [mid] 3  \quad \text{rising-falling tone: } 435
  \item [low] 4
  \item [extra-low] 5  \quad \text{occurs only in the combinations listed above}
\end{itemize}

\textsuperscript{3}Mingograms Nos. 3, 7, 12, 21-29, 35-40 and 43-45, spoken by Zondet Paul
(Z, 32 years old), Nos. 1-2, 4-6, 8-9 and 11, spoken by Gninhi Denis (G, 27)
and Nos. 14-20, 30 and 50 spoken by Guei Bozon Paul (B, 31) were recorded
in the phonetics laboratory of the Institut de Linguistique Appliquée (Univer­
sity of Abidjan). We would like to thank Robert Steck who supervised and
processed the recordings and Henri-Claude Grégoire for advice given us in
interpreting the readings. Mingograms Nos. 13, 31-34, 41-42 and 46-49 spo­
ken by Guei Bozon Paul (B) are extracted from an earlier series of recordings
made in the phonetics laboratory of the Institute of Linguistics, Jos, Nig­
eria, in 1975 by Norris McKinney, of the Summer Institute of Linguistics, to
whom we also express our thanks here.
<table>
<thead>
<tr>
<th>No.</th>
<th>Tone</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>p₁ˡ</td>
<td>'bundle, pile'</td>
<td>'hypothetical particle'</td>
</tr>
<tr>
<td>2</td>
<td>pᵢ₄⁵</td>
<td>'fence'</td>
<td>'mother'</td>
</tr>
<tr>
<td>3</td>
<td>pᵢ¹</td>
<td>'calabash'</td>
<td>'orange'</td>
</tr>
<tr>
<td>4</td>
<td>pᵢ³</td>
<td>'a measure, half'</td>
<td>'eyes'</td>
</tr>
<tr>
<td>5</td>
<td>pᵢ¹</td>
<td>'cocoon'</td>
<td>'gazelle'</td>
</tr>
<tr>
<td>6</td>
<td>(a⁴)pᵢ¹</td>
<td>'(we-completive) sew'</td>
<td>'monkey' (species)</td>
</tr>
<tr>
<td>7</td>
<td>pᵢ²</td>
<td>'to carve (intr.)'</td>
<td>'marriage'</td>
</tr>
<tr>
<td>8</td>
<td>pᵢ³</td>
<td>'to carve'</td>
<td>'military rank'</td>
</tr>
<tr>
<td>9</td>
<td>pᵢ²</td>
<td>'to enter (intr.)'</td>
<td>'neck'</td>
</tr>
<tr>
<td>10</td>
<td>pᵢ¹</td>
<td>'group of workers'</td>
<td>'lizard' (species)</td>
</tr>
<tr>
<td>11</td>
<td>pᵢ³</td>
<td>'sock'</td>
<td>'field'</td>
</tr>
<tr>
<td>12</td>
<td>pᵢ⁵</td>
<td>'Dyula'</td>
<td>'monkey' (species)</td>
</tr>
<tr>
<td>13</td>
<td>pᵢ⁴</td>
<td>'to look for'</td>
<td>'poison' (species)</td>
</tr>
<tr>
<td>14</td>
<td>pᵢ²</td>
<td>'to look (intr.)'</td>
<td>'embers'</td>
</tr>
<tr>
<td>15</td>
<td>bᵢ³</td>
<td>'pig'</td>
<td>'mosquito'</td>
</tr>
<tr>
<td>16</td>
<td>bᵢ³</td>
<td>'quail'</td>
<td>'barb of an arrow'</td>
</tr>
<tr>
<td>17</td>
<td>bᵢ³</td>
<td>'wall'</td>
<td>'rust'</td>
</tr>
<tr>
<td>18</td>
<td>tᵢ³</td>
<td>'trees'</td>
<td>'reason'</td>
</tr>
<tr>
<td>19</td>
<td>tᵢ⁴</td>
<td>'buffalo'</td>
<td>'frog' (species)</td>
</tr>
<tr>
<td>20</td>
<td>tᵢ³</td>
<td>'affair'</td>
<td>'snail'</td>
</tr>
<tr>
<td>21</td>
<td>tᵢ⁴</td>
<td>'palm nut'</td>
<td>'little end'</td>
</tr>
<tr>
<td>22</td>
<td>tᵢ²</td>
<td>'shame'</td>
<td>'law'</td>
</tr>
<tr>
<td>23</td>
<td>tᵢ³</td>
<td>'glue'</td>
<td>'beak'</td>
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<td>24</td>
<td>tᵢ⁴</td>
<td>'spider web'</td>
<td>'inheritance'</td>
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<tr>
<td>25</td>
<td>tᵢ⁴</td>
<td>'lightning'</td>
<td>'giraffe'</td>
</tr>
<tr>
<td>26</td>
<td>tᵢ¹</td>
<td>'caterpiller'</td>
<td>'crab'</td>
</tr>
<tr>
<td>27</td>
<td>tᵢ⁴</td>
<td>'hammer'</td>
<td>'here is...'</td>
</tr>
<tr>
<td>28</td>
<td>tᵢ³</td>
<td>'truth'</td>
<td>'bundle'</td>
</tr>
<tr>
<td>29</td>
<td>tᵢ³</td>
<td>'saliva'</td>
<td>'thus'</td>
</tr>
<tr>
<td>30</td>
<td>tᵢ³</td>
<td>'medicine' (species)</td>
<td>'rice'</td>
</tr>
<tr>
<td>31</td>
<td>dᵢ¹</td>
<td>'duiker' (species)</td>
<td>'mourning'</td>
</tr>
<tr>
<td>32</td>
<td>dᵢ²</td>
<td>'behind'</td>
<td>'duiker' (species)</td>
</tr>
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<tr>
<td>---</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>65</td>
<td>kwɛ⁴²</td>
<td>'finish (intr.)'</td>
<td>97</td>
</tr>
<tr>
<td>66</td>
<td>kwɛ⁴</td>
<td>'chimpanzee'</td>
<td>98</td>
</tr>
<tr>
<td>67</td>
<td>kwɛ³¹</td>
<td>'fishhook'</td>
<td>99</td>
</tr>
<tr>
<td>68</td>
<td>kwɛ⁴³</td>
<td>'red palm nut'</td>
<td>100</td>
</tr>
<tr>
<td>69</td>
<td>kwla¹</td>
<td>'tortoise'</td>
<td>101</td>
</tr>
<tr>
<td>70</td>
<td>kwla²</td>
<td>'bush'</td>
<td>102</td>
</tr>
<tr>
<td>71</td>
<td>kwla⁴²</td>
<td>'to vomit (intr.)'</td>
<td>103</td>
</tr>
<tr>
<td>72</td>
<td>kwla⁴³</td>
<td>'to vomit'</td>
<td>104</td>
</tr>
<tr>
<td>73</td>
<td>kwla²⁵</td>
<td>'wooden recepticle'</td>
<td>105</td>
</tr>
<tr>
<td>74</td>
<td>kwla³⁵</td>
<td>'fetish' (species)</td>
<td>106</td>
</tr>
<tr>
<td>75</td>
<td>kwla⁴¹</td>
<td>'cluster of fruit'</td>
<td>107</td>
</tr>
<tr>
<td>76</td>
<td>kwa³</td>
<td>'hand'</td>
<td>108</td>
</tr>
<tr>
<td>77</td>
<td>kwä³⁵</td>
<td>'husband'</td>
<td>109</td>
</tr>
<tr>
<td>78</td>
<td>kwo⁴</td>
<td>'trace'</td>
<td>110</td>
</tr>
<tr>
<td>79</td>
<td>kwo⁴¹</td>
<td>'bulging forehead'</td>
<td>111</td>
</tr>
<tr>
<td>80</td>
<td>kwo³³</td>
<td>'feast'</td>
<td>112</td>
</tr>
<tr>
<td>81</td>
<td>kpo¹</td>
<td>'awale (game)'</td>
<td>113</td>
</tr>
<tr>
<td>82</td>
<td>kpo³</td>
<td>'hump'</td>
<td>114</td>
</tr>
<tr>
<td>83</td>
<td>kpo³¹</td>
<td>'hoe'</td>
<td>115</td>
</tr>
<tr>
<td>84</td>
<td>kpa¹</td>
<td>'banana cake'</td>
<td>116</td>
</tr>
<tr>
<td>85</td>
<td>kpa²</td>
<td>'bone'</td>
<td>117</td>
</tr>
<tr>
<td>86</td>
<td>kpa³</td>
<td>'ladder made of Indian bamboo'</td>
<td>118</td>
</tr>
<tr>
<td>87</td>
<td>gbe⁴³</td>
<td>'dog'</td>
<td>119</td>
</tr>
<tr>
<td>88</td>
<td>gba⁴</td>
<td>'fork, battle'</td>
<td>120</td>
</tr>
<tr>
<td>89</td>
<td>gbä⁴³</td>
<td>'food taboo'</td>
<td>121</td>
</tr>
<tr>
<td>90</td>
<td>fä²</td>
<td>'hat'</td>
<td>122</td>
</tr>
<tr>
<td>91</td>
<td>fä³</td>
<td>'head decoration'</td>
<td>123</td>
</tr>
<tr>
<td>92</td>
<td>fɔ²</td>
<td>'slice'</td>
<td>124</td>
</tr>
<tr>
<td>93</td>
<td>fɔ⁴³</td>
<td>'goitre'</td>
<td>125</td>
</tr>
<tr>
<td>94</td>
<td>fɔ⁴²</td>
<td>'to wrestle (intr.)'</td>
<td>126</td>
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<tr>
<td>95</td>
<td>s₁¹</td>
<td>'yam'</td>
<td>127</td>
</tr>
<tr>
<td>96</td>
<td>s₁⁴²</td>
<td>'to pass (intr.)'</td>
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</tbody>
</table>
Table 1: Pairwise contrasting sets for all tones

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>31</th>
<th>32</th>
<th>41</th>
<th>42</th>
<th>43</th>
<th>15</th>
<th>25</th>
<th>35</th>
<th>45</th>
<th>435</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>*</td>
<td>93:94</td>
<td>71:72</td>
<td>65:35</td>
<td>65:100</td>
<td>71:74</td>
<td>7:12</td>
<td>7:11</td>
<td>14:11</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>43</td>
<td>*</td>
<td>89:35</td>
<td>72:73</td>
<td>72:74</td>
<td>102:103</td>
<td>89:11</td>
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<td></td>
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<tr>
<td>15</td>
<td>*</td>
<td>35:100</td>
<td>35:38</td>
<td>35:120</td>
<td>35:11</td>
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<td></td>
</tr>
<tr>
<td>25</td>
<td>*</td>
<td>73:74</td>
<td>56:57</td>
<td>73:11</td>
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<td>47:44</td>
<td>77:11</td>
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<tr>
<td>435</td>
<td>*</td>
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</tbody>
</table>
1.2. **Short vs. long glides.** All the glides listed in section 1.1 are shown on short monosyllabic items of the type C(C)V, i.e. they occur on a simple short vowel. The following list of minimal (or near minimal) pairs shows some of the glides occurring on both short and long items. The numbers in parentheses refer back to the list given under 1.1. In the notation, the juxtaposition of two numbers denotes a glide occurring on a single vowel. The separation of the numbers by a hyphen indicates a sequence of tones spread out over two or three vowels.

```
<table>
<thead>
<tr>
<th>Glide</th>
<th>Meaning</th>
<th>Glide</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>p031</td>
<td>'small hole'</td>
<td>p03-1</td>
<td>'hangar'</td>
</tr>
<tr>
<td>pa41</td>
<td>'cocoon' (5)</td>
<td>paa4-1</td>
<td>'manioc'</td>
</tr>
<tr>
<td>s031</td>
<td>'hen' (108)</td>
<td>s03-2</td>
<td>'price'</td>
</tr>
<tr>
<td>jre35</td>
<td>'monkey' (species) (38)</td>
<td>jree3-35</td>
<td>'beans'</td>
</tr>
<tr>
<td>pâ435</td>
<td>'sock' (ll)</td>
<td>pââ43-35</td>
<td>'gift'</td>
</tr>
</tbody>
</table>
```

For curiosity's sake it is worth mentioning that in the dialect of Siably the following minimal contrasts, based on tone and length alone, were found: s031 'pestle' (Tao: s01), s02 'hepatitis' (s02), s03 'arm' (s03), s03 'snail', s04 'under', s031 'hen' (s031), s041 'stem of clump of palm nuts', s042 'to get up (intr.)', s043 'day', s045 'year', s051-1 'charcoal' (s01-1), s052-2 'two', s053-2 'price', s054-4 'worry', s054-45 'quick'. In Tao, a number of these have different vowels (shown in parentheses); on the other hand Tao has s0542-2 'to be rotten' (Siably: s0â43-2).

1.3. **The problem of interpreting the glides.** Now that the identity of the 14 tones has been established on C(C)V syllables, we may resume the question of interpretation with more precision. It is necessary to decide whether the tones identified as rising, that is 31, 32, 41, 42, and 43, and falling, that is 15, 25, 35, and 45, should be considered as sequences of level tones distributed over one vowel, or as unitary contour tones. The latter solution would imply that one recognize the phonological status of the glide as such.

Let us note first that an analysis of falling tones in terms of two successive tones would oblige us to postulate another level of tone which
would be lower than the low tone, at least for tone 45. We will deal in
subsequent sections mainly with the question of the interpretation of the
rising glides as we examine the function of the tones in different contexts
and under the influence of various conditioning factors.

2. Tone on CVV and CVVV Morphemes

2.1. General restrictions bearing on the occurrence of tones in relation
to syllable structure. All of the co-occurrence possibilities for the tones
identified in section 1 will be presented below. First of all, let us men­
tion two general distributional restrictions:

- the occurrence of falling tones is limited to the final vowel of
  the morpheme;
- rising tones occur only on the initial vowel, with the exception of
  the sequence 2-32, where the rising glide is on the final vowel.

The complete range of the 14 tones occurs therefore only on prepausal C(C)V
syllables, where the vowel is at the same time morpheme initial (but see
2.3.3 below) and final.

No significant difference has been observed in the tonal behaviour of
CV... and CCV... morphemes. Hence, for the rest of this paper, statements
about CV... items will be considered to be also applicable to CCV... items
and vice-versa.

2.2. Tone sequences on CVV and CVVV morphemes. The distribution of tones
on CVV morphemes is governed by the following rules:

1. A level tone on $V_1$ may be followed by a level tone of the same pitch
on $V_2$:

1-1 --- $\text{pâi}^5$ 'large black jää 'weaver bird'

ant'

---

4The first column in each section illustrates tone patterns on sequences
of identical vowels, the other columns show the same patterns mostly on het­
erogeneous vowel sequences. For a discussion of the interpretation of the
sequences 1-1, 2-1, 4-2 and 42-2, see 2.3 below.

5A strictly phonemic transcription of the nasal consonants would take
into account the fact that the nasals $[m, n, r, \eta_m]$ are variants of the
voiced stops /b, d, ʃ, ɡ/ in nasal environments (cf. Link [1975:206]). $\text{pâi}$,
The Tone Puzzle of Wobe

2-2 poo 'mud'  sao 'mane'  kao 'short dry season'
3-3 poo 'ladle'  doc 'elephant'
4-4 kwëe 'trumpet'  sao 'draw soup'  kao 'palm tree'

2. A level tone on $V_1$ may be followed by a level tone of a higher pitch on $V_2$:

2-1 kwëe 'species'  nēē 'story'  bai 'shirt'
of bird

3-1 poo 'open shed'  nēē 'poverty'  too 'basket'
3-2 koo 'leopard'  dao 'smoke'  too 'weasel'
4-1 paa 'manioc'  kuo 'stomach'  gbao 'local bed'
4-2 --- (plee\(^3-3\))  kao 'hard mat (intended for sale)'
4-3 --- gbau 'suitcase'

3. A level tone on $V_1$ may be followed on $V_2$ by a falling tone beginning at the same pitch as that of $V$. However, no examples of the sequence 2-25 have been found:

1-15 --- jrie 'eye'  duo 'take'
3-35 smTT 'wild yam'  jae 'cooking pot'  tāū 'boat (species)'
4-45 too 'mortar'  kao 'consequence
of transgression'

4. A rising tone beginning with tone 4 (low tone) on $V_1$ may be followed on $V_2$ by a level or falling tone which begins at the ending point of the rising tone. Again, tone 25 has not been found in this context.

4-1  kwëe 'canoe'  gbēë 'compound'
4-2  koo 'sparrow hawk'  kao 'hard mat'
4-3  poo 'owl'  kuo 'stem, plant'
4-1-15 --- gboc 'okra'
4-3-35 too 'winged termites'  gbao 'partridge'

---

[For example, would therefore be /'jaɪ/ in phonemic transcription. However, to facilitate the reading we have chosen to use the usual symbols to represent nasal realizations. For the same reason, we have represented the medial variants of /d/ [Link 1975] by using the symbols 'r' and 'l'.]
In addition, the sequence 43-1 occurs:

43-1 kea 'old man'

The sequence 43-2 occurs on verbs, but it is morphologically complex:

43-2 too
too 'he denied' (43 is the inherent tone of too 'to deny', tone 2 is the mark of limited transitivity)

5. All non-low level tones, as well as the rising tones, with the exception of 42 (cf. 2.3.2 below), may be followed by 35; low tones may be followed by 45. Note that the rising tones which begin at pitch 3 (31 and 32) may be followed only by tone 35 (rule 5 overlaps partially with rule 3):

1-35 kwɛɛ 'peanuts' kao 'spring' poo 'bat'
2-35 sraa 'sacrifice' dao 'limb' blao 'termite hill'
3-35 smTT 'wild yam' blao 'leaf (species)'
31-35 soo 'horse' sēɛ 'flech' deo 'red ant'
32-35 paa 'granary' flae 'large tunic'
41-35 too 'rapidly' kēü 'goblet'
43-35 smTT 'fish' kea 'God' pāa 'gift'
4-45 soo 'edible gbau 'flexible wood of caterpillar' a trap'

6. Tone 2 may be followed by the rising tone 32:

1-2-32 'voyage' pnaa 'girl' dii 'sweet'

7. On CVVV morphemes, all level tones as well as the rising tones with a low beginning point occur followed by level tones which are in turn normally followed by tone 35 (or 45 after low tone):

1-1-35 wouɛ 'tree (species)'
2-2-35 dooɛ 'heart'
3-3-35 kooɛ 'cough'
3-1-35 sōa 'nettle (species)' kaoa 'file'
3-2-35 sēa 'fright'
41-1-35 puua 'towel' kuua 'rainy season'
43-3-35 gbauo 'bush' cuue 'cat'
4-1-35 soae 'cartridge' mōa 'little black ant'
4-4-45 sooɛ 'bottle' plie 'cow's tail'
8. The sequence 4-1 may be followed by 15:
   4-1-15 klaae 'tomorrow'

9. In addition we have encountered sequences of low level tones and of low tone followed by tone 3.
   4-4-4 toao 'machete' piie 'hurricane'
   4-3-3 gbauo 'insect that bites'

2.3. **Problems of interpretation.** A number of the tones and tone patterns presented above call for additional comment and interpretation.

2.3.1. Tone 435 has not been found on CV syllables except in the word pã 'sock' (cf. 1.1, #11), which is consistently perceived as short. Its analysis as CV is further confirmed by its contrast with pã43-35 'gift', which is of the form CVV (cf. 1.2 above).

2.3.2. Tone 42 occurs on CV syllables only in the case of verbs, where it is morphologically complex (cf. 1.1, nos. 7, 14, 65, 71, 96). One would be inclined to treat it as a sequence. In addition, it is frequent on the first syllable of bisyllabic nouns, where it occurs exclusively in the combination 42-2. This could not be interpreted as the phonetic realization of 4-2, because this latter sequence alternates with 42-2 in a grammatically significant way:

   kao42-2 'hard mat'
   p'ee3 kao4-2 'hard mat designated for sale'
   sell hard-mat

One might consider interpreting 42 before 2 as a realization of 43 or of 41, tones which are clearly evidenced elsewhere. But both of these tones may be followed by tone 2 in the intransitive form of certain verbs, and are therefore in contrast with 42 in this position:

   faa41-2 'to amuse oneself'
   too43-2 'to deny (intr.)'

---

6Pike [1948:8] insists on the importance of this criterion in the interpretation of glides either as unitary contour tonemes or as sequences of two level tonemes: "The unitary contour glides cannot be interrupted by morpheme boundaries as can the nonphonemic compounded types of a register system." This criterion, valid in itself, should not, however, be applied out of context. Notably one must admit the possibility of portmanteau morphs realized by a single toneme.
41-2 and 43-2 are clearly different from 42-2 (Fig. 43 and 40). It is true that in both cases we are dealing, as for pa₄ʰ₂ (cf. 1.1, #7), with morphologically complex sequences, the final tone 2 being the mark of limited transitivity which is added to the inherent tone of the verb. Therefore one might attempt to save the interpretation of 42 as a variant of 41 or 43 before 2 by arguing that there is a morpheme boundary in 41 + 2 and 43 + 2 but not in 42-2. This would then explain the divergent realizations of the complex sequences. But such a hypothesis seems rather farfetched, especially since the combinations of tones and vowels observed on the verbs, with or without morphological complexity, remain in all other cases within the limits of the combinations occurring on simple lexemes. We therefore affirm the existence of a tone 42, which thus completes the series 31, 32, 41 and 43, but whose distribution is restricted. As for the sequence 4-2, it is always the result of a process of morphotonological substitution in the formation of compound nouns (cf. 4.1, 5).

2.3.3. Tone 15 has not been found on CV morphemes. It occurs, however, on the second syllable of one of the rare CVCV words (1.1, #35). We consider this environment to be analogous to a CV morpheme. Tone 15 is more frequently found in final position of CVV type words. Thus, one may contrast jri₁-₁₅ 'eye' with jri₂-₁ 'to steal + 3rd pers. sg. non-human object pronoun'. Tone 25, on the other hand, has only been found on monosyllables of the type CV. It is possible that these restrictions are due to the limitations of our corpus.

2.3.4. The distinction between the sequences 1-1 and 2-1 is based on an attempt to establish a balance between a number of rather heterogeneous observations:

1. One finds rising glides which begin at pitch level 2 (Fig. 2 mā₂ nē₂-₁ sō₂-₂ 'my two proverbs'). One also finds falling contours which end on pitch level 2 or slightly above (jæ₁-₂ 'weaver bird'). There does not exist, in isolation, a tone which remains phonetically at an even pitch above level 2.

2. The rising tone on CVV morphemes might correspond to tone 1 on CV, which is equally realized as a rising tone (cf. 3.3). It would therefore be interpreted as /1-1/, and its realization specified as [2-1].
3. The above interpretation, which harmonizes well with the phonetic data, runs into a distributional problem, however. Phonemic /2-1/ would then be the only gap in the inventory of rising sequences of level tones (cf. 2.2, rule 2); on the other hand, the tone falling towards level 2 must consequently be interpreted as /1-2/, in which case it would be the only falling sequence besides those having a final tone 35 (cf. 2.2, rule 5).

4. It seems preferable, therefore, in the interest of distributional symmetry, to interpret [2-1] as /2-1/ and [1-2] as /1-1/. This solution, first considered for purely structural reasons, was confirmed afterward from the phonetic point of view. Actually, the ending point of the sequences realized [1-2] in isolation was situated clearly above level 2 when the initial tone was lowered to level 4 under the effect of a morphotonological change; the tones of jae[1-2] and of gbao'1-1 were perceived as absolutely identical in:

\[
\text{kwlo}^{45} \text{jae}^{4-1} \text{s55}^2 \quad \text{'two village weaver-birds (village weaver-bird two)'}
\]
\[
\text{kwlo}^{45} \text{gboa}^{4-1} \text{s55}^2 \quad \text{'two village beds'}
\]

It seems reasonable then to suppose that the final underlying tone of the sequence realized [1-2] is in fact a tone of level 1.

2.3.5. The contrast between 2-1 and 1-1 seems to be neutralized in the case of verbs. Actually, the sequence consisting of a verb root at tone 1 followed by a suffix with an assimilating tone is realized [2-1] before a following tone 1, [1-1] before a following lower tone, [1-2] before a pause:

\[
\text{\textcircled{3}blue}^{1-1} (\ldots) \quad \text{'he dug...'}
\]
\[
\text{\textcircled{3}blue}^{2-1} \text{bie}^1 \quad \text{'he dug the hole}
\]
\[
\text{\textcircled{3}blue}^{1-1} \text{ta}^{43} \quad \text{'he dug here'}
\]
\[
\text{\textcircled{3}blue}^{1-2} \quad \text{'he dug it'}
\]

On the other hand, there is a distinct and invariable tone pattern /1+2/ which results from the combination of the inherent tone 1 of a verb root and the tonal suffix /2/, the mark of intransitivity:

\[
\text{\textcircled{3}blueu}^{1-2} \quad \text{'he dug'}
\]

The /1+2/ pattern also occurs as the result of the coalescence of an inherent tone pattern 1-35 followed by the mark of intransitivity, i.e.

1-35 + 2 + 1-2:
Therefore, without necessarily claiming to be exhaustive, we have observed on the conjugated form of the verb the following patterns which are not found on nouns: 42 on CV; 41-2, 43-2 (cf. 2.3.2) and 1-2 on CVV. All these patterns involve the mark of limited transitivity (or intransitivity, as the case may be). In addition, verbs never carry the sequences 31 nor 3-1 (for the inherent tones of verbs cf. 4.2).

2.4. A generalized statement of sequential constraints on tone: its implications for the nature of the tones. A comparison of the tones and sequences of tones which are found respectively on CV (1.1), CVV, and CVVV (2.2) words reveals that the predominant tone patterns are similar on all three types of words. The sequence 435, for instance, is found in analogous fashion on CV, CVV, and CVVV words. Whether it is realized 43-3-35 on CVVV, with a longer time on tone 3, seems to be mainly a detail of the realization. If there are restrictions—the whole range of combinations occurring on CVV is not found on CV nor on CVVV—there are, however, no contradictions the organizing principle which controls the patterns on CV, CVV, and CVVV seems to be the same everywhere.

This, of course, calls for a more general statement of the distribution of tones than we have been able to give in section 2.2. In looking for a generalization, we might then ask what assumptions about the nature of the tones must we make in order to account in the simplest possible way for the permitted combinations. Let us start with the hypothesis that a set of registers and a feature Falling (but no feature Rising) will be sufficient to capture the general characteristics of the permitted tone sequences. Under this premise, the following formula is a positive overall statement of the occurring sequences (except 2-32 which seems to be rather marginal). The integers 1-4 refer to the four registers which are also represented by the variables X and Y, while F stands for the falling feature.  

\[ \text{mae}^{1-35} \quad \text{to forget} \quad \text{mae}^{1-2} \quad \text{to forget (intr.)} \]

---

7One might try to also eliminate the feature Fall. The simplest way to achieve this would be to postulate an extra-low register 5. But this amounts to little more than renaming the feature. Any attempt to account for
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\[ M_1: X \ Y \begin{cases} \begin{cases} \Y \vspace{1em} \\ \Y \end{cases} \end{cases} \begin{cases} \begin{cases} \F \vspace{1em} \\ \F \end{cases} \end{cases} \]

Condition: \( X \geq Y \)

(Note that higher integers refer to lower tones and vice-versa.)

\( M \) stipulates that the tonal configuration on any CV, CVV or CVVV word may begin on any of the four registers (\( X \)), continue on the same level (\( Y = X \)) or on any of the levels higher than \( X (Y < X) \) and be optionally terminated by a fall starting either from \( Y \) or from level 3.

Further constraints are best expressed as restrictions affecting the mapping of the tone sequences on the segmental sequences:

1. On CV, if \( Y < X \) and if \( F \) is there, then \( Y + 3 \). In other words, the only rising-falling sequence permitted on CV is 435.

2. On CVVV, if no \( F \) occurs, then \( Y \geq 3 \). In other words, a tone sequence carrying only registers does not rise higher on CVVV than tone 3. A sequence containing higher tones obligatorily ends with a fall.

The following three constraints all have to do with level 2:

3. The sequence 2-1 (the only rising sequence beginning above level 3) only occurs on CVV and is never followed by a fall (see also 2.3.4 above). Note however that tone 1 tends to be phonetically realized on CV as a glide rising from level 2 (cf. 3.3).

4. The fall beginning at level 2 is limited to CV morphemes carrying initial tone 2, i.e. where \( X = Y = 2 \).

the falling glides by resorting only to the four registers runs into considerable difficulty. Since our main concern in this paper is with the rising glides we have not pursued this idea any further. It is interesting to note that there is no simple way of accounting for the sequential patterns by means of a segmental approach to tone. As it stands, the formula allows for a XY sequence to extend over one, two or three vowels. Similarly, a sequence of three tonal units XYF may extend over one, two or three vowels. Any attempt to express the same facts by maintaining a strict one-to-one correlation between tonal features and vowels results in loss of generalization, e.g. \( F \) would have to occur in each column of the formula since it may terminate CV, CVV, and CVVV items. Another observation of theoretical significance is that there is no satisfactory way of formulating the generalizations expressed in the formula by means of binary tonal features. This would seem to reinforce Stahlke's [1977] demonstration of the inadequacy of binary features for accounting for all the relevant facts of tonal systems.
5. A rising sequence 4-2 is never followed by a fall.

Although $M_1$ seems to capture in a straightforward generalization the essential distributional characteristics of Wobe tones, it is still not completely satisfactory. It does not take into account the fact that, without variation of the segmental structure, a glide from a given beginning point to a given end point may have more than one realization. This difference, which may be seen as one between the relative duration of pitches, is used for contrastive purposes in Wobe. It is true that minimal pairs between 41-1 and 41-1, 42-2 and 4-2, or 43-1 and 4-1 (cf. 2.2, 2 and 4) have not been found so far in lexical tone patterns. However, all of these different patterns exist and cannot synchronically be attributed to segmental conditionings. Furthermore, they constitute grammatically significant minimal contrasts if the context of compound nouns is taken into account:

\[
\text{kwee}^{41-1} \ '\text{canoe}' \quad \text{vs.} \quad \text{tu}^3 \ \text{kwee}^{4-1} \quad (\text{Fig. 37}) \ '\text{canoe made of one tree trunk}'
\]

It is thus not sufficient to say that a sequence $XY$, e.g. 41, 42, 43, can be mapped on CV, CVV, etc. In order to account for contrasts like the one between 41-1 and 41-1 within the proposed framework we must add to the formula the option of a sequence of three registers instead of two:

\[
M_1': \ X \ Y \ (Y) \left( \left[ \begin{array}{c} [Y] \\ [F] \end{array} \right] \right)
\]

The modified formula implies a significant difference between two sequences $XY$ and $XYY$. The mapping convention of the latter would have to specify that it occurs only on CVV or on the first two vowels of CVVV and that the first of two Y's is mapped onto the first vowel. Moreover, since there are no contrasting shapes of glides rising from tone 3, $X$ would have to be specified as 4 if both Y's occur.

Alternatively, it is possible to double the variable $X$ instead of $Y$, i.e.

\[
M_1'': \ X \ (X) \ Y \ \ldots
g\]

Specifications and mapping conventions being modified correspondingly, the option $XY$ would yield the configurations 41, 42, 43 on CV; 41-1 (interpreted as realization of 4-1), 42-2 (4-2), and 43-3 (4-3) on
CVV. By contrast, 4-1, 4-2 and 4-3 would correspond to the pattern XXY and be interpreted respectively as 44-1, 44-2, and 44-3. We shall briefly look again at these different solutions in the context of a broader perspective at the end of section 4.4.

Finally, if we elect to revise our framework by introducing a rising feature (R), the following formula can be proposed. It amounts to interpreting the difference between 4-1 and 41-1, etc. not in terms of different arrangements of the same kind of tones but rather in terms of substitution of unitary tones of different kinds:

\[ M_1''' : \left\{ \begin{array}{l} \{ X \} \\ \{ Y \} \end{array} \right\} \]

In this formula, R is specified as a rise with low beginning point. The end point of the rise is represented by Y. RY would yield 41, 42, and 43 on CV, 41-1, 42-2, and 43-3 on CVV. Glides rising from level 3 and sequences 4-1, etc. would be derived from XY as in \[ M_1' \]. We shall see in the following sections that the inclusion of a rising feature among the basic assumptions about the Wobe tone system receives strong support from a closer examination of the realization of the tones and above all of the morphotonology.

3. Realizations of the Tones

3.1. Range of realizations of the 14 postulated tones. Diagram 1 represents the 14 distinct tones found on CV syllables. We have situated them on a scale of five tonetic levels. Level five is significant only for the ending points of falling contour tones. At the right we have indicated (separately for each of the two principal informants, cf. fn. 3) the average frequencies recorded for each tone. The range of frequencies covered by the third informant is considerably higher (between 150 and 300 Hz). See Diagram 1 on the next page.
3.2. **Invariant level tones: tones 2 and 3.** The only tones with an invariable level realization are tones 2 and 3. Figures 47 and 48 illustrate this for tone 3 on CV syllables (se³se³ 'a long time ago'); Figure 46 for tone 3-3 on CVV (poo³-3 'ladle'). A tone 2 on a CV syllable is shown in Figure 49 (bo² 'there'—the slight rise at the beginning is due to the initial voiced consonant). The interval between the two levels is about 15 Hz for speaker B (Fig. 49: bo² = 115 Hz; ka³ = 100 Hz).

3.3. **The very high tone: tone 1.** The very high tone 1 is not, from a phonetic point of view, a level tone. Its realization is clearly rising, as exemplified by the realizations of sî¹ 'yam' in Fig. 31 (from 140 to 180 Hz) and in Fig. 32 (from 140 to above 200 Hz). Tone 1 is realized as a straight rise (Fig. 1: ma² ke¹ sôô²-2 'my two ends') or slightly convex (Fig. 32), the sequence interpreted as (2-1) (cf. 2.3.4) tends to be characterized by a uniform rise (cf. Fig. 2 ma² nêê²-1 sôô²-2 'my two proverbs').

An uninterrupted series of several tone 1's distributed over a sequence of words is realized as a slightly rising movement which increases towards the end of the series. The penultimate tone tends however to be realized level just before the very strong rise which characterizes the final tone 1, whether it precedes a lower tone or a pause. The following sentence illustrates this rising movement:

\[ ë¹ ñnë¹ jru² de² sî¹ kwên¹ \]  'I rested my head among the yams' (Fig. 3) (I-completive rest head prep. yams among)

Disregarding the initial rise which characterizes the onset of ë¹, the beginning point of the first series of tone 1's can be situated at 180 Hz.
There is only a very slight rise over the first two elements, whereas jru\textsuperscript{1} is marked as the final element of the series by a rise from 180 to 220 Hz. The tone 2 of the preposition de\textsuperscript{2} inserted between two series of tones 1 is at about the level of the beginning point of the preceding series of tone 1's; si\textsuperscript{1} 'yam' which bears a preterminal tone 1, barely rises 10 Hz in relation to de\textsuperscript{2} whereas kwlu\textsuperscript{1} 'among', in final position, attains the culminating point of 250 Hz.\textsuperscript{8}

The sequence 1-35 is illustrated in Figure 4 (b\textsuperscript{e}e\textsuperscript{1-35} 'red pepper'). The initial rising movement is too extended to be explained only by the presence of the consonant; it seems to belong to the rising realization of tone 1, this time at the beginning of a falling sequence. As with tone 1 it is reduced in non-initial position (Fig. 5: m\textsuperscript{a}2 b\textsuperscript{e}e\textsuperscript{1-3(5)} ka\textsuperscript{3} 'here is my red pepper').

3.4. The upper rising tones: 31, 32, and 41. For the rising tones 31, 32, and the corresponding sequences on CVV morphemes, refer to Figures 6 (m\textsuperscript{a}2 kpo\textsuperscript{31} s55\textsuperscript{2-2} 'my two hoes'), 8 (m\textsuperscript{a}2 k\textsuperscript{e}32 s55\textsuperscript{2-2} 'my two laws'), 9 (to\textsuperscript{32} 'intelligence'), 7 (too\textsuperscript{3-1} 'basket') and 10 (too\textsuperscript{3-2} 'weasel'). Note the concave movement with a more or less marked hold on the beginning which characterizes these glides with the exception, however, of 3-2 (Fig. 10) which rises straight from 140 Hz to 180 Hz (taking into account only the clearly audible part of the vowel).

Compare this movement with that of tone 3-1 (Fig. 7). It attains the height corresponding to the end of 3-2 after 25 csec and during the last 10 csec rises to above 250 Hz.

It will also be noted that the rising tone 41 is realized as a straight glide, without any initial hold on level 4 (Fig. 11: k\textsuperscript{e}41 'beak').

3.5. The falling tones. The falling tones 15, 25, 35, 45, and the rising-falling tone 435 are realized before pause with a drop which generally

\textsuperscript{8}The phenomenon of rising glides in successive steps has also been observed in Kru by Elimelech [1974] (cited in Fromkin [1976:56]). Nevertheless in this case it seems to be a question of the assimilation of the beginning pitch of any tone to the ending point of a preceding rising tone.
reaches a level lower than 4, as is evident in Fig. 4 (bɛɛ1-35 'red pepper'), 14 (sraa2-35 'sacrifice'), 12 (too41-35 'quickly'), 13 (sbe25 'paper'), 27-29 (nm135 'meat'), 33-34 (ko35 'rice'), 21 (kle45 'species of monkey'). It should be evident from the contrasts between level and falling tones shown in 1.1 that a falling tone in final position is not a phenomenon of intonation but a particular property of certain morphemes which distinguishes them from other morphemes which have a level realization in final position (for example Fig. 49: ka3 'here is...'; Fig. 46: ... pɔɔ3 'ladle').

In non-final position, the falling glide disappears, except for tone 25. Compare the realization of ko35 'rice' in Fig. 33 and 34 to that of ko3(5) in Fig. 49. Tone 45 is also realized as level in medial position but, as we will show below, in a different way than non-falling tone 4.

There is therefore neutralization, within the sentence, of the contrast between some of the falling tones and their corresponding non-falling tones (15/1, 35/3, 435/43). In the position of neutralization the "missing" falling glides (12, 32, 432, 42) do not exert any influence on the following tone.9

As to tone 25, its downglide is clearly realized in medial position but does not fall as low as in final position. Before pause, sbɛ25 'paper' shows a long glide (Fig. 13) extending over more than 40 Hz; in medial position there is only a short fall (Fig. 15: oo3-2 sbɛ25 sɔɔ2-2 'his two papers') which goes slightly below level 3. Nevertheless this short down-glide is still contrastive as can be seen by comparing Fig. 16 and 17 as well as 18 and 19. The pitch of kɛ25 'inheritance' (Fig. 16) drops slightly lower than the following ka3 'here is...', whereas kɛ2 'rust' (Fig. 17), remains stable before ka3. In Fig. 18, the slight fall (about 10 Hz) at the end of kwla2 'forest' is conditioned by the locus of the following /d/.

---

9This is in contrast to the widespread situation in African languages where loss of a low tone causes a lowering of tone on a following syllable, as in many languages where "downstepped" high can be accounted for in this way. For a case of an apocopated falling tone which, in a language without the phenomenon of downstep, has an effect on the following tone, cf. Flik [1977].
It can easily be seen, on the other hand, that the downglide is more pronounced on kwë25 'receptacle' (Fig. 19) and concomitant with the vowel itself. It covers a range of about 20 Hz and is then followed by an additional slight lowering conditioned by the voiced consonant.

One might argue that what has been presented as tone 25 could really be analyzed as a sequence 2-35. This would help explain the fact that, unlike the other falling tones, it maintains its falling realization in non-final position. However, 25 (on CV) and 2-35 (on CVV) both exist and are clearly distinct. This can be seen by comparing, for example, sbe25 'paper' and sraa2-35 'sacrifice'. The duration of sraa2-35 has been found to be 37 cs in final position (Fig. 14), that of sbe25 25 cs (Fig. 13). In medial position (Fig. 20: mā2 sraa2-3(5) 552-2 ) the downglide does not go beyond level 3; the duration is 28 cs, i.e. almost as long as 552-2 (30 cs). On the other hand, sbe25 in Fig. 15 is much shorter (23 cs) than the following 552-2 (34 cs).

3.6. The low tones: tones 45, 4, and 43. Diagram 2 below shows tones /45/, /4/ and /43/ as they are realized in sentence final position. It is these realizations which served as our basis for designating these tones as respectively low-falling, level low and rising low-mid.

\[
\begin{array}{c|c|c}
3 & 4 & 45 \\
\end{array}
\]

Diagram 2

Figures 21 (kle45 'species of monkey'), 22 (kle4 'species of lizard') and 23 (kle43 'field') permit the comparison of the realizations of these tones in final position. One will notice that the beginning point of tones 43 and 45 is in the range of 115-120 Hz; tone 4 is slightly lower, at about 110 Hz (speaker Z).

In medial position tone /45/ is realized as a level or slightly falling tone;\(^10\) Fig. 24 shows kle45 'species of monkey' realized with a quick fin-

\(^{10}\)Hombert [1977:185 ff.], discussing an analogous variation of the real-
al descent from 115 to below 100 Hz (Z) before ka³ 'here is...', realized at 130 Hz (cf. Fig. 21 for the realization of kle³ in final position). For an example of this realization on a long word, see Fig. 45 (plaa³-⁴⁵ 'lion').

Tone /4/ is illustrated in medial position by Fig. 25 (kle⁴ 'species of lizard'). (Cf. Fig. 22 for the realization of kle⁴ in final position.) Like kle³ in Fig. 24, it is situated at approximately 115 Hz, but towards the end shows a rise to the level of 130 Hz, which remains nevertheless 10 Hz below ka³. The difference between /4³/ and /4/, although it is not always easy to perceive, may also be observed in the sequences kle³ nm³⁵ 'monkey meat' and kle⁴ nm³⁵ 'lizard meat' in Fig. 27 and 28. It comes through in this case by the slight rise of kle⁴ just before nm³⁵, whereas kle³, from the same beginning point (115 to 120 Hz), shows a slight fall whose lowest point coincides with the beginning of nm³⁵. Figure 31 verifies the same phenomenon for speaker B: tē⁴ 'to try' rises from 80 to 105 Hz and therefore almost reaches level 3.

The choice of the sequence kle, dictated by the availability of minimally contrastive items fitting into the same contexts, for demonstrating the contrasts between tones 4³, 4, and 4⁵ may raise queries as to the interpretation of this sequence. Sequences of this kind are notoriously ambiguous and may be interpreted either as CVCV or as CCV. We need to stress, therefore, that in Wobe they are clearly of the latter type. Even a rapid glance at the examples of kle, e.g. in Fig. 21 and 22, shows that they are short compared to a typical long item such as s³³²²² illustrated in Fig. 20. On the other hand there is no noticeable vocalic transition between the consonants. This is confirmed by the oscillograms. By way of contrast, a short transition vowel between the initial consonants of dba can be easily recognized on the oscillograms of Fig. 21 and 22. We have not found a minimal pair involving the length difference for kle, but CCV and CCVV are clearly contrastive; a minimal contrast was given in sec-
The Tone Puzzle of Wobe

Even if the rising movement of tone /4/ is not always very strong it seems that this is the characteristic which permits one to distinguish it from /45/ in context. The rise of /4/ is realized very audibly, however, when the following tone begins at low level, as Figures 21 to 23 illustrate for dba⁴ 'to kill' before kle⁴⁵, kle⁴ and kle⁴³. The ending point of dba⁴ attains the frequency of from 130 to 140 Hz, with a beginning point situated at between 105 and 115 Hz (the latter being measured without taking into account the lowering conditioned by the locus of db...).

The realization of /4³/ is distinguished from that of /4/ principally by two factors:

1. The general level of the rise of /4³/ is higher than that of /4/. This difference may be easily observed in comparing the realizations of kle⁴³ 'field' and of kle⁴ 'lizard' in Fig. 25 and 26 (speaker Z). The tone of kle⁴³ (Fig. 26) rises from 120 to 140 Hz and attains the average pitch level represented by ka³, whereas kle⁴ (Fig. 25) rises from 110 to 130 Hz and remains below the average level of ka³. Likewise, for speaker B there is a difference of about 10-15 Hz between the beginning points of te⁴ 'to try' (Fig. 31: 80 Hz) and of te⁴³ 'to buy' (Fig. 32: 95 Hz).

2. The rise of /4/ marks essentially only the end of the total realization and is preceded by a long hold at low level. The rise of /4³/, on the other hand, is abrupt and ends with a long hold at mid level. This results in a concave melodic curve for /4/ and a convex curve for /4³/. This difference in the shapes of the curves may be observed in the examples cited above (Fig. 25 and 26, 31 and 32) where it is combined with a difference in height. On the other hand, Figures 33 (tē⁴³-3 'to buy') and 34 (tē⁴-3 'to try') do not show an appreciable difference of height at their beginning point (80 Hz). The final part of the 4³-3 glide is about 10 Hz above the end point of the 4-3 glide. On the other hand the concave nature of tē⁴⁻3 comes out very clearly compared to the convex nature of tē⁴³⁻³. The difference between Fig. 28 (kle⁴ nm₃⁵ 'lizard meat') and 29 (kle⁴³ nm₃⁵ 'field animal') may be summarized in the same terms, without reference to the heights, which hardly vary between the two realizations. Indeed it seems that the concave or convex shape of the melodic movement is the constant difference between the nonterminal realizations of /4/ and /4³/; it is moreover the

---

...tion 1.2 above. It is therefore not possible, at least in terms of a synchronic analysis, to explain the realizations of these tones as sequences of tones typical of bivocalic syllable patterns. For a further discussion of the status of medial consonants in Wobe, see Link [1975].
nuance which the trained ear arrives at perceiving most persistently. The difference of height, if there is one, contributes to the differentiation and perhaps at times compensates for it.

Diagram 3 below summarizes our observations concerning the realization of low tones in context and may be compared with Diagram 2 above:

\[
\begin{array}{c}
/45/ \\
/4/ \\
/43/
\end{array}
\]

Diagram 3

3.7. Rising patterns contrasting by shape. The difference between concave and convex realizations is found elsewhere in the system and seems to be a key for the differential perception of certain sequences of tones. Even a summary comparison of the curves realized by the sequences 4-1, 4-2 and 4-3 on the one hand, and 41-1, 42-2, and 43-3 on the other, permits one to ascertain this. Actually, the notions of convexity and concavity seem to be the most appropriate ones for accounting for the tonal difference between 

\textit{manioc} (Fig. 35), 

\textit{canoe} (Fig. 36), and 

\textit{canoe made of one tree trunk} (Fig. 37) as well as between 

\textit{stem, plant} (Fig. 38), and 

\textit{suitcase} (Fig. 39). (The initial lowering in this last case is due to the consonant /gb/.)

If one takes into account the complex tone pattern 43-32 which is encountered on verbs, one can distinguish three or four distinct sequences rising from 4 to 2 on CVV morphemes: (a) the convex realization 42-2 illustrated in Fig. 40 (k\textit{oo}42-2 'sparrow-hawk') and 41 (t\textit{ee}42-2 'to try + mark of limited transitivity + sing. non-human object pron. -\textit{e}') ; (b) the concave realization 4-2 which is heard as an alternate of the 42-2 pattern in compounds, in an analogous way to the 4-1 alternate of 41-1 illustrated in Fig. 37; (c) the rise 43-32 which is consistently distinguished from the 42-2 rise by a much shorter duration (30 cs in Fig. 42, against 45 cs of t\textit{ee}42-2 in Fig. 41) and by a higher beginning point (95 Hz, against 80 Hz in Fig. 42). It is possible that the level section at tone 3 between two successive rises of too43-32 is pertinent for the distinction between 43-32 (Fig. 42) on one hand and 43-2 (Fig. 43) on the other.
What is certain, however, is that there exists a distinct 43-1 sequence characterized by two successive rises between which there is a level section at tone 3 (Fig. 44). In kea\(^{43-1}\) 'old' the rise from 4 to 3 lasts 17 csec, the level passage lasts 10 csec, and the rise towards 1 lasts 10 csec. Compare this with Fig. 45, which shows the effect of the syntactic tone pattern on kea\(^{43-1}\) whose tone is then realized as a concave curve (4-1): the section at level 4 (at 120 Hz) is held for 20 csec, whereas the rise takes place in 15 csec, without an intermediary level section.

Although we have not been able to set up analogous distinctions for the rising tones which begin on tone 3 it seems that, taking into account their realization mentioned above, we should rank them with the concave curves, except for the sequence 3-2 (cf. 3.4).

We find therefore that the presence of a feature Concave distinguishes tone 4 (rising) from tone 43. It also distinguishes between other such sequences of tones which, though they have the same beginning and ending points, have contours of different shapes. One might wonder what place this feature should be given in the tonal system of Wobe. We will come back to this question at the end of the following section (see 4.4 and Table 3 below) after having considered some cases of morphotonological change.

4. Morphotonological Function of Tone

An examination of some morphological changes will permit us to further verify our hypotheses concerning the distinctive tonal units of Wobe, insofar as the mutual influence which the tones undergo in certain grammatical contexts might have a diagnostic value with regard to the identity and nature of the tonemes.\(^{12}\)

\(^{12}\)Walton [1976], discussing the so-called autosegmental hypothesis which in his stronger form claims that all glides can ultimately be derived from discrete levels, makes the following statement (p. 234 f.): "it would seem to me that we must also allow that underlying tones be characterized by unitary features such as Rise and Fall if there is morphophonemic justification for such representation and if the use of discrete, level pitch features only obscures such tonal morphophonemic processes." This criterion applied to Wobe tone serves not so much to establish the independent status of glides as such but to corroborate the existence of different kinds of glides. This, in turn, implies, of course, the recognition of the phonological status of glides as such.
4.1. Tones in compound nouns. The most interesting case in this respect is a syntactic tonal pattern which characterizes compound nouns. Because of the wide applicability of the compounding process involved, the tonal change which accompanies it affects virtually all nouns and permits one to observe its effect on all of the tones.

The following facts characterize this syntactic tone pattern:

1. The tone of term B (the second constituent) of the compound is lowered when there is a tone change: to tone 35 for nouns whose inherent tone is at level 3 or above; to level 45 for nouns whose tone includes a low component (lower than 3). (The column on the right shows term B with its inherent tone):

   - ne 3 nT35 'kerosene (fire water)'
   - tae 32 f 35 'piece of cloth (cloth slice)'
   - sro 2 tu 35 'paddle (to paddle wood)'
   - kwla 2 plT 45 'bush porcupine'
   - kwlo 45 gbe 45 'village dog'
   - plee 3 pā 45 'sock for sale (to sell sock)'

2. Although the variation which we have just noted depends solely on the inherent tone of term B, we also observe a case where the tone pattern of term A has an effect on that of term B: when the former is 45, the latter undergoes the effect of a progressive assimilation and becomes 45 even when the inherent tone of B does not contain a low component.

   - kwlo 45 nT 45 'village water'
   - å 45 jō 45 'a kola nut (kola seed)'
   - too 45 tu 45 'mortar wood'

3. The lowering rules apply selectively: for tones with a non-low beginning point, they apply to level and falling tones, but not to rising ones. Inversely, for tones with a low beginning point, they apply to rising tones, but not to the low "level" tone (4), 45 being of course by its nature indifferent to the lowering rules.

   a) Cases where the rules apply:

   - kla 3 sbε 35 'school book (school paper)'
   - jε 45 kwla 45 'recipient for kola nuts (kola recipient)'
   - kwlo 45 ko 45 'village rice'
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b) Cases where the rules do not apply:

je⁴⁵ ke³² 'highway code (road law)'

sraa²-³ sœ³¹ 'hen for sacrifice (sacrifice hen)'

plee³ paa³²-³⁵ 'granary for sale'

kwale³ sro⁴ 'pile of peanuts (peanuts pile)'

But:

plee³ pœ³³-³⁵ 'ladle for sale'

œ² jree³-³ puua⁴⁻⁴⁵ 'bath towel (with to-wash towel)'

The falling tones of V₂ and V₃ may be modified if the tone of the preceding vowel undergoes a modification (cf. 3. above); they are then lowered to the same level as the tone of V₁:

sœ³ jrie³⁻³⁵ 'snake eye'

kwiae² di² kao³⁻³⁵ 'forest spring (forest in spring)'

kwie⁴⁵ kao⁴-⁴⁵ 'village spring'

kwie⁴⁵ sraa⁴⁻⁴⁵ 'village sacrifice'

But:

Because of the simplification of falling tones in non-final position (cf. 3.5 above and R₁ below), there is strictly no difference between e.g. 3⁻³⁵ and 4⁻⁴⁵ on the one hand and 3⁵-³⁵ and 4⁵-⁴⁵ on the other hand. We shall generally use the shorter notation.
5. A comparison of the modifications which the short tones (on CV) and their corresponding long tones (on CVV) undergo in identical conditions might show us to what extent their behavior is analogous, either in the sense of a unitary interpretation or in the sense of an interpretation as sequences of tonemes. The evidence furnished by this comparison is, however, ambiguous.

Patterns 31 and 3-1 both resist any change:

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>sraa 2-3</td>
<td>só 31</td>
</tr>
<tr>
<td>kwl ö 4-5</td>
<td>só 31</td>
</tr>
<tr>
<td>kwla 2</td>
<td>sii 3-1</td>
</tr>
<tr>
<td>je 4-5</td>
<td>sii 3-1</td>
</tr>
</tbody>
</table>

32, likewise, is invariable:

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>plee 3</td>
<td>bli 32</td>
</tr>
<tr>
<td>kwl ö 4-5</td>
<td>bli 32</td>
</tr>
</tbody>
</table>

However, 3-2 allows the lowering of the beginning point to low level:

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>kwl ö 4-5</td>
<td>dao 3-2</td>
</tr>
</tbody>
</table>

3-3 undergoes the same modifications as 3, and 4-4, like 4, remains invariable. On the other hand, the long tones 1-1 and 2-1 are distinguished from the short tones 1 and 2 by the fact that only their initial tone is variable.

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>plee 3</td>
<td>poo 3-3</td>
</tr>
<tr>
<td>bla 4</td>
<td>doc 3-3</td>
</tr>
<tr>
<td>kwl ö 4-5</td>
<td>kao 4-4</td>
</tr>
<tr>
<td>kwI 1</td>
<td>toao 4-4-4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>kwl ö 4-5</td>
<td>toao 4-4-4</td>
</tr>
<tr>
<td>kwl ö 4-5</td>
<td>jae 1-1</td>
</tr>
<tr>
<td>plee 3-3</td>
<td>bai 4-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>plee 3-3</td>
<td>bai 2-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>'hen for sacrifice'</td>
<td>só 31 'hen'</td>
</tr>
<tr>
<td>'village hen'</td>
<td>só 31 'hen'</td>
</tr>
<tr>
<td>'bush grass'</td>
<td>sii 3-1 'grass'</td>
</tr>
<tr>
<td>'road grass'</td>
<td>sii 3-1 'grass'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>'cow for sale'</td>
<td>bli 32 'cow'</td>
</tr>
<tr>
<td>'village cow'</td>
<td>bli 32 'cow'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>'smoke from the village'</td>
<td>dao 3-2 'smoke'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>'ladle for sale'</td>
<td>poo 3-3 'ladle'</td>
</tr>
<tr>
<td>'strong man'</td>
<td>doc 3-3 'elephant'</td>
</tr>
<tr>
<td>'village palm tree'</td>
<td>kao 4-4 'palm tree'</td>
</tr>
<tr>
<td>'European machete (white man's machete)'</td>
<td>toao 4-4-4 'machete'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Tone</th>
<th>Long Tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>'village machete'</td>
<td>toao 4-4-4 'machete'</td>
</tr>
<tr>
<td>'village weaver bird'</td>
<td>jae 1-1 'weaver bird'</td>
</tr>
<tr>
<td>'shirt for sale (to sell shirt)'</td>
<td>bai 2-1 'shirt'</td>
</tr>
</tbody>
</table>
Finally, the behavior of the short rising tones beginning at low level is clearly different from that of the corresponding long tones, since the latter do not permit any alternation with a falling tone. (For low-rising tones on CV, see examples under rule 1 above.)

\[
\begin{align*}
\text{dée}^3 \text{ paa}^{4-1} & \quad \text{'what manioc?'} \\
\text{tu}^3 \text{ kwée}^{4-1} & \quad \text{'canoe made from one tree}
\end{align*}
\]

\[
\begin{align*}
\text{dée}^3 \text{ koo}^{4-2} & \quad \text{'what sparrow hawk?'} \\
\text{ble}^3 \text{ gbau}^{4-3} & \quad \text{'record player (to sing)}
\end{align*}
\]

\[
\begin{align*}
\text{kui}^3 & \text{0oo}^{4-45} \quad \text{'type of owl'}
\end{align*}
\]

4.1.1. In spite of the complexity of the facts, there are evident regularities. Among the possible analyses of the tone system of Wobe, one which ac-

14Although all the rules have been well documented and verified generally with more than one speaker, there remain a number of residual cases which behave differently. For example, \text{sma}^2 'sauce' has the pattern 32 in the construction: \text{bée}^1-3 \text{sma}^3 2 'pepper sauce'. Here \text{sma}^2 behaves as if it were a bisyllable, \text{CVV}^2-2, and not like a monosyllable of the type \text{CCV}^2. One could suppose that \text{sma}^2 was originally realized as a bisyllable and has retained the morphonological behavior which characterizes disyllabic words. We want to stress that \text{sma}^2 is no different, except for its syntactic tone pattern, from words like \text{kmo}^2 'world', \text{srē}^2 'trick', and \text{kia}^2 'hoe', which take without exception the syntactic tone 35. Another series of exceptions may perhaps be explained semantically. We have observed that in certain cases a non-low term B takes the syntactic tone 35 without, however, assimilating to a preceding tone 45. One might say that \text{P}_2 (see below) does not apply in these cases. It seems to be mainly body parts which are involved, which implies a part-whole relationship between B and A. For example:

\[
\begin{align*}
\text{kle}^4 & \text{ nmī}^3 35 \quad \text{'monkey meat' (Fig. 27)} \\
\text{kle}^4 & \text{ sō}^3 35 \quad \text{'monkey arm'}
\end{align*}
\]

One might hypothesize that this semantic relationship is characterized by a more restrained application of the lowering rules. Finally, the word \text{gba}^4 'fork' and its homonym \text{gba}^4 'struggle' seem to constitute an exception to the rule of invariability of tone 4:

\[
\begin{align*}
\text{dē}^3 & \text{ bée}^2-2-3 \text{ gba}^4 \quad \text{'weeding fork'} \\
\text{māō}^1-2 \text{ gba}^4 \quad \text{'night battle'}
\end{align*}
\]

One might offer as a possible explanation the hypothesis that this is an idiosyncrasy of words beginning with /gb/ (cf. 5.1).
counts for the morphophonological changes in terms which, if not simple, are at least coherent, should from our point of view be preferred to the others, and should be considered as representative of the intuitive perception of the relevant units by the speaker. We propose, first of all, a definition in terms of distinctive features of the tones whose existence we postulated in section 1 on the basis of a one to one relationship between vowels and tones. We will use five distinctive features for this purpose, three of which refer to distinctions of height and two to directional properties (Rising and Falling).

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Very High</th>
<th>Low</th>
<th>Rise</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>+</td>
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<tr>
<td>2</td>
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<td>31</td>
<td>+</td>
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<td>32</td>
<td>+</td>
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<td>41</td>
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<td>42</td>
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<td>43</td>
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<td>15</td>
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<td>+</td>
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<td>25</td>
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<td>+</td>
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<td>35</td>
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<td>45</td>
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<td>+</td>
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<tr>
<td>435</td>
<td>-</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 2

Each group of features must be understood as the definition of the pitch of one and only one vowel phoneme.

It is now possible to restate the lowering rules set forth above by using the features of Table 2. To do this, we propose the following set of ordered rules:
The input of $P_1$ stipulates that the rule apply only to tones of term B of a compound which are either low and rising or non-low and non-rising. The set of features listed to the right of the arrow specifies that the rule results in a falling tone either with a mid (35) or with a low (45) beginning point, depending on the value assigned to $\alpha$. The feature [-Rise] is necessary in order to exclude tone 435 in this position.

$P_2$ accounts for the additional lowering to 45 of term B which takes place after a term A carrying tone 45. $P_2$ applies to the output of $P_1$.

$P_3$ copies the result of $P_1$ and $P_2$ on the non-initial vowels of term B. Its entry conditions state that on non-initial vowels only (a) tones containing a falling glide, (b) non-high level tones, and (c) high level tones followed by a falling tone on the last vowel (interdependency shown by angled braces) undergo the lowering process. $P_3$ applies recursively.

In the application of $P_1$ the feature Fall is automatically pushed back to word final position by the general rule of simplification which assigns the realization $\emptyset$ to the falling feature in every context except before pause and in combination with tone 2:
The obvious question to be asked in regard to this set of rules is how the entry condition of $P_1$, which triggers off or blocks the whole process, could be motivated in a natural way. Is there a plausible explanation of the interdependency of low and rising features, or does the rule, as it stands, miss an important generalization? We shall turn again to this question in 4.4 below.

4.1.2. The only detail which escapes $P_1$ is the fact that the sequence 3-1 behaves like the rising tone 31, i.e. remains invariable in every case (cf. rule 5 above). This could be remedied by assigning ad hoc the feature Rise to the sequence 3-1, thus blocking $P_1$, given that the input condition is not met. One might also consider the possibility of interpreting 3-1 as 31-1, which would automatically prevent $P_1$ from applying, since the tone of the initial vowel would be non-low and rising. From a structural point of view, nothing seems to stand in the way of this interpretation since only one type of movement has been observed between levels 3 and 1. However, this solution is even less acceptable since the realization of 3-1 is completely lacking the convex curve with the rapid rise which distinguishes, for example, the sequence 41-1 from 4-1 (cf. Fig. 7, 36, and 37). We shall propose a different solution to this problem in section 4.4.

4.1.3. An alternative for describing the pitch of compound nouns would consist in formulating a rule which would make use only of the features of height and of the feature Fall. Such a rule would rest on similar assumptions, except for the use of binary features, as those which served as the basis for summarizing the sequential constraints on tone (cf. 2.4, $M_1$):

$$P_1' \{ [\text{-Low}] \} + [\text{-High}] + \text{Fall} \} / A + C_{(V)(V)} B$$

$P_1'$ followed by $P_2'$ and $P_3'$ analogous to $P_2$ and $P_3$ above, would lead to the same result as $P_1$, and this without reference to a feature Rise. The entry conditions are fulfilled for non-low level tones ([Low]), for glides rising from low (if $a$ is assigned the value +) and for falling tones (if $a$ is specified as -). However, this rule seems less well motivated than $P_1$. It sti-
ulates, in effect, a condition of application which is valid for two-suc-
ceeding tones on CV, but would not hold for the same succession of tones on
CVV. On the other hand, this latter restriction is well motivated in P₁ by
the bringing into play of a feature Rise for glides on CV but not for se-
quen ces of level tones distributed over CVV.

4.2. Tones in verb roots. Verb roots are divided into eight tonal classes
according to their inherent tones and variations.

1 41 pa₁ 'to sew'
2 4 dba₂ 'to kill'
3 43 di³ 'to eat'
35 45 wlu₃⁵ 'to speak'
43 45 pa₄³ 'to pluck'
43 tba₄³ 'to light'
4 tē⁴ 'to try'
41 fa₄¹ 'to enjoy oneself'

These variations are partly phonologically conditioned; the variant with
a low component appears after a pronoun with a 45 tone or immediately after
a subject which is in focus. In the latter case, one would consider that it
is a matter of grammatical conditioning. (The variation 3 43 is limited
to the context of a subject in focus.)

a⁴⁵ pa₄¹ bai²⁻¹ 'we sewed a dress'
ē⁴⁵ dba⁴ nmi₃⁵ '(you, sg.) kill the animal!
3₃ m₃₃ wlu₄⁵ 'he is the one who spoke'
ju¹ di₄³ ko₃⁵ 'the child is the one who ate the rice'

The alternants in the domain [-High] show a tendency to group the tonemes in
a manner analogous to that observed for compound nouns. Without getting
lost in speculations, these regularities of relations between tonemes permit
us to get a glimpse of the elements of a tonal harmony which underlies the
tonal system of Wobe. Note in this regard the variations 35 45 and 43 45
and their conditioning by the preceding low falling tone. At the same time
it is necessary to specify that the Rising feature of 41 is not replaced in
these conditions by the feature Falling as one might have expected after
rule P1. On the other hand, the supposedly level low tone (4) shows the same "resistance" to morphotonological changes as it does in compound nouns; the other "resistant" tones, 31 and 32, do not appear as the inherent tones of verbs. Note also that the alternation 2 ~ 4 involves only tones which have up until now been interpreted as level:

\[a^45 \text{ dba}^4 \text{ k}^4\] 'we have cultivated the field' (Fig. 23)

with the rise which characterizes the realization of 4 in this context (cf. 3.6).

One might add to these observations one which relates to bisyllabic verb stems: the lowered tone of the first vowel is copied onto the following vowel when the latter is non-high:

\[\text{dbaa}^3-35 \quad \text{dbaa}^4-45 \quad \text{to measure}
\]
\[\text{wo}^3-35 \quad \text{wo}^4-45 \quad \text{to wash}
\]

On the other hand tone 4, whether it be inherent to the root or derived by a lowering of an inherent tone 2, does not permit the assimilation of the following tone: \[\text{ke}^2-35 \sim \text{ke}^4-35 \quad \text{to laugh}'\]. This is parallel to the blocking of the tonal modification of a nominal such as \[\text{gbau}^4-3\] (cf. 4.1, 5 above).

### 4.3. Tones on verb suffixes.

Finally, still in the framework of verb morphology, a certain number of suffixes of the type -V, such as -ε 'declarative', -α 'dependent', as well as 3rd person pronouns ( -ɔ 'masc. sing.', -ọ 'fem. sing.', -ε 'non-human sing.', and -i 'non-human plural'), take the tone of the preceding verb stem. Others, such as \[-V^3\] (vowel assimilating the quality of the stem vowel) 'mark of modification of transitivity' alternate only in the non-high domain. The following verbs illustrate this assimilation for the declarative suffix -ε and the pronoun -ε :

\[\text{\v^3 j}^1\text{rie}^{-1-1}... \quad \text{'he stole...'}
\]
\[\text{\v^3 j}^2\text{e}^{-2-2}... \quad \text{'he saw...'}
\]
\[\text{\v^3 d}^3\text{e}^{-3-3}... \quad \text{'he ate...'}
\]
\[\text{\v^3 p}^3\text{le}^{-3-3}... \quad \text{'he sold...'} \quad (\text{Fig. 13})
\]
\[\text{\v^3 t}^4\text{e}^{-4-3}... \quad \text{'he bought...'} \quad (\text{Fig. 46})
\]
\[\text{\v^3 t}^4\text{e}^{-4-3}... \quad \text{'he tried...'} \quad (\text{Fig. 34})
\]
\[\text{\v^3 kw}^4\text{le}^{-45-45}... \quad \text{'he stayed...'} \quad (\text{Fig. 30})
\]
\[\text{\v^3 gbō}^4\text{e}^{-45-45}... \quad \text{'he looked at...'} \quad (\text{Fig. 50})
\]
As a general rule, the tone of the suffix is assimilated to the ending point of the tone of the root. There is however one notable exception: a tone 4 on the root triggers a tone 3 on the suffix rather than a tone 4 as one would expect. On the other hand, tone 45 causes the tone of the suffix to shift to level 4. Could the tone interpreted up until now as level tone 4 actually be a rising tone whose ending point corresponds to level 3? This hypothesis seems to impose itself and is strengthened by the rising realization of tone 4 in context which up until now we have treated as a variant. But assuming that tone 4 is interpreted as rising, by which feature would one differentiate between 43 and 4 since both are rising and both have the same ending point?\footnote{Remembering that tone 4 has a clear tendency to be level in utterance-final position (see 3.6, Diagram 2, and Fig. 22), one could summarize the ambiguity in the area of the low tones by stating that the same contrast between /4/ and /45/ manifests itself in non-final position by the features Rising and Level, and in final position by the features Level and Falling. The feature Level ([−Rise], [−Fall]) characterizes 4 in final position, and 45 in non-final position. It is as if two feature systems alternate in pre-pausal and in utterance medial position.}

4.4. A revised set of tonal features. We have seen in 3.6 that the shape of the melodic curve is the physical constant permitting differentiation between tones 4 and 43 in context. If we take this difference in shape as the essential feature distinguishing the two tones, the question arises as to how the contrast between concavity and convexity may be integrated into the whole of the tonal system in an economic way. An additional distinction between [+Concave] and [−Concave] within the class of rising tones postulated in 4.1 (Table 2) would be redundant everywhere except in the case of low tones. We propose, therefore, to consider the feature Concave as distinctive, and the feature Rising as redundant. On the one hand the feature [+Concave] or, on the other hand, the feature [+High] combined with another feature of height, imply the phonetic feature [+Rise]. This solution also has the advantage that it permits integrating the rising realization of the Very High tone (tone 1) in a natural way.
It becomes then necessary to introduce the feature [Extreme]\(^{16}\) in place of [Very High] in order to be able to take into account the difference between 45 and 435. Therefore we add to the redundancy rules one which specifies the rising realization of tones 43 and 435:

\[
[+\text{Low}] \rightarrow [+\text{Rise}]
\]

Any tone specified as [+Rise], but not at the same time as [+Concave], is automatically characterized as convex ([−Concave]). Table 3 presents, in our opinion, compared to Table 2 (cf. 4.1), a more adequate interpretation of the tonal system of Wobe in terms of distinctive features:

<table>
<thead>
<tr>
<th>High</th>
<th>Extreme</th>
<th>Low</th>
<th>Concave</th>
<th>Fall</th>
<th>Rise (redundant feature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>31</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>41</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>42</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>43</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>25</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>35</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>45</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>435</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 3

Having introduced the feature [Concave], we are now in a position to reformulate the entry condition of \(P_1\) (cf. 4.1.1):

\(^{16}\)Maddieson [1971] proposes a feature "Extreme" in order to account for tone languages with four or five registers (cited in Fromkin [1972:49]).
Although $P_1'$ is not simpler than $P_1$ in terms of the number of features which need to be specified, it provides a natural statement of the conditions under which the second constituent of a compound is lowered: the change takes place whenever the tone of the initial vowel of the constituent has a non-concave shape; it is blocked when this tone has a concave shape. The feature [Low] is disconnected from the shape of the glide and only, and quite naturally, affects the height of the resulting tone.

Without going into further details of formalization it is worth mentioning that the notion of concavity, defined as a prolonged hold at the beginning of a pitch contour, is not only applicable to tones on CV but also to sequences of tones on CVV. Table 4 demonstrates, for rising tones and sequences of tones, the correlation between the presence of the feature of concavity and resistance to the lowering process:

| [-Concave] | [+Concave] |
| CV   | CVV   | CV   | CVV   |
| 43   | 43-3  | 4    | 4-3   |
| 435  | 43-35 |      |       |
| 42   | 42-2  | 4-2  |       |
| 41   | 41-1  | 4-1  |       |
|      | 31    | 3-1  |       |
| 3-2  |       |      |       |
| 2-1  |       |      |       |

Table 4

Consistently, it is the tones and sequences of tones with a concave curve which block the application of the lowering rules. Most strikingly, this criterion even explains the divergent behavior of the sequences 3-1 (cf. 4.1.2 above) and 3-2 whose realizations were earlier (cf. 3.4) described as concave and non-concave respectively. Thus the feature [Concave] allows us to capture the principal physical property differentiating between tones 43 and 4 in context, to explain the tonal assimilation of suffixes to the
verb root in a regular way, and to give a simple rationale for the bizarre behavior of tones in noun compounding. All this contributes to strengthen our conviction that the feature of concavity occupies a pivotal place in the tonal system of Wobe.

It is of course conceivable to break down a concave contour into a sequence of registers. The difference between tones 43 and 4 could then be expressed in terms of the number of integers associated with a given segment: 43 vs. 443. The input to $P_1$ could be restated in a way analogous to $M_1''$ (cf. 2.4), by making use of the variables $X$ and $Y$ (where $Y < X$), as $X(Y)$, thus excluding any sequence of the concave type XXY. However, in order to correctly predict the blocking of $P_1$, one would have to analyze tones 31 and 32 as 331 and 332. This appears to be rather odd, if for no other reason than that there would be no simple counterparts 31 and 32 on CV segments, whereas 3-2, distributed over CV, would have to be described, paradoxically, as a single 3 followed by 2, in order to undergo the lowering process. If one chose, on the other hand, to write the convex rise (43) as 433 and the concave rise (4) as 43, conforming to the idea behind the distributional statement $M_1'$ (cf. 2.4), one would face a similar problem in regard to the rising tones starting from level 4, such as 41 interpreted as 411, etc., with no simple counterpart 41 occurring on CV. There just does not seem to be a natural way of accommodating all the facts without resorting to the feature [Concave].

4.5. Extension of features to longer sequences. Finally for the contour tones, as well as for the long level tones (sequences of two identical level tones), we must approach the question of their extension with respect to the segmental structure underlying them.

In setting forth again as the principal criterion the sensitivity of tones and sequences of tones with respect to the lowering rules, one notices a clear difference between the configurations characterized by the feature [-High] and those which have the feature [+High]: in the first case the domain of application (or of non-application) is the whole morpheme whether it be CV, CVV, or CVVV. In the second case, the domain of application (or non-application) is limited to the initial vowel (with the exception of cases
where the morpheme ends on a falling tone). Table 5 summarizes the application of this criterion to the main tone patterns occurring on words of the three types of syllable structure.

<table>
<thead>
<tr>
<th>Class of Tones</th>
<th>Sensitive</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>CVV</td>
<td>CVVV</td>
</tr>
<tr>
<td>[-High]</td>
<td>43</td>
<td>43-3</td>
</tr>
<tr>
<td>435</td>
<td>43-35</td>
<td>43-3-35</td>
</tr>
<tr>
<td>3</td>
<td>3-3</td>
<td>35</td>
</tr>
<tr>
<td>[+High]</td>
<td>2</td>
<td>2(-2)</td>
</tr>
<tr>
<td>[-Low]</td>
<td>1</td>
<td>1(-1)</td>
</tr>
<tr>
<td>3(-2)</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>15,25</td>
<td>1-15</td>
<td></td>
</tr>
<tr>
<td>[+High]</td>
<td>41</td>
<td>41(-1)</td>
</tr>
<tr>
<td>[+Low]</td>
<td>42</td>
<td>42(-2)</td>
</tr>
</tbody>
</table>

We determine the domain of the tonal configurations as the scope of their sensitivity to morphophonological change:

Tones of the class [-High] are suitably treated as unitary tonemes extending over the entire word, whether it is of the type CV, CVV or CVVV. One will distinguish five options of sensitive tones, 43, 435, 45, 3, 35, to which is added the resistant concave tone 4. The only difficulty comes from the fact that the resistant patterns of long words present an additional distinction between a level realization 4-4(-4) and a rising realization 4-3(-3). If one wishes to express, in the description, the general isomorphism of the other low patterns, the best solution seems to consist of interpreting the patterns 4, 4-4, and 4-4-4 as level realizations of toneme 4, and the patterns 4-3 and 4-3-3 as sequences of a toneme 4 followed by a toneme 3.

By the same token, tones of the class [+High] [-Low] occurring on long
items may be seen as complex. For inasmuch as one recognizes the existence
of a major dividing line between the tones situated at mid level, unmarked,
and below, and the tones realized above this dividing line, nothing is op­
posed, in principle, to interpreting them differently with respect to the
segmental structure. By insisting on the isomorphism of 31 and 3-1 one
could even eliminate the rising tonemes which begin on level 3. One would
interpret them as sequences 3-2 and 3-1 whatever the segmental domain over
which they are distributed. However, the general functioning of the rising
tones is more favorable to a unitary interpretation. It is imperative for
tones which belong at the same time to the two categories [+High] and [+Low]
because of the clear division between 41 and 42 on the one hand, and 4-1 and
4-2 on the other according to the criterion of sensitivity. Likewise, the
partial sensitivity of 3-2, but not of 32, does not reinforce the argument
based on the homogeneity of 31 and 3-1. Finally, the principle of coexten­
sitivity of the vowels and tonemes seems to be a necessary condition for an
adequate description of the functioning of tones of the class [+High].

4.6. Summary. We arrive therefore at the conclusion that in Wobe a coher­
ent analysis of the facts leads us to postulate the existence of 14 tonemes.
In spite of the marked tendency of the extreme registers towards contoured
realizations, there is very little doubt as to the pertinence of four regis­
ters. The best proof of this is perhaps the fact that the assimilation of
atonal suffixes occurs at four distinct levels (cf. 4.3). However, we have
seen that when one takes into account the characteristics of the realization
of tones, and especially of their combinatory properties, we are forced to
admit the existence of irreducible contour tones which are impossible to
describe in a satisfactory way as sequences of two level tones.

In the course of our study we have been able to propose a set of class­
ificatory features which, so to speak, keep the system in balance:

features of height:       [+High], [+Low], [+Extreme]
features of modulation:   [+Concave], [+Falling]

5. Tones and Consonants. Synchrony and Diachrony

5.1. Correlation of Wobe consonants and tones. The consonantal system of
The Tone Puzzle of Wobe

Wobe is as follows:

\[
\begin{array}{cccccccc}
\text{p} & \text{t} & \text{c} & \text{k} & \text{kw} & \text{kp} \\
\text{b} & \text{d} & \text{j} & \text{w} & \text{gb} & \text{(} & \text{l/r} & \text{are variants of} & \text{/d/)} \\
\text{f} & \text{s} \\
\end{array}
\]

Table 6

As for distribution of tones, the following question arises: is there a relationship between the voicing of consonants and the pitch? Voiced stops, except for gb and j, are very rare at the beginning of words which have an initial low tone. In fact, b has been found with low tone only on two morphemes, namely bo⁴ 'if' and ke³ba⁴ 'first' (adv.); d only with non-low tones, never with low tones: di¹ 'spear', do² 'song', de³ 'mother'. j appears with low and non-low tones: ju¹ 'child', jo² 'seed', jo³ 'viper', je⁴⁵ 'kola'. We notice, however, in the system of Wobe consonants the absence of a palatal semi-vowel. It seems that j and y which are distinct phonemes in other Kru languages are represented in Wobe by the one phoneme j. Supposing that originally j was restricted to non-low tones as is the case for d, one could conclude that the words bearing low tone beginning with j would have originally begun with y. ¹⁷ Indeed, one notes correspondance between j accompanied by low tone in Wobe and y in Guere, at least in the following case:

\[
\begin{array}{ccc}
\text{ye}⁴ \text{(Guere)} & \text{je}⁴⁵ \text{(Wobe)} & \text{'}kola' \\
\end{array}
\]

On the other hand, kp and gb are in complementary distribution with

¹⁷We owe this explanation to a remark of Welmers [1975] about Déwö⁴. After grouping the consonants according to the tones they occur with, he draws the conclusion that j (voiced palatal stop) is not part of the group which includes the other voiced stops and fricatives. Here is how Welmers explains this fact: "The reason why /j/ belongs here rather than with the voiced stops and fricatives is probably that /j/, which occurs only in morpheme-initial position, is almost (though not perfectly) in complementary distribution with /y/ which also belongs in this group." One could hypothesize that the process begun in Déwö⁴ in the form of a quasi-complementary distribution, has ended, in Wobe, in a complete resorption of the semivowel y by the voiced palatal stop.
We find ourselves, then, faced with an apparent paradox: whereas most kinds of stops are systematically restricted to words with non-low tones, the occurrence of /gb/ is limited to low tone words. Conversely, unvoiced stops are abundantly represented in low tone words, while /kp/ never occurs with low tone. Is there any explanation for this criss-cross distributional pattern?

Before we try to elucidate this question, it is important to note that the restrictions bearing on the distribution of consonants with respect to low tone are valid only for the inherent pitches of words. They are inoperative in cases where a low grammatical tone is substituted for the inherent tone:

- kp occurs only with non-low tones: kp\(^1\) 'banana cake', kp\(^2\) 'bone', kp\(^3\) 'bamboo ladder'.
- gb appears only with low tone: gba\(^4\) 'battle', gbee\(^2\)-\(^2\) 'poisonous tree', gblo\(^5\) 'reed', gbe\(^3\) 'dog', gbaoc\(^3\)-\(^3\)-\(^3\) 'partridge', gbauc\(^3\)-\(^3\)-\(^3\) 'bush'.

Since in these grammatical contexts there is contrast rather than complementary distribution between /kp/ and /gb/, the distinctive status of both phonemes remains established.

5.2.1. Consonant changes from proto-Wobe-Guere. The Guere dialect spoken in Blolequin\(^{18}\), has, compared to Wobe, a remarkably "rich" consonant system:

---

\(^{18}\)Guere, which is spoken in an area adjacent to the southwestern part of the Wobe region, between Duékoué, Quiglo and Toulepue, constitutes, along with Wobe, an uninterrupted chain of dialects belonging to the same linguistic group and having many features in common. However, there is not spontaneous mutual intelligibility between all of the dialects. The Guere examples cited in this section are partly taken from published materials on the Blolequin dialect [Fisher 1976]. We are indebted to Alan Fisher for making available to us further data on the consonant system and tones of Blolequin. The data were checked by Fisher and Bearth, with the help of Victor Bombe (21), a Guere speaker from Blolequin, and a tentative analysis was proposed which underlies the following observations on the development of Wobe consonants and tones. A preliminary acoustic analysis of a sample of the same
Unlike Wobe, the Guere system manifests the complete series of voiced counterparts of the voiceless stops and fricatives. In addition, there is an implosive series which is lacking in Wobe. This latter series contains two rare phonemes: a palatal implosive and a labiovelar semivowel \( w' \) whose precise phonetic nature remains to be determined but which shows at first glance the same acoustic features as the other members of the series.

A comparison made on the basis of Fisher [1976] supplemented by the Guere equivalents of most of the C(C)V words listed in section 1.1 above, leads us to recognize the pattern of a consonant shift which took place between an anterior stage representing an ancestor language common to Guere and Wobe and the present day Wobe:

1) Guere voiced stops and fricatives, except /gb/, are replaced in Wobe by voiceless stops and an added initial low tone component. The following list of cognates illustrates this principle:

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
<th>Meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>baa(^{31})</td>
<td>paa(^{4-1})</td>
<td>'manioc'</td>
</tr>
<tr>
<td>doo(^{14})</td>
<td>too(^{4-1-35})</td>
<td>'quickly'</td>
</tr>
<tr>
<td>gle(^{3})</td>
<td>kle(^{4-3})</td>
<td>'field'</td>
</tr>
<tr>
<td>ji(^{3})</td>
<td>ci(^{4-3})</td>
<td>'leopard'</td>
</tr>
<tr>
<td>goo(^{2})</td>
<td>koo(^{4-2-2})</td>
<td>'sparrow hawk'</td>
</tr>
</tbody>
</table>

data, made at the Phonetics Laboratory of the Institut de Linguistique Appliquée of Abidjan University, would seem to corroborate our tentative conclusions about Guere consonants and tones.
Words which have low tone in Guere tend to be realized as low falling in Wobe:

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>doo⁴</td>
<td>too⁴-⁴⁵</td>
</tr>
<tr>
<td>jue⁴</td>
<td>cuue⁴-⁴⁵</td>
</tr>
<tr>
<td>dë⁴</td>
<td>të⁴⁵</td>
</tr>
</tbody>
</table>

It is of course a well known fact that the realization of voiced stops is accompanied by a rising glide which is normally not distinctive. The rising glide associated with the voiced consonants, although non-contrastive, is however comparatively strong and clearly perceivable in Guere. As the (unpublished) mingograms show, its starting point tends to be, both utterance-initially and utterance-medially, below the phonemic low level tone. It is then natural to assume that when the devoicing of the consonants took place, the rising glide was retained and constituted a new tonal contrast with originally non-voiced words lacking this glide, as illustrated by the last two items of the first cognate list.

2) Guere implosives are replaced in Wobe by the corresponding voiced (non-implosive) consonants. In fact, the Wobe series of voiced consonants corresponds to the implosive series in Guere. This derivation explains the gap in the Wobe system due to the absence of /g/. There is no tone change involved in this mutation.

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>ɓe⁴¹</td>
<td>be³¹</td>
</tr>
<tr>
<td>ɗe²</td>
<td>de²</td>
</tr>
<tr>
<td>j’ri¹</td>
<td>jri¹</td>
</tr>
<tr>
<td>w’co³-³</td>
<td>wco³-³</td>
</tr>
</tbody>
</table>

It is worth noting that Guere implosives never combine with inherent
Neither do voiceless stops it seems. (Some uncertainty subsists concerning this restriction with regard to velar and labiovelar stops.) On the other hand, the voiced consonants of Guere which do occur with low tone have undergone devoicing. The combination of these factors results in the absence of low tone in lexical items beginning with voiced consonants in Wobe, and its frequent occurrence with voiceless consonants. In other words, the consonant shift is accompanied by a reversal of the constraint governing the co-occurrence of low tone and the voicing feature between Guere and Wobe.

3) The palatal semivowel /y/ as mentioned above (5.1) also becomes /j/ in Wobe. The non-implosive labio-velar semivowel /w/ is replaced in Wobe by /kw/ (which also represents Guere /kw/ and /gw/).

\[
\begin{array}{|c|c|}
\hline
\text{Guere} & \text{Wobe} \\
\hline
\text{ye}^4 & \text{je}^h \\
\text{wla}^3 & \text{kwla}^4 \text{}^3 \\
\hline
\end{array}
\]

As the last cognate pair shows, /w/ is also reflected in Wobe by an additional low tone component. /w/ behaves thus diachronically as the originally voiced consonants do, whereas /w'/ behaves like the implosives. This is borne out in the synchronic dimension by the fact that Guere /w/ is realized with a rising on-glide which is not found with /w'/.

These observations provide additional justification for classifying Guere /w'/ in the same series as the implosives and Wobe /w/ together with the voiced stops. The following chart displays the foregoing rules of the Guere-Wobe consonant shift (\(4 \) = low tone component):

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{p} & \text{t} & \text{c} & \text{k} & \text{kp} & \text{kw} \\
\text{b} & \text{d} & \text{g} & \text{gb} & \text{gw} & \text{kw} \\
\text{6} & \text{d} & \text{j} & \text{y} & \text{w} & \text{w'} \\
\text{f} & \text{s} & \text{z} & \text{4} \\
\hline
\end{array}
\]

Table 8

19 Low tone occurs however with implosives in connection with grammatical tone change.
5.2.2. **Origin of the convex-concave dichotomy.** As to the origin of the convex-concave dichotomy, some observations supported by a first rapid analysis of mingograms from Guere (Bolequin) provide at least a good working hypothesis. In Guere, both concave and non-concave rising glides occur. The latter are realized either as a straight rise or slightly convex. Their distribution seems to be as follows:

a) A low rising glide occurring with unvoiced stops, unvoiced fricatives or implosives (mainly in the imperative form of verbs) manifests a phonemic rising tone. This glide is non-concave and contrasts with phonemic level tone characterized by the absence of initial upglide.

b) Voiced stops and fricatives are always accompanied by a strong non-concave upglide whose beginning point tends to be lower than level 4, regardless of the phonemic tone of the word.

c) Voiced stops and fricatives also occur in combination with phonemic rising tone beginning at level 4. This phonemic upglide, in contrast to the conditioned upglide, is characterized by a longer hold at the beginning point and thus yields a concave contour.

The contrast between conditioned and phonemic upglide is clearly demonstrated in certain grammatical environments, e.g. in the imperative of the 2nd person sg.:

- **jre**₃ (with conditioned upglide) 'to scold'
- **jre**₄₃ (with phonemic concave upglide) 'scold!'
- **jri**₁ (conditioned upglide) 'to lean over'
- **jri**₁₄₁ (phonemic upglide) 'lean over!

The low tone of these forms reflects an original low tone pronoun whose segmental component has been elided.

It appears that lexical low rising tones occurring with voiced consonants in Guere are mostly or exclusively glides of the 42 type.²⁰ There is also good evidence for a regular correspondence between Guere 42 and 32 rising tones accompanying voiced consonants on the one hand and the Wobe concave rising tone 4.

²⁰We cannot be totally affirmative on this point since available data on Guere glides [Fisher 1976] need to be reexamined in the light of the discovery of the difference between the rise conditioned by voicing and the phonemic rise.
The Tone Puzzle of Wobe

Guere Wobe

dil42 (dil42?) ti4 'buffalo'
z542 s54 'below, under'
gw654 kw64 'chimpanzee'
gba54 gba4 'fork'
dl32 tl4 'palm nut'
g332 kw04 'trace'
b532 p54 'to look for'

The change from 32 to 4 involves the devoicing process described above, with retention of the originally conditioned low component accompanying voiced consonants.

Our hypothesis, then, is that the concave low rise in Wobe, i.e. tone 4, reflects an original phonemic rising glide in Proto-Wobe-Guere whereas the other low rising tones reflect an originally conditioned rise accompanying voiced consonants.

In the light of the foregoing observations, which admittedly need further confirmation, the source of Wobe rising tones can be summarized as follows:

a) Mid rising tones (31, 32) correspond to original mid-rising tones in Proto-Wobe-Guere.

b) Low rising convex tones (41, 42, 43) are derived from original level tones occurring with voiced initial consonants via a devoicing process.

c) The concave rising tone (4) is a reflex of a Proto-Wobe-Guere low rising tone in some cases and of a mid rising tone lowered through devoicing in other cases.

The following set of cognates illustrates the different types of correspondences:

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
</table>
| s531    | sö31    | 'hen'
| z53     | s543    | 'light, day'
| s53     | s54     | 'snail'
| z542    | s54     | 'below, under'
| zö4     | sö45    | 'year' |
5.2.3. Explanation of the relation of /kp/ and /gb/ to low tone. We are now in a position to reconsider the inverse relationship of the labiovelar stops /kp/ and /gb/ to low tone, as compared to the distribution of the other stops with regard to the same tonal feature. The explanation is simple: the labiovelars did not undergo the consonant shift which led to the reversal of the constraint regulating the co-occurrence between the voicing and the low tone feature. /kp/ and /gb/, perhaps because of an inherent stability, did not change and thus reflect the original condition as it applied to all stops and fricatives in Proto-Guere-Wobe.

On the other hand, the non-phonemic low-rise occurring with /gb/ in Guere becomes phonemic in Wobe as a result of the devoicing process affecting all other voiced consonants except /gb/. That this is the case is shown by the fact that items beginning with /gb/ are treated morphophonemically in the same way as those containing a low tone component:

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>gbe$^3$</td>
<td>gbe$^43$ 'dog'</td>
</tr>
<tr>
<td>plee$^{3-3}$ gbe$^{45}$ 'dog for sale'</td>
<td></td>
</tr>
<tr>
<td>(not *plee$^{3-3}$ gbe$^{35}$ cf. 4.1)</td>
<td></td>
</tr>
</tbody>
</table>

Thus, the complementary distribution of /kp/ and /gb/ with regard to low tone, which still needs to be established for Guere, seems to reflect not a historical process, but rather a natural affinity between on the one hand the features low and voiced and on the other, the features non-low and voiceless.

5.2.4. Loss of medial consonants in Wobe. In comparison with Guere, one notes that in many Wobe words a medial consonant, most frequently /l/, has been deleted.

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>pele$^{2-3}$</td>
<td>pec$^{2-35}$ 'banana'</td>
</tr>
<tr>
<td>bila$^{1-3}$</td>
<td>bia$^{1-35}$ 'brother-in-law'</td>
</tr>
<tr>
<td>soko$^{4-1}$</td>
<td>soo$^{31-35}$ 'horse'</td>
</tr>
</tbody>
</table>

Thus, the change of the syllabic structure, together with the lowering of tone associated with the process of devoicing, seems to explain certain de-
viant sequences of tone in Wobe"

<table>
<thead>
<tr>
<th>Guere</th>
<th>Wobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>gela³-1</td>
<td>kea⁴³-1</td>
</tr>
</tbody>
</table>

'old man' (cf. 3.4)

5.2.5. Origin of falling tones. An obvious explanation for the falling tones would be that they are vestiges of a final apocopated syllable. However, the evidence in favour of this hypothesis is so far limited to the Nyabwa reflex of Wobe ko³⁵ 'rice': koō⁴⁴ [Bentinck 1978].

The falling tones occur also in Guere. Just as in Wobe they are an unpredictable and hence distinctive ingredient of morpheme structure, and their realization is limited to the position immediately before pause. In addition to the lexical and phonological conditioning, there is however a syntactic constraint to the effect that the fall only occurs at the end of an affirmative declarative sentence. This syntactic condition does not apply in Wobe. We have no explanation to offer for this phenomenon.

What seems clear is that the falling tone is best analyzed as a single tonal unit, not as a sequence: (1) this interpretation is in keeping with the overall tendency in the system to assign tonal units to no less than a single vowel and sequences to vowel sequences; (2) it eliminates the need for an extra low level tone to describe the low falling tone; (3) the behavior of falling tones undergoing morphological processes is not identical with that of corresponding level tones, as is shown by the rule P₃ (4.1.1 above).

6. Conclusion. The Wobe tone puzzle is far from being completely solved as will be evident from the last sections in particular. Our main concern in writing this paper was to present the facts, not to advocate any particular view about universal or even "West African" tonal features. But it will be clear to anyone familiar with current issues in tonology that the facts presented in this paper, if correct, have some bearing on the discussion about tonal features. For one thing, it is hard to see how a theory recognizing only relative pitch heights as linguistic primes could consistently account for the facts observed in Wobe. Even if in pursuing the search for historical antecedents, it was possible, although this is far from certain, to de-
rive all the glides from an original level system, this would not be sufficient to validate the constraint. A theory must be able to account for the properties of a language on which its present-day speakers base their articulation of the language. If this is true then it is difficult to overlook the pivotal role which the Concave feature, whatever its origin might be, plays in the present-day Wobe tone system.

On the other hand, if one admits a feature specifying the shape of a glide in the universal inventory of tonal features, one recognizes such features as Rise and Fall by implication. It should be clear that the notion of the shape of a glide presupposes the simpler notion of the glide itself. Hence the recognition of the uncommon (at least in African languages) [Concave] feature would at the same time further confirm the more general postulate for contour features to stand as primes in tonal analysis [Fromkin 1974, 1976].

APPENDIX

The following pages contain a set of mingograms (Fig. 1-50) destined to provide instrumental evidence for some of the salient facts about Wobe tone. Because of limited space, only the melody curve is shown. However, the transcription of the Wobe segments reflects, through the arrangement of the letters, the oscillograms which have been cut off. Each figure gives a morpheme-by-morpheme translation, supplemented by a free translation where necessary. The source of the examples is indicated after the figure number by the capital letter referring to the informant (see note 3).

The following abbreviations are used in the glosses: compl. (completive aspect), decl. (declarative marker), dep. (dependent clause marker), emph. (emphatic marker), lim.tr. (limited transitivity: no object or only one object manifested by a pronoun), loc. (locative preposition), poss. (possessive marker).
The Tone Puzzle of Wobe

Fig. 1 (G) 'my two little ends'

Fig. 2 (G) 'my two proverbs'

Fig. 3 (Z) 'I put my head in the yams'

Fig. 4 (G) 'here is my red pepper'

Fig. 5 (G) 'here is my red pepper'
Fig. 6 (G) 'my two hoes'

Fig. 7 (G) 'my two laws'

Fig. 8 (G) 'my two laws'

Fig. 9 (G) 'weasel'

Fig. 10 (Z) 'beak'

Fig. 11 (G) 'quickly'

Fig. 12 (Z) 'he sold paper'
The Tone Puzzle of Wobe

Fig. 14 (B) 'his sacrifice'

Fig. 15 (B) 'his two papers'

Fig. 16 (B) 'here is the inheritance' Fig. 17 (B) 'here is the rust'

Fig. 18 (B) 'in the forest' Fig. 19 (B) 'in the recipient'

Fig. 20 (B) 'his two sacrifices'

Fig. 21 (Z) 'we killed a monkey'

Fig. 22 (Z) 'we killed a lizard'

Fig. 23 (Z) 'we made the field'

Fig. 24 (Z) 'here is a monkey'

Fig. 25 (Z) 'here is a lizard'

Fig. 26 (Z) 'here is a field'
The Tone Puzzle of Wobe

Fig. 27 (Z) 'we ate monkey meat'

Fig. 28 (Z) 'we ate lizard meat'

Fig. 29 (Z) 'we ate a field animal'

Fig. 30 (B) 'he stayed in the village'
Fig. 31 (B) 'it is he who tried the yam'

Fig. 32 (B) 'it is he who bought yam'

Fig. 33 (B) 'he bought the rice'

Fig. 34 (B) 'he tried the rice'
The Tone Puzzle of Wobe

Fig. 35 (Z)  
Fig. 36 (Z)

Fig. 37 (Z) 'canoe made of a single tree trunk'  
Fig. 38 (Z)

Fig. 39 (Z)  
Fig. 40 (Z)

Fig. 41 (B) 'he tried it'  
Fig. 42 (B) 'he bought it'
Fig. 43 (Z) 'he denied'

Fig. 44 (Z) 'old individual'

Fig. 45 (Z) 'old lion'

Fig. 46 (B) 'he bought a ladle'

Fig. 47 (B) 'he tried it for a long time'
Fig. 48 (B) 'he used to buy it for a long time'

Fig. 49 (B) 'the place where he bought rice is here'

Fig. 50 (B) 'he looked at the rice'
REFERENCES


Swahili e, ka, and nge are hypothesized to be signals with meanings that deal with the degree of probability of an event taking place. All three forms grammatically assign a lack of certainty to the event. This is termed questioning the event. More specifically, e signals that although the event is questioned it is still relatively likely; nge signals questioned and relatively low likelihood; ka signals simply questioned and is neutral to higher or lower likelihood. Human inferential capacity allows a wide range of messages to be conveyed by the signaling of these unitary meanings in various contexts. Traditional analyses of these forms fail to distinguish between meaning and message and in so doing either (1) posit as meaning a part of the message range (as with ka) or (2) categorize the messages into types and posit each type as a meaning (as with e and nge). Limitations of traditional theory thus inhibit the postulation of the underlying unitary meaning necessary to explain the actual distribution of a form.

1. Introduction

The approach to language presented in this paper is based upon the pos-
tion that the structure of human language is determined by its function as an instrument of communication. To view language as such a system supposes its basic units to be signals paired with meanings. Since the number of signal-meaning pairs in a language is perforce finite while the communicative potential of a language is unlimited, there must be some mediating apparatus that allows unlimited messages to be communicated by a finite number of meanings. This mediator between meaning and message is inference, i.e. the problem solving ability of human intelligence, in particular the ability to go beyond given information to draw plausible conclusions. A hearer will examine and integrate all available information, not only the meaning of a signal but also, very importantly, its linguistic and extralinguistic context, to arrive at what he infers is the message intended by the speaker in the signaling of that meaning.

The analytical goal of such an approach is to postulate unitary meanings for signals and to show how these meanings are appropriate to explain the actual distribution of the signals in a text, i.e. to show how all the messages conveyed by a signal are manifestations of a signal's unitary meaning.

Traditional procedure, too, has been to analyze forms in search of a unitary meaning. However, faced with the wide range of messages conveyed by a signal in a variety of contexts, the tendency has been to carve this range into conceptually different "uses". This usually has one of two alternative results. The first alternative is that each use is postulated as a meaning, resulting in an (often unstated) claim of homonymy. The second alternative is that the statistically most frequent use is postulated as the single meaning of a form, and data that would belie that postulation is ignored or suppressed.

It is because traditional approaches have no explicit recognition of the problem of how finite signals can communicate an unlimited number of messages that they lack the theoretical motive for the distinction between meaning and message. Only the message is accessible to a traditional analysis and thus its categorization of a form's semantic content is almost necessarily multiple. Such approaches make their goal the analysis of the message after it has been understood rather than how it is that the message gets understood. This is why in the field of semantics generally the tendency is to
deal with the problems of the philosopher as to the analysis of ideas, i.e. the messages, rather than the analysis of the structure of language, i.e. the meanings and their relations.

Traditional analyses of Swahili proceed as described above. Treatment of the final vowel e is an example of the first alternative just mentioned that of multiple meanings. The final vowel e is called the "subjunctive", a cover term for a list of "uses" to which e is put: second of two commands, purpose, polite commands, etc. Treatment of the marker ka is an example of the second alternative of ignoring all but the most frequent "use". Traditionally, ka is limited to the meaning "consecutive" in spite of abundant counterexamples. The weakness of these approaches is further shown by their complete inability to explain how ka and e in conjunction (traditionally "ka in the subjective") can convey the message "non-past action involving movement away from speaker".

This paper postulates new, unitary meanings for e and ka (as well as for nge, traditionally described by the cover term "conditional"). These meanings deal with the strength of a speaker's claim as to the probability of an event's taking place (the event being that named by the verb stem to which the e, ka or nge is attached). Let us look now at these newly hypothesized meanings and the nature of their interaction with context.

2. nge: LOW LIKELIHOOD OF OCCURRENCE

The marker nge signals the meaning that the event with which it is associated (specified by the verb stem) has a relatively low likelihood or low probability of occurrence. This single meaning is exploited to convey different messages depending on the context in which the meaning is signaled, e.g.

---

1For the purposes of this paper we will consider nge and another "conditional" marker, ngali, to be synonymous, at least in relation to the other forms analyzed here. That is, both signal low probability relative to e, as discussed below in the text. Only nge will be mentioned. The difference between nge and ngali, transparently not one of time as is sometimes suggested, is the basis of a forthcoming paper.
(1) TuNGEsoma sana, tuNGEfaulu mtihani kesho.
    we-NGE-study hard we-NGE-succeed test tomorrow
    'If we were to study hard, we'd do well on the test tomorrow.'

(2) TuNGEsoma sana, tuNGEfaulu mtihani jana.
    we-NGE-study hard we-NGE-succeed test yesterday
    'If we had studied hard, we would have done well on the test yesterday.'

(1) and (2) differ only in the words kesho 'tomorrow' and jana 'yes­
terday' which supply otherwise identical utterances with the respective con­
texts of future and past. It is human experience that we know more about
the past than we do about the future. Here we see linguistic use made of
this fact that the past is relatively known and the future relatively un­
known.

The meaning LOW LIKELIHOOD in the context of the future, e.g. in (1),
results in the message of a low probability of the event, a plausible in­
ference given the general uncertainty of the future. On the other hand, a
speaker can have certain knowledge of a past event. In (2) the speaker as­
sesses a low probability of a past and therefore knowable event. Were the
event actually to have occurred, such a low probability would not have been
assessed by the speaker. The hearer's conclusion will be that the speaker
is claiming that the event did not in fact take place, but had in the past
a low probability of doing so. Let me expand on this.

The actual occurrence of an event is, in general, more salient than the
possible occurrence of an event. Therefore, given the choice of reporting
either an occurrence or a possible occurrence speakers will generally report
the occurrence. When a possible occurrence is reported, we infer that the
speaker did not have such a choice (because if he did, he would report the
actual occurrence). In a future context, a speaker does not have this
choice—he cannot report an actual occurrence—because of ignorance of
things to come; in a past context the speaker hasn't the choice because he
does have a knowledge of things past—he knows what did or didn't happen.

----

2The literal translations are meant to illuminate the signal(s) under
discussion and not to provide the reader with a course in Swahili morphology.
So the meaning LOW LIKELIHOOD in a future context results in the message that the speaker is claiming a low probability for the event that is yet to occur. LOW LIKELIHOOD in a past context results in the hearer concluding that the event did not occur but had in the past a possibility of doing so.

3. e: HIGH LIKELIHOOD OF OCCURRENCE

As nge signals a relatively LOW LIKELIHOOD, e, the traditional "subjunctive", signals a relatively HIGH LIKELIHOOD, a high probability of occurrence.

It should be made clear that the high probability of e is not a certainty, not a probability of "one". An occurrence which is grammatically assigned a lack of certainty we will call an occurrence which is questioned. Thus, e signals that an occurrence is questioned, but the likelihood of occurrence is still relatively high (nge also signals that an occurrence is questioned but that the likelihood is low.)

As mentioned above, the traditional grammars of Swahili explain that there are various uses to which e is put, e.g. polite commands, purpose, and the second of two commands. I suggest that these "uses" are simply traditional categorizations of the wide range of messages that, depending on the context, may be inferred from the meaning of e, HIGH LIKELIHOOD. To be sure, these traditional uses are conceptually different, but linguistically there is no basis for distinguishing them. Philosophically they are distinguishable, but linguistically they are all plausible exploitations of a single meaning, HIGH LIKELIHOOD.

In a certain context, we find e in messages of "polite command":

(3) UnqojE
    you-wait-E

'Please wait/you should wait.'

I therefore do not chop the final a of a Bantu verb nor various verbal endings as the "applicative", "reciprocal", etc. for their separate presence might confuse the reader not thoroughly familiar with Swahili grammar, while those of course who are familiar with it do not need my assistance. The abbreviation "imv", of course, stands for "imperative"; traditional tense names are used, e.g. "future", "past", etc., for ease of presentation, although I do not necessarily claim that these are their meanings.
When a speaker gives a "command", what he does linguistically is to make a prediction about an action to be performed by someone else. The more certain the prediction, the stronger the command. The less certain the prediction, the weaker, or more polite the command. The element of "politeness" in (3) arises from the speaker's less-than-certain assessment of execution of an event to be performed by someone other than the speaker. In not claiming the certainty of the occurrence the speaker allows for some degree of volition on the part of the person who is to do the action (though the high likelihood assessed urges its completion). This lack of certainty "softens" the command by implying that the speaker has less than absolute control over the situation. Such an absolute control would be implied by the use of a form that does not call an occurrence into question, e.g.

(4) Utangoja.
    you-future-wait
    'You will wait.'

(5) Ngoja!
    wait(imv)
    'Wait!'

In different contexts, we find e in messages of "purpose", e.g.

(6) Atakuja dukani anunuE ndizi.
    he-future-come store-loc he-buy-E bananas
    'He will come to the store so that he may buy bananas.'

and as the second of two commands, e.g.

(7) Njoo uIE.
    Come (imv) you-eat-
    'Come and eat.'

In these contexts, e is always attached to a verb stem naming an event that takes place after some earlier event, and, to a greater or lesser degree, as a result of that earlier, first occurrence. The first occurrence is always the prerequisite for the second occurrence. The second occurrence is thus contingent upon the first. This strengthens the relationship between the two occurrences. Compare (6) and (7) above, in which the second
occurrence has been questioned, that is, grammatically assigned a lack of certainty, to (8) and (9) below, in which the second occurrence is not questioned.

(8) Atakuja dukani. Atanunua ndizi.
    he-future-come store-loc he-future-buy bananas
    'He will come to the store. He will buy bananas.'

(9) Njoo. Kula.
    come(imv) eat (imv)
    'Come! Eat!'

In (8) and (9) the second occurrences are not questioned and the effect, according to informants, is one of disjointedness, of more separate, more unrelated actions as compared to (6) and (7). In (6) the actor must go to the store before he can buy bananas and in (7) he must come before he can eat: these are related, closely connected actions, the second contingent upon the first. Because some condition must be fulfilled before the second occurrence may be executed, these contingent occurrences have a greater possibility of not taking place than they would have were they not contingent upon anything, as the events are in (8) and (9). A speaker shows this possibility of non-occurrence by questioning these related, second occurrences, grammatically assigning a lack of certainty and therefore dependence with the presence of e. However, this possibility of non-occurrence is not great, and so e, with the meaning "the occurrence is questioned but HIGHLY LIKELY", is appropriate.

This strategy of exploiting the meaning of e was traditionally categorized as either "purpose" or "the second of two commands" on the basis of whether the first occurrence was a command or non-command, though the linguistic strategy is the same regardless of the antecedent's identity.

4. ka: OCCURRENCE QUESTIONED, NEUTRAL TO HIGH/LOW LIKELIHOOD

We have seen that nge signals that an occurrence is questioned and relatively LESS LIKELY, e that an occurrence is questioned but relatively MORE LIKELY. Sometimes a speaker will not need to, or want to specify "more" or "less" likely. The morpheme ka signals simply that an occurrence is QUESTIONED, without specifying the relative likelihood. This
might be visualized by the following scheme:

\[
\begin{align*}
\text{ka:} & \quad \begin{cases} 
\text{e:} & \text{HIGH LIKELIHOOD OF OCCURRENCE} \\
\text{nge:} & \text{LOW LIKELIHOOD OF OCCURRENCE} \\
\text{OCCURRENCE IS QUESTIONED,} & \text{NEUTRAL TO HIGH/LOW LIKELIHOOD}
\end{cases}
\end{align*}
\]

The Swahili grammars only refer to \text{ka}\textsuperscript{3} as showing action consecutive to the time expressed in the preceding verb, e.g.

\textsuperscript{3}In the Standard Swahili spoken and written in the south of the Swahili speaking area there is a homonymous form, which I will call "southern" \text{ka}, as opposed to the \text{ka} discussed in the text, found throughout the Swahili speaking area, which I will contrastively call 'general' \text{ka}. Southern \text{ka} by itself occupies the two morphological slots often referred to as the "subject prefix" and "tense marker" slots (as does the "tense" \text{hu}) and is only used for third person singular subjects, e.g. (\text{yeye}) \text{ka} \text{fika} 'he arrived' (from \text{fika} 'arrive') but (\text{mimi}) \text{ka} \text{fika} 'I arrived'. So synchronically, southern \text{ka} may thus be viewed as a portmanteau signaling "past time" and "third person singular subject". (Elicitation and textual analysis strongly suggest that southern \text{ka} further signals that the action of the lexical verb to which it is attached should be viewed as one of special importance or higher relevance within the discourse.) I surmise that the origins of southern \text{ka} are to be sought in the Vumba and Mtang'ata dialects of Swahili, spoken around the Kenya-Tanzania border at the coast, for which Lambert [1957] and Whiteley [1956] report that the past tense is signaled by the following, which we will here call "non-standard past tense morphology": (1) "vowel harmony" (complete assimilation of the final vowel to the stem-final vowel, though with regular exceptions); (2) absence of "tense marker"; and (3) a particular set of "subject prefixes" the third person singular being \text{ka}. In other words, the third person singular past in these dialects is, save for vowel harmony, morphologically the same as southern \text{ka}, e.g. Vumba \text{ka} \text{fiki} 'he arrived' (and the vowel harmony is sometimes not in evidence, e.g. with passives). Whiteley [1958] reports that Pemba dialects also show this \text{ka} prefix in the past (though in most dialects with an overt tense marker and no vowel harmony). This non-standard past tense morphology is not documented north of Wasin Island (located in the extreme south of Kenya), and my own research on the Tikuu (also known as Bajuni or Gunya) and Amu dialects in the north of Kenya shows no evidence of its presence. Benji Wald [personal communication] informs me that neither is it in evidence in Mombasa Swahili. And indeed, the Standard Swahili spoken in these more northern areas shows only "general" \text{ka}, with no utilization or even comprehension of southern \text{ka}. That is to say, southern \text{ka} is in evidence only in the Standard Swahili spoken in the south, an area where local dialects show the non-standard past tense morphology, and not in the north, where the local dialects do not.
Nilikwenda sokoni, *nikAununa* ndizi sita, *nikAa* tatu, I-past-go market-loc I-KA-buy bananas six I-KA-eat three
*nikAmpa* mwenzangu tatu.
I-KA-him-give companion-mine three

'I went to market *and bought* six bananas, *ate* three, *and gave* my companion three.'

This very common exploitation of the meaning of *ka* will be discussed shortly. First, let us examine a body of data in which *ka* does not denote consecutive action at all.

The following three examples (taken from modern Kenyan and Tanzanian plays) are of non-consecutive action, past and non-past, questioned by the presence of *ka*.

(12) Two thieves have robbed a man. In the course of the robbery, one kills a policeman. The accomplice says to the killer:

*Wewe mjinga sana Kwa sababu gani uKAwmua yule askari?* (NL:19)

'You're a fool. Why should you have killed that policeman?'

(13) A mother has thrown her daughter out of the house. A friend of the daughter comes to see the mother:

*Friend: Mie ameniambia kama mmefukuza alipo kuja kwangu kulala.*

*Mother: Amfukuze nani? Kuna mzee aKAmfukuza mtoto there-is parent she-KA-throw-out child wake?* (WU:22)

'hers'

*Friend: She told me that you had thrown her out when she came to my place to sleep.*

*Mother: Who threw her out? Is there a parent *who would throw out* her own child?*

(14) A man is speaking to himself after having killed, in a ritual game, a demon-man who laughed as he died. 'Did he want me to kill him?' he asks himself. 'Why did he laugh?' Then he says:

*Alikuwa anacheka huku anakufa! Kuna mtu aKAcheka huku there-is man he-KA-laugh time anakufa? Alijua, sio alijua, aliamini kama hafi.* (MT:8)

'He was laughing as he died! Is there a man *who would laugh* as he died? He knew, no, not he knew, he believed he wasn't dying.'
Examination of the texts shows that the above events with ka ('kill', 'throw out' and 'laugh') have indeed occurred and further that their occurrence was considered by the speaker to be bizarre, quite contrary to normal expectations. In tests substituting ka in the above sentences with li, the non-questioned past tense, informants stress the effect ka has upon the message as one of surprise and incredulity, e.g. various possible translations of (12) suggested by informants were 'what the hell did you kill that policeman for?', 'what really drove you to do such a crazy thing?'.

Even though it is known to the speaker (and hearer) that the event has indeed taken place, the speaker, by using ka, is acting as if there was some question as to whether the event occurred. He does this to suggest that the event might well not, indeed should not, have occurred and to express surprise that in fact it has.

In these instances it is ka, as opposed to nge or e, that is appropriate to show questioning, for ka is neutral to and does therefore not necessarily signal either high or low probability. nge is inappropriate because, as we have discussed, its low probability in a past context would almost certainly imply to the hearer that the event had not occurred. Also inappropriate is e because its high probability meaning would not express the show of uncertainty suggested by ka.

The following example of ka showing questioning is taken from Tanzanian President Nyerere's tract on socialism. Notice which events are questioned by ka, which, that is, the speaker is making a weaker claim that it will occur than if the ka were not present.

(15) Maskini wanaweza kuwa na roho za kibepari --- wanyonyaji wa binadamu wenzake. Vile vile, tajiri anaweza akawa na roho ya same manner rich he-present-can he-KA-be with spirit of Ujamaa; anaweza akathamini mali yake kwa sababu tu socialism he-present-can he-KA-value wealth his for reason only
inaweza kutumiwa kuwasaidia binadamu wenzake...
it-present-can to-be-use-ps to-them-help human companions his
Nimesema kuwa tajiri anaweza akawa mpenda Ujamaa. I-perfective-say to-be rich he-present he-KA-be adherent socialism
Lakini kumpata tajiri mpenda Ujamaa ni shida sana. Kwa kweli utajiri na Ujamaa hupingana.
'Poor men can have the souls of capitalists --- parasites on their fellow men. Likewise, a rich man can have a socialist spirit; he can value his wealth only because it can be used to help his fellow man... I have said that a rich man can be one who embraces socialism. But finding a rich man who loves socialism is quite unlikely. In truth wealth and socialism do not get along.'

Dr. Nyerere stresses the less-than-certain, i.e. "questioned" nature of the proposition that a rich man could be the soul of socialist wealth sharing. He states in so many words that it is unlikely and marks by ka as questioned occurrences that a rich man could have a socialist spirit, value his wealth only to help others, be one who embraces socialism. Notice in the opening sentence that Dr. Nyerere does not similarly question the proposition that poor men can be capitalists at heart and covet the wealth of others.

Another exploitation of ka 's meaning, OCCURRENCE IS QUESTIONED, also unnoticed by grammarians, is exemplified by the following:

(16) A wife has found her husband seducing another woman. She cries as the scene fades. The next act of the play opens with the husband and wife having sat together for some time without speaking. The husband paces nervously, the wife is dejected, lost in her own thoughts. The wife clears her throat.

Husband: (quickly) 'Yes?' Wife: 'I didn't say anything.'
Husband: 'I thought you said something.' Silence.

The wife stares fixedly, calls her husband's name.
Husband: (slowly) 'Yes?' The wife says:

Wife: Naona... mimi naona (pole pole)... ingalikua
I-present-feel I I-present-feel slow slow it-ngali-be
bora uKAniacha,
better you-KA-me-leave

Husband: (Anageuka haraka) NikuachE?
he-present-turn quick I-you-leave-E

Wife: Ndlo, uniachE (WU:39)
yes you-me-leave-E

Wife: I feel...I feel (spoken slowly)... it might be better if you were to leave me.
Husband: (turns quickly) I should leave you?
wife: Yes, you should leave me.

The speaker (the wife) is making what amounts to a prediction about an
action to be performed by another (her husband) and the situation is therefore a command context exactly parallel to examples (3)-(5) discussed above in the section on e as polite command. Remember that a prediction of someone else's actions that is questioned though HIGHLY LIKELY (that is, with e) is more deferential than a non-questioned prediction because in not claiming the surety of the occurrence one allows for volition and situational control on the part of the person who will perform the action. (Yet the high likelihood assessed urges the execution of the event.) The wife's use of ka in (16) shows even more deference.

The wife begins, approaching the situation as tentatively as possible ('It might be better'⁴), followed by ka, the signal for QUESTIONED, on the action that she is gently urging her husband to do ('if you were to leave me'—notice in the Swahili there is no lexical 'if' or 'were'; these are glosses of ka's contribution to the message). Elicitation from informants suggests that ka is appropriate here, and nge and e are not, because nge would result in a claimed probability too low to allow interpretation as "urging" or even "suggesting" while e would signal so high a probability as to preclude the tentativeness with which the wife broaches this extremely delicate subject. Notice how once the subject has been broached and the husband, in his surprise asks with e, the high probability form, if she is saying 'I should leave you?', the wife then responds with e, as if saying, now that it's out in the open, 'yes, you should leave me'.

Let us now return to those instances of ka that are discussed by the grammars, exemplified by (11), repeated here:

(11) Nilikwenda sokoni, niKAunu na ndizi sița, niKAla tatu, I-past-go market-loc I-KA-buy bananas six I-KA-eat three
    niKampa mwenzangu tatu, I-KA-him-give companion-mine three

⁴As stated in fn. 1, both ngali (found in the example under discussion) as well as nge signal low probability relative to e's high probability. We may note then that example (16) shows a clear, step-by-step correlation of signaled degrees of probability to the deference-tentativeness found in the message: ngali (low probability, high deference), ka (neutral to high/low probability, therefore appropriate for what might be called relatively "mid" deference), e (high probability, less deference-tentativeness).
'I went to market and bought six bananas, ate three, and gave my companion three.'

In contexts such as these, the action of the verb with ka is always in some way dependent upon another occurrence and will not take place if the other does not. In (11) we may view 'going to market' as a necessary prior condition to the 'buying of six bananas' which is in turn a necessary prior condition to 'eating three', and so on. The action of the verb with ka is thus a result of another, prerequisite action. This is the same kind of relationship discussed in regard to e in examples (6) and (7), in which the messages inferred from the questioning of a second occurrence, and thus claiming a contingency relation, were "purpose" and the "second of two commands". Here also, the speaker questions the action of the verb by including ka, i.e. grammatically assigning the action a lack of certainty. In these instances the lack of certainty about the action of the verb with ka is only to the extent that the action is contingent upon a previous occurrence and will not take place if that one does not. However, in this past context the hearer can infer that the prerequisite action has indeed been performed ('I went to market') and that the action of the verb with ka, contingent upon it, also has. So the speaker does not intend a message that leaves the occurrence of the verb with ka in doubt but rather, by suggesting that the occurrence was contingent upon another event, known to have occurred, he shows that the actions were related, conjoined events. Compare (11) above, in which the buying and eating are grammatically questioned and therefore contingent events, with (11') below, in which these actions are not grammatically questioned.

I-past-go market-loc I-past-buy bananas six I-past-eat three
Nilimpa mwenzangu tatu.
I-past-him-give companion-mine three.
'I went to market. I bought six bananas. I ate three. I gave my companion three.'

In (11') the buying, eating and giving are not grammatically questioned as they are in (11) and are perceived by informants as more separate, unrelated events.
This effect of contingency and a therefore closer feeling of relation comes from the fact that some condition must be fulfilled before the action of the verb with ka may occur (not the case in (11')). Because some condition must first be fulfilled, the contingent occurrence has a greater possibility of not taking place than if it were not contingent upon anything (as are the events in (11')). This possibility of non-occurrence is signaled by the presence of ka. However, as noted before, the hearer infers that the prior condition has indeed been met, and that the action of the verb with ka, contingent upon it, also has actually occurred.

It is this exploitation of the meaning of ka that led to the traditional definition of ka as the "consecutive tense". Yet even with this exploitation of ka any consecutiveness is simply a consequence of the contingency relationship being claimed and not part of ka's constant meaning. There is certainly no consecutiveness in the previously discussed examples (12)-(16).

5. ka-e: LOWER LIKELIHOOD THAN e ALONE.

The morphemes ka (OCCURRENCE QUESTIONED) and e (OCCURRENCE QUESTIONED but HIGHLY LIKELY) may co-occur on the same verb stem. The semantic effect of such co-occurrence appears to be additive, the event being named by the verb being questioned twice. Thus, we may view the situation as being in effect a questioning of e, a lowering of the likelihood that would be assessed were only e present on the verb. We might visualize this by adding ka-e to the scheme presented before in (10):

(17)

\[
\begin{align*}
\text{ka:} & \quad \text{OCCURRENCE IS QUESTIONED,} \\
& \quad \text{NEUTRAL TO HIGH/LOW LIKELIHOOD}
\end{align*}
\]
\[
\begin{align*}
\text{e:} & \quad \text{HIGH LIKELIHOOD OF OCCURRENCE} \\
\text{ka-e:} & \quad \text{LOWER LIKELIHOOD THAN} \\
& \quad \text{e ALONE} \\
\text{nge:} & \quad \text{LOW LIKELIHOOD OF OCCURRENCE}
\end{align*}
\]

We find this combination of ka and e (ka-e) in contexts which we can characterize (for second and third person actors) as involving movement away from the speaker. The combination ka-e contrasts with e alone for in comparable situations we normally find e attached to verbs whose execution requires either no movement relative to the speaker or movement toward the speaker. Compare the following:
(18) Atakwenda dukan i aKAnunuE ndizi. (ka-e: movement away)
he-future-go store-loc he-KA-buy bananas
"He will go to the store to buy bananas."

(19) Atakuja dukan i anunuE ndizi. (e alone: movement towards)
he-future-come store-loc he-buy-E bananas
"He will come to the store to buy bananas."

(20) Nenda uKAIE.
go (imv) you-KA-eat-E
'Go and eat.'

(21) Njoo uIE.
come (imv) you-eat-E
'Come and eat.'

(22) Njoo uKAIE.
come (imv) you-KA-eat-E
'Come, and then go eat.'

(23) A match is on the floor between speaker and hearer:

(a) Inama ukiokotE kibiriti. (e alone: no movement)
bend down (imv) you-it-pick up-E match
'Bend down and pick up the match.'

(b) *Inama uKAKiokotE kibiriti. (*ka-e: no movement)
bend down (imv) you-KA-it-pick up-E match
'Bend down and pick up the match.'

The above examples of e alone are of the type discussed in the section on e concerning "purpose" and the "second of two commands". The important point here is that they contrast with the ka-e examples in terms of movement relative to the speaker. ka-e signals more questioning than does e alone. In terms of different messages conveyed, the distinction is habitually "movement away from speaker" versus "no movement from speaker".

The degree of questioning of any event is going to be influenced by how much information the speaker can have about that event (remember the differences in message caused by the contexts 'past'—more known—versus 'future'—less known). A speaker will habitually claim, about an event to be performed by another, a greater certainty (e alone) if he is in the
place where the action is to be performed (the case with an action involving no movement away from the speaker) and a lesser certainty (ka-e) if he is not in the place where the action is to be performed (the case with an action that involves movement away from the speaker).

A speaker may, however, claim the higher certainty about another's actions even though he is not in the place where the action is to be performed, i.e. the action will involve movement away from the speaker, yet despite his relatively less knowledgeable position he claims the higher degree of certainty (e alone) instead of the slightly lower degree (ka-e) often associated with such contexts, e.g.

(24) Ałakwenda dukani anunuE ndizi.
    he-future_go store-loc he-buy-E bananas

'He will go to the store so that he may buy/with the express purpose of buying bananas.'

The effect on the message is a claim of 'strong purpose': when the actor goes to the store, the speaker claims, it is highly probable (e alone) that he will buy. This is very appropriate for situations where the speaker claims knowledge of the actor's strong intentions, strong enough to counterbalance the lack of knowledge of certainty that goes with the speaker's not being in the location where the event is to be performed.

So other things being equal, a speaker will claim a lower certainty (ka-e) from a less knowledgeable position (not in location of event) and a higher certainty (e alone) from a more knowledgeable position (in location of event). But if the speaker wants to show he has extra information that has a bearing on the probability of the event (an actor is more likely to do something if he strongly intends it than if he does not), he can claim the higher certainty (e alone) from an otherwise less knowledgeable position (not in location of event).

6. Conclusion

This paper has presented a new analysis of the Swahili forms e, ka, and nge, an analysis that recognizes the necessity for making a distinction between a form's meaning, i.e. its semantic constant, and the range of possible messages that a hearer can infer from the form's presence in var-
ious contexts.\textsuperscript{5}

All instances of the occurrence of these forms in speech are seen to be the direct consequence of a form's constant meaning, and the appropriateness of its semantic contribution to the intended message as a whole. Thus we have an analysis that is more than just the listing of a form's uses, and further, that does not merely cite one of these uses as the semantic constant. Rather, it has been hypothesized that there is an invariant meaning attached to the form, through which we may come to an understanding of its varied uses.

\textsuperscript{5}This approach to linguistic analysis derives from the theoretical framework known as "form-content" grammar, an approach to the semantics of grammatical systems originally developed by Professor William Diver at Columbia University. For a general introduction to the theory, see Diver [1975: Introduction]; Garcia [1975: Ch. 2]. For a detailed application of the theory, cf. Garcia [1975]. Other studies of Swahili within this framework are Port [1972], Contini [1974, 1976, 1979], and Hawkinson [1979].
REFERENCES


SWAHILI TEXTUAL REFERENCES


RELATIVE TIME REFERENCE IN THE BAMILEKE TENSE SYSTEM

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In this paper it is demonstrated that Bamileke-Dschang (Grassfields Bantu, Cameroon) has a highly developed system of multiple past and future tenses with inherently relative time reference. A tense marker in one clause may refer either relatively to the time reference of a preceding clause, or it may refer absolutely to the time of speaking. In addition, tense markers can be combined within a single clause, in which case the timing of a second tense marker is calculated relative to the first marker. It is shown that tense markers occurring in second position in a clause historically derive from main verbs which are consecutivized one after the other.

In an unpublished paper on the tense-aspect structure of the Dschang dialect of Bamileke, a Grassfields Bantu language spoken in Cameroon, Tadadjeu [1975] argues that in both past and future time reference, Dschang distinguishes five tenses. These are illustrated in (1) and (2).

(1) past tenses (P₁ - P₅)
    P₁ : Ḃá 'táŋ 'he has just bargained'
    P₂ : Ḃá ṃtáŋ 'he bargained [earlier today]'
    P₃ : Ḃ kò táŋ 'he bargained [yesterday]'  
    P₄ : Ḃ lè táŋ 'he bargained [before yesterday; some days ago]'
    P₅ : Ḃ lè la? án táŋ 'he bargained [a long time, e.g. a year or more ago]'

---

¹This article is a revised version of a paper presented at the Annual Winter Meeting of the Linguistic Society of America, Boston, 1978. I am particularly indebted to Maurice Tadadjeu, who discussed these data with me and who provided the major source of information for this paper. While he may or may not agree with my reanalysis, I am grateful to him for sharing his earlier work with me. I would also like to thank Michael Silverstein for bringing certain materials on multiple tenses in Amerindian languages to my attention as well as the members of the Grassfields Bantu Working Group for their valued interaction. Research on Grassfields Bantu was supported in part by a National Science Foundation grant no. BNS76-81261 and by a Guggenheim Fellowship.
(2) future tenses (F₁ - F₅)

| F₁  | a'ad tάñ | 'he is about to bargain' |
| F₂  | àa 'pìn'ό tάñ | 'he will bargain [later today]' |
| F₃  | àa 'lű'ό tάñ | 'he will bargain [tomorrow]' |
| F₄  | a'ad lάθέ 'tάñ | 'he will bargain [after tomorrow; some days from now]' |
| F₅  | a'ad fú 'tάñ | 'he will bargain [a long time, e.g. a year or more from now]' |

The time distinctions categorize actions which have occurred or will occur
(1) immediately before or after the time of speaking; (2) earlier or later the same day; (3) the day before or the day after; (4) some days before or some days after; and (5) a long time before or a long time after. The symmetry of this proposed system of five past and five future tenses is matched by the presence of several time adverbials in Dschang which, as seen in (3), can also refer to either the past or the future, depending on context:

(3) a. èěsčo | 'yesterday; tomorrow'
   b. àlè? zèè | 'the day before yesterday; the day after tomorrow'
   c. èfù? 'mó? | 'this morning; this evening'

Many languages, especially in Africa, have been noted to divide up past and future time into more than one tense, e.g. today past tense, yesterday past tense, and before yesterday past tense. As in these other languages, the tenses in (1) and (2) have been defined with respect to the present time of speaking and thus have been dealt with as having absolute time reference, as in Tadadjeu's analysis. Upon closer examination, however, I have found these tenses to have relative time reference, as seen in the tentative reanalysis in (4).

<table>
<thead>
<tr>
<th>(4) definition</th>
<th>time reference</th>
<th>past tenses</th>
<th>future tenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROXIMATE</td>
<td>[very short time]</td>
<td>P₁: 'á'</td>
<td>F₁: 'á'</td>
</tr>
<tr>
<td>SAME DAY</td>
<td>[a few hours]</td>
<td>P₂: àa</td>
<td>F₂: F₁ + plό</td>
</tr>
<tr>
<td>ONE DAY AWAY</td>
<td>[a day]</td>
<td>P₃: kě</td>
<td>F₃: F₁ + lű/šu?</td>
</tr>
<tr>
<td>SOME DAYS AWAY</td>
<td>[±2 or more days]</td>
<td>P₄: lě</td>
<td>F₄: F₁ + lά?</td>
</tr>
<tr>
<td>LONG TIME AWAY</td>
<td>[±a year or more]</td>
<td>P₅: P₄ + lά?</td>
<td>F₅: F₁ + fú</td>
</tr>
</tbody>
</table>
Already in Tadadjeu's earlier study there were a few hints that these tenses have a relative character, as seen in the sentences in (5) and (6), taken from his 1975 paper:

(5) à kè 'lê ṣọt èè 'lù î dì lì 'mò 'he said [P₃] that you will see he P₃ say that you F₃ see child the child [P₃]'  
(6) àà 'lù î dì ?e yè è kè lì 'mò 'he will say [P₃] that you saw he F₃ say that you P₃ see child the child [P₃]'  

These sentences have two readings. If the tense of the second clause is interpreted as referring to the present time of the discourse, (5) is read 'he said [yesterday] that you will see the child [tomorrow]' and (6) is read 'he will say [tomorrow] that you saw the child [yesterday]'. In such a case the F₃ and P₃ tenses have absolute time reference. In a second reading, however, the tense of the second clause refers to the time represented by the tense of the first clause. In this case the reading of (5) is 'he said [yesterday] that you will see the child [today]', and that of (6) is 'he will say [tomorrow] that you saw the child [today]'. In this case, the F₃ and P₃ tenses have relative time reference.

In these examples the potential relativity of time reference is seen from the interaction of two separate clauses. This is the usual context cited in descriptions of tense systems said to have relative time reference e.g. Comrie [1976] and Givón [1972]. What is particularly striking about the Dschang system is that many of the tense markers can be combined in the same clause and thus refer relatively to each other, as seen in (7) and (8)

(7) àà 'lù î dì lì ?e lì lì 'mò 'he will bargain later tomorrow'  
    he F₃ F₁ bargain

(8) à à 'lè lá? nflu ñtàn 'he long ago bargained a long time afterwards' [i.e. after something else]  
    he P₅ F₅ bargain

In (7) the F₃ tense marker establishes the time reference as being tomorrow i.e. the day after the time of the discourse. The F₁ tense marker, which is defined as meaning 'later the same day', thus now refers to later time tomorrow. In (8) the P₅ tense marker establishes that the action has taken place a long time, perhaps years, ago. The following F₅ tense marker indicates, however, that the action has, in addition, taken place a long time
after something else, whose $P_5$ time reference had already been established in the discourse. The result is something quite different from what would have obtained if these tense markers had absolute time reference. We see in the above examples that subsequent time references are established relative to preceding ones, with the first time reference normally being determined with respect to the time of the actual discourse.

We now turn to the question of which tenses can combine with which. A table is provided in (9).

\[
\begin{array}{cccccccccc}
 & P_5 & P_4 & P_3 & P_2 & P_1 & F_1 & F_2 & F_3 & F_4 & F_5 \\
\hline
F_2 & + & + & + & + & - & = & \# & + & + & + \\
F_3 & + & + & + & \# & - & = & + & \# & + & + \\
F_4 & \# & \# & \# & \# & - & = & \# & \# & \# & \# \\
F_5 & + & + & - & - & - & = & \# & \# & \# & - \\
\end{array}
\]

In this table (+) indicates that a given tense combination is attested, while (-) indicates that the combination in question is ungrammatical. The equal sign (=) reflects the fact that the $F_2$, $F_3$, $F_4$, and $F_5$ tenses are constructed by using tense markers following the marker 'a', which, used alone, marks $F_1$. Finally, the unequal sign (\#) occurs when a given combination is attested, but with a meaning other than the one predictable from a mechanical reading of the combined tenses. One general property of the system is that none of the past tenses, nor the $F_1$ tense, occurs in second position. That is, only $F_2$, $F_3$, $F_4$, and $F_5$ occur in this position. The reason for this is that it is exactly these tense markers which are still morphologically verbs, with the etymologies shown in (10) (cf. Tadadjeu [1975:46]):

\[
\begin{align*}
F_2 & \quad \text{p`n} < \text{lè-p`n} \quad \text{'to return'} \\
F_3 & \quad \begin{cases} 
\text{lù} < \text{lè-lù} \quad \text{'to get up'} \\
\text{šù?} < \text{lè-šù?} \quad \text{'to come'}
\end{cases} \\
F_4 & \quad \text{lá?} < \text{lè-lá?} \quad \text{'to spend the night'} \\
F_5 & \quad \text{fú} < \text{lè-fú} \quad \text{?}
\end{align*}
\]
That these markers are still verbs (even if no corresponding main verb exists in the case of F₅) is seen from the sentences in (11), where the future markers take the infinitive prefix le-:

\[(11) \quad \text{a} \quad \text{he} \quad \text{F₃ want to} \quad \text{F₂ bargain} \quad \text{[later today]}' \]
\[\text{"} \quad \text{"} \quad \text{"} \quad \text{le-iù} \quad \text{le-sù?} \quad \text{[tomorrow]}' \]
\[\text{"} \quad \text{"} \quad \text{"} \quad \text{le-Iá?} \quad \text{[after tomorrow]}' \]
\[\text{"} \quad \text{"} \quad \text{"} \quad \text{le-Iú} \quad \text{[a long time from now]}' \]

Since these markers are still verbs, they can be used after other tense markers in exactly the same way as main verbs. What this means is that in second position these markers occur in the consecutive construction. Thus, the sentence seen earlier in (7) actually has four different potential meanings, as seen in (12).

\[(!2) \quad \text{a} \quad \text{he} \quad \text{F₁ get up & return & bargain} \quad \text{[next day future]}' \]
\[\text{b} \quad \text{he} \quad \text{F₁ get up} \quad \text{F₂ bargain} \quad \text{[next day bargain]}' \]
\[\text{c} \quad \text{he} \quad \text{F₁ F₃ return & bargain} \quad \text{[later the same day]}' \]
\[\text{d} \quad \text{he} \quad \text{F₁ F₃ bargain later tomorrow}' \]

From these examples we see how in the F₁ tense a verb meaning 'to get up', i.e. the next morning, can become a "next day future". Similarly, if one returns (understood: to a certain place or state of mind) and then does something, this doing something necessarily takes place subsequent to the first action or state, whence the development of a "later the same day".

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2These sentences appear in Tadadjeu [1975:11]. Tadadjeu has informed me [personal communication] that the verbal tense markers can be used in imperatives as well. I have also determined that they take the same consecutive markers as do main verbs, basically N- after a past tense and e- (→ ø) after a future tense.
future.

Returning to the table in (9), we notice that progressively more future tenses are possible in second position as we move from $P_1$ to $P_2$ to $P_3$ and to $P_4$ and $P_5$. The reason why this is so is largely semantic. The basic pattern is illustrated in (12).

\[(13) \text{áá ámbíng hàtáng} \quad \text{he F}_2 \quad \& \text{bargain} \quad \text{he earlier today bargained later [than something else that took place earlier today]}\]

In this combination the only tense which could conceivably make sense after the immediate past tense ($P_1$) would be the $F_1$, in which case the meaning would be 'he just bargained just after something else'. However, we have already said that $F_1$ does not occur in second position, and specifically because the $F_1$ construction does not involve a tense marker which is a verb capable of occurring in the consecutive construction. As we move further into the past in the table in (9), more of the future tenses make sense in second position.

Let us now consider cases where (#) indicates a change of meaning. Where the same $F_2$, $F_3$, or $F_4$ marker is combined with itself, the second occurrence must necessarily be a main verb, as seen in the example in (14).

\[(14) \text{áá 'íwú 'íwú táŋ} \quad \text{he F}_3 \quad \& \text{bargain} \quad \text{he will get up and bargain [tomorrow]}\]

This does not apply to doubling of $F_5$, which is impossible since no existing corresponding main verb has been found. In cases where the second verb is the $F_4$ marker, it sometimes has its main verb meaning 'to spend the night', as in (15),

\[(15) \text{áá 'íwú lág? táŋ} \quad \text{he F}_5 \quad \& \text{bargain} \quad \text{he will spend the night [tomorrow] and bargain}\]

or, more interestingly, gives a "definite" meaning. Thus, consider the two possible meanings of (16).

\[(16) \text{áá fú 'íwú táŋ} \quad \text{he F}_5 \quad \& \text{bargain} \quad \text{a. 'he will spend the night [some years from now] and bargain'}\]

\[\text{b. 'he will definitely bargain [some years from now]'}\]
In (16a) laʔ appears as the main verb 'to spend the night'. In (16b), however, laʔ indicates that the action is more certain to occur and can even be interpreted as creating a future anterior tense, i.e. 'he will have bargained [some years from now]'. What one does not find is laʔ occurring as an F₄ marker in second position. Thus, (16) cannot mean 'he will a long time from now bargain some days afterwards'. The reason for this is that the definite/anterior reading preempts the F₄ interpretation. It is only when it is used in isolation that laʔ signifies the F₄ time span.

The relativity of time reference encoded by these tenses is thus firmly established. In addition, it can be demonstrated that the time periods covered by each tense partially overlap, which requires some modification of the analysis tentatively proposed in (4). Remaining in the F₄ tense for the moment, we observe in (17) that laʔ can precede the F₅ marker fú:

(17) əlaʔ laʔ fu tāŋ
he F₄ F₅ bargain from now

'he will definitely bargain [some years from now]'  

Although (17) appears to be built on the F₄ tense, its only meaning is 'he will definitely bargain [some years from now]', i.e. exactly the same meaning as in (16b). What this indicates is that the F₅ marker fú "pushes" the time span forward into the distant future. Similarly, in (18),

(18) əlaʔ laʔ tāŋ ə'zɔɔ
he F₄ bargain tomorrow

where the time adverbial 'tomorrow' is used with F₄ instead of the expected F₃, we observe that F₄ can also be pushed back into the tomorrow time span. By using F₄ instead of F₃, the speaker communicates his subjective viewpoint that tomorrow is more distant than its normal F₃ designation. Similarly, the F₃ marker lu can be extended into the F₄ time span with a time adverbial, as seen in (19).

(19) əə lu tāŋ əlɛ zɛɛ
he F₃ bargain day after tomorrow tomorrow

'he will bargain the day after tomorrow

By using the F₃ instead of the expected F₄ tense in (19), the speaker treats the day after tomorrow as being closer to the reference point than it would be with the other tense. The same subjectivity determines which tense will be used in any given context.
Note, finally, that the same à? marking P4 and/or future definite/anterior is used after P2, 3, and 4 to indicate a past anterior, as in (20).

(20) a. à áà àndá? àntáng \(\text{he P2 bargain}\) 'he had already bargained [earlier today]'

b. à kée à? àntáng \(\text{he P3 bargain}\) 'he had already bargained [yesterday]'

c. à lè à? àntáng \(\text{he P4 bargain}\) 'he bargained [a long time ago]' \(\text{(=P5)}\)

In the case of à? following P2 and 3, the bargaining has been completed before something else which took place earlier today and yesterday, respectively. When à? follows P4, however, we obtain the P5 tense with the meaning of a long time ago. Thus, except for its P4 function, à? indicates anterior, definite time reference within the period covered by the preceding tense marker.

We now come to the question of assigning exact meanings to the tenses. Ideally a tense system involves one form for each meaning and one meaning for each form. Also, as Tadadjeu had hoped, a tense system ideally recognizes the same distinctions in the past as it does in the future. One problem resulting from the above analysis is that the P5 tense in (20c) is formally identical to P4 + à?, and since the anterior marker à? can be factored out as a separate parameter pervading the system, we are left with only four past tenses (P1 – P4) as opposed to the five future tenses. We will not resolve this difficulty here.\(^3\) Instead, we attempt to capture the above

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\(^3\)A similar problem exists in other Grassfield Bantu languages, as I found in working with Étienne Sadembouo on Bamileke-Fe’fe’ and with Emmanuel Chiabi and John Watters in Kom. In Fe’fe’, the verb ffm ‘to come back’ has frequently been identified as becoming an "earlier today" past tense marker (cf. Ngangoum [n.d.:94]). However, it can be combined with both the "yesterday" and "general" past tense markers to indicate that the event took place in the morning, i.e. earlier that day. In Kom, on the other hand, there is a marker lè which, as pointed out by Chia [1975], forms the basis for a distant past tense much like the P5 in Dschang. However, this marker combines with the three other past tenses and has the meaning 'in the morning'. (As suggested by Emmanuel Chiabi, lè may derive historically from the verb /lɔl/ 'to get up'.) The problem in Fe’fe’ is that it would be arbitrary to recognize an earlier today tense marked by ffm without recognizing similar 'early that day' tenses when ffm follows the various past
insights with the binary feature analysis provided in (21).\textsuperscript{4}

The following features are utilized in (21):

(a) [SAME DAY]: tenses refer to time periods which may or may not take place during the same day as the reference point, e.g. the time of speaking.

(b) [NEAR]: within each feature specification for [SAME DAY], a tense may or may not refer to the portion of the time period which is nearest to the reference point; thus, for example, [+SAME DAY, +NEAR] refers only to immediate past (P\textsubscript{i}) or immediate future (F\textsubscript{i}).

(c) [ANTERIOR]: pending a more detailed analysis, forms with \#\#? are specified [+ANTERIOR], while forms lacking \#\#? are [-ANTERIOR]; the one exception if F\textsubscript{4} which, although marked by \#\#?, is [-ANTERIOR].

(d) [FAR]: because of the F\textsubscript{5} tense, a further feature is required to indicate time periods which are far from the reference point; this redundantly covers P\textsubscript{5} since although formally a past anterior, P\textsubscript{5} is semantically a distant past.

In addition to these features, another feature will be needed to distinguish past from future tenses.\textsuperscript{5}

\textsuperscript{4}Various feature analyses have been proposed to capture tense-aspect distinctions, including Givón [1972], Friedrich [1974], Hymes [1975], and Anderson [1979], the last of whom treats Aghem, another Grassfields Bantu language.

\textsuperscript{5}Anderson [1979] uses both [PAST] and [FUTURE] for Aghem, while in closely related Kom (and in Noni), it may be possible to capture past, present and future tenses with the single feature [FUTURE]. This is because in
The advantage of this feature analysis is that the subjectivity of time reference is accurately captured. In (18) above we saw that the so-called "after tomorrow" general future tense (F₄) could be used with the time adverbial 'tomorrow'. In (19) we saw that the so-called "tomorrow" future tense (F₃) could be used with the time adverbial 'day after tomorrow'. These facts indicate that definitions such as "tomorrow future tense" (in absolute terms) or "next day future tense" (in relative terms) are inadequate. Instead, as seen in (21), the F₃ tense is defined as [-SAME DAY, +NEAR] and is thus defined as "just after the same day". The F₄ tense, on the other hand, has the feature specifications [-SAME DAY, -NEAR] and is defined as "after the same day". Whether one chooses to refer to events as occurring "just after the same day" (=F₃) or not depends on one's subjective judgment. One can argue, of course, that the time period which objectively falls "just after the same day" is precisely "the next day". While this is a fact about time, a speaker can choose to treat a more distant time period as being just after (or just before) the same day.

Whether this feature analysis can provide further insights and be extended to other areas of the Dschang tense-aspect system is not known. In any case, the preceding discussion has, I hope, justified the notion that these tenses inherently denote relative time reference and that their exact use in discourse is in part subjectively controlled by the speaker.

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6Cf. Sharman [1956:30-31] who describes part of the ChiBemba tense system as follows: "The distinction 'recent-remote' has hitherto been formulated (if at all) as 'yesterday-before yesterday'. Very often, a 'recent' event will be discovered to have occurred yesterday, naturally enough: but the correct division is the vaguer one. The attitude of the speaker is the deciding factor, not the mechanical division of days."
REFERENCES


WHAT IS DOWNSTEP? A REPLY TO CLARK

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This paper replies to a proposal by Clark [1980] that syntactically conditioned downstep in Igbo and Kikuyu should be reinterpreted within a dynamic framework of tonal representation according to which tone patterns are characterized in terms of pitch change markers (pcm's). We show that the reanalyses proposed by Clark within this framework involve an unnecessary proliferation of rules, failing to capture simple generalizations that are naturally expressed within an autosegmental approach.

1. Introduction

In recent papers and in her 1978 thesis, Mary Clark proposes a new theory of tone which she terms the dynamic-tone framework. Her contribution to a recent number of Studies in African Linguistics [Clark 1980] argues that this theory provides an account of downstep which is superior to those given within an alternative framework (that of autosegmental phonology) by Goldsmith [1976] for Igbo and by Clements and Ford [1977] for Kikuyu. Briefly, downstep is characterized by Clark as a primitive phonological entity "~", occurring at syllable boundaries, which determines a phonetic drop in pitch on subsequent syllables. The novelty of Clark's proposal is that all tonal distinctions, not just those normally treated under the rubric of "downstep" in terraced-level tone languages, are characterized in terms of this unit, or in terms of its converse "↑" (upstep), which determines pitch rises. It is quite natural that Clark should seek to find prime evidence for such a frame-

[Editor's note: This article is a reply to Mary M. Clark, "On the treatment of syntactically-distributed downstep", which appeared in Studies in African Linguistics 11:101-137. A rebuttal by Mary M. Clark appears on pp. 261-265.]
work in tone languages evidencing terraced-level systems at the surface level, as do Igbo and Kikuyu, for such languages should in principle be the most susceptible to successful treatment within this framework.

However, we remain unconvinced by Clark's argumentation for two primary reasons. First, the conception she presents of explanation in phonology is constructed in such a way as to optimalize theories characterized by the proliferation of rules of a certain type. Second, the specific analyses of Igbo and Kikuyu offered within this framework involve a needless loss of generalization, and moreover, fail to account for much of the data considered. (Clark's article offers further discussion of Akan; we leave the evaluation of her proposals to those with more experience in this language than we have.)

Clark suggests that only a dynamic-tone analysis offers a principled account of tonal alternations triggered by the presence of lexical or grammatical downstep. This claim derives not only from her proposal to eliminate level tones in favor of "pitch change markers" (downsteps and upsteps), but also from another, quite independent proposal: that sequences of contiguous pitch change markers located at syllable boundaries are "ill-formed". Clark states: "One important property of the system is that there can be no more than one pcm [pitch change marker] at a given boundary in the surface form; representations such as "σ + σ" (where "σ" = "syllable") are ill-formed..." (p.115). From such a principle, Clark draws the conclusion that any rule that may be proposed for a tone language which removes one of a pair of offending pcm's at a boundary in a given representation is ipso facto derived in a principled way. Such rules are (following Clark) "principled" even if their effect is to create offending, ill-formed structures in turn (as do her rules (41) and (48)).

This is, at best, a novel use of the term "principled"; in the present case, it is highly misleading as well. If a theory rules out certain surface forms—here, those with two successive pitch change markers—then it is no credit to the same theory that various rules must be invoked within that framework to patch up representations containing adjacent pcm's. Yet patching up is the primary function played by the various "resolution" rules Clark proposes. Furthermore, the connection between the various rules is
not one that is linguistically explanatory in that it might hold promise of explaining how the language could be acquired. Quite the contrary: given the patching up role that the later rules play for the earlier rules in Clark's analysis of Igbo, it is quite difficult to imagine how such a system could be gradually acquired at all. No subpart of the rules could have been acquired at some early stage, for, by Clark's hypothesis, such a subgrammar would generate not only forms which were different from the adult grammar's forms—a reasonable state of affairs—but it would generate simply unpronounceable surface forms, leaving the child with no form at all in a large number of cases.

In our view, then, Clark's frequent use of the term "principled" is idiosyncratic. In general, it is not the function of a linguistic theory to "explain" the contents of language-specific rules; on the contrary, language-specific rules summarize what the language learner has inferred strictly on the basis of listening to the data presented and are thus in a literal sense ad hoc: they are motivated purely by the effort of the language learner to internalize a grammar that will produce the kinds of effects that the learner observes.

In our view, theories tend to be successful when they have the following property (and grammars produced by such theories may then be called principled): a large range of otherwise chaotic data is seen to be the result of the confluence of several simple and largely independent factors, factors which interact in ways that tend to repeat themselves in various human languages (and thus may be seen as the contribution of linguistic theory). We propose to show that the autosegmental accounts of Igbo and Kikuyu have precisely this property. We discuss these languages in turn.

2. Igbo

The basic structure of the Igbo associative construction, from an autosegmental point of view, is relatively simple. A morphologically "floating" High tone occurring between the modified and the modifying nouns is always associated (in the autosegmental sense) with the word on the left, where it is generally phonetically realized (and is thus not an abstract segment). It is, however, deleted when the following word begins with a High tone:
In addition, there are two rules that "mutate" or modify the tone of the second word in the construction, both of which are triggered by this associative High tone. The first, given in (2), shifts a stem-initial High tone to Mid (also called "Drop"), which, in conformity with Clark's informal notation, we symbolize as "!H". The second rule, (3), deletes a Low prefix tone:

(2) $H \rightarrow !H / [H_{\text{affix}}]# (T) + ___$

(3) $L \rightarrow \emptyset / [H_{\text{affix}}]# ___$

These two rules precede the floating-High deletion rule (1). Each of the rules is formally and conceptually simple, and there is surface information that could naturally lead a language learner to arrive at each of them largely independently of the others. A typical derivation is as in (4). The associative High tone is circled.

(4) a. | i s i | o k e
   H H H L H H
   b. | i s i | o k e
   H H H L L H
   c. | s i | 'h e a d of rat'
   H H H

Any account of this construction must deal with three aspects:

(A) the set of tonal mutations of the left-hand word;

(B) the fact that the left-hand word mutates if and only if the (mutated) right-hand word does not begin with High, i.e. the right-hand word forms part of the conditioning environment for the change described in (A);

(C) the set of tonal mutations of the right-hand word, as illustrated in (5):
What is Downstep?

(5) **Isolation (underlying) tone**

<table>
<thead>
<tr>
<th></th>
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<th>Mutated tone</th>
</tr>
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<tbody>
<tr>
<td>a. i.</td>
<td>H H</td>
<td>H ! H</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>! H</td>
</tr>
<tr>
<td>ii.</td>
<td>L H</td>
<td>! H H</td>
</tr>
<tr>
<td>b.</td>
<td>L L</td>
<td>(no change)</td>
</tr>
<tr>
<td></td>
<td>H L</td>
<td>(no change)</td>
</tr>
</tbody>
</table>

We will limit our remarks largely to points (B) and (C), for Clark [1980:106] notes that the analysis of the tonal alternation in the left-hand word given by Goldsmith [1976], i.e. (A), is an "entirely principled account of this alternation".

Generalization (B) (noted, in fact, by Clark as her (4c)) is not respected by her system, which consists of the following rules:

(6) a. ! Insertion (39), which inserts the associative marker !, circled in representations for ease of identification.

b. ! Shift (48), with this effect:

\[ \text{N}[\cca V \ldots]. \]

c. Identical PCM Deletion (36), which deletes the first of two identical, consecutive pitch change markers, under the condition that if the pcm is a !, then # # must appear between the two identical pcm's.

d. ! Retraction (41), which shifts ! to !.

e. ! Deletion, stated first as (44): ! ! ! ! , later revised to (46): \( ! (V) ! \rightarrow ! (V) \).

f. ! Before ! Reduction (38), which changes a sequence of consecutive + 's: + . . . + becomes + . . . + .

Clark [personal communication] notes that these rules must be ordered, with generalization (B) then emerging out of the formulation of (6b) and its ordering before (6c) and (6d). She suggests [p.c.] that this ordering follows in a principled way from the fact that (6b), correctly formulated, contains a syntactic specification ( "!N" ), whereas (6c) and (6d) do not. This account, however, is less than convincing, for there appears to be no independent motivation for the syntactic specification found in (6b) but not in (6c) or (6d), as far as we can see. The crucial rule ordering remains necessary, then, in Clark's analysis.
Note that there is no natural way to specify the class of right-hand words in generalization (B) above within Clark's framework (unlike the autosegmental framework). Thus, to exclude monosyllabic H words from undergoing (6b) (which would incorrectly bleed the left-hand word from undergoing mutation), Clark must specify syllable structure ("begins with V") in (6b). If the rule were written in what is presumably the simpler form within the dynamic tone framework, \[ \uparrow \downarrow \ldots \uparrow \], it would operate incorrectly when the right-hand form is a monosyllabic High, as noted.

Turning to area (C), and considering the tonal mutations described in (5), Clark's account as given fares no better. As Clark has correctly observed, bisyllabic words in Igbo are composed of prefix plus stem; the rare monosyllabic nouns have no prefix. Rule (5) can thus be summarized as follows: all and only words with High tone on the stem undergo a tonal mutation in this position in the associative construction (and thus words in (5b) undergo no change); in particular, the change is from High to Mid, as noted in (5ai). Furthermore, L H changes to \('H\) H. How does Clark's system of rules describe these changes?

In the case of a H L word, no tonal change in fact occurs, but Clark's rules do not function correctly:

(7) i si \(\downarrow \) m \(\uparrow\) be \(\uparrow\) 6a
i si \(\downarrow\) m \(\downarrow\) be \(\uparrow\) 6b
i si m \(\downarrow\) be \(\uparrow\) 6c
\[6d, 6e: \text{do not apply}\]
\[\ast\text{isi } m \uparrow \text{ be } \uparrow\] 6f

but cf. the correct:
\[\text{isi m } \downarrow \text{ be } \uparrow\]

(We assume Clark's "V" in (6b) stands for syllabic nasals as well as vowels.) This surface form violates Clark's central surface filter prohibiting surface sequences of pitch change markers, but it is the only output produced for words in second position with H L tone pattern.

There is no way within Clark's framework to express the generalization concerning which forms do in fact undergo mutation in (5), i.e., those in (5a), with stem High tone. In fact, this is an explicit embarrassment; the
change from H H to H!H must, on Clark's account, be accommodated by a special rule (6b) which includes a condition that Clark does "not regard... as a particularly natural condition" (p.122). On the other hand, the autosegmental rule which she criticizes, (2), parallel to her (10), handles these cases correctly, treating the H H cases as normal rather than exceptional.

We have thus far considered Clark's account of right-hand H H words, H L words, and H words. Nothing happens in the case of L L words; in the final remaining case, L H words, Clark introduces a new rule (her (46), stated in (6e)) under the guise of extending another one, her (44). We find this step most unconvincing for two reasons. The extended rule (46), deleting a + across a vowel from a preceding + , is in no way consistent with Clark's claim that the "set of tonal alternations...should be predictable from what we know about the general behavior of high tones and floating tones" (p.104). The extended rule (46) does not satisfy this criterion. It might be observed that (46) as such is a rule schema, of which one sub-part, i.e. (44), is, by Clark's criterion, expected or natural. But it surely goes against both the spirit and the letter of Clark's criterion to say that any rule is principled just so long as it forms a subpart of a rule schema of which a different subrule is independently principled. Along similar lines, it is well worth observing that the notions of rule schema and abbreviation of rules have their primary justification in the view that rules are justified on the basis of their formal simplicity, not their substantive content.

The justification of (46) is suspect for a second reason: it rests heavily upon (44)'s being independently motivated. Rule (44), repeated here as (8), is itself quite suspect, however. It serves only to patch up the bad effects of rule (6d), repeated here as (9).

\[
\text{(8)} = \text{Clark's (44)} \quad \uparrow \rightarrow \emptyset / \downarrow \\
\text{(9)} \quad \sigma \uparrow \downarrow
\]

If the data that are used to motivate (8) and (9) are considered in their own right, a better solution is available, even within the dynamic tone
framework, in which no rule comparable to (9) is necessary.

If we look at the pcm changes that occur between the underlying form and the surface form to a left-hand word ending in a $t$ in a mutation environment, we find the following rather straightforward generalization: if the pcm is the only pcm in the word, i.e. if it is a L L word, the pcm retracts; otherwise, it deletes. These two statements are given in (10) and (11), ordered thusly as by any of the proposed versions of the elsewhere condition.

(10) $\sigma \sigma^+ \rightarrow$

(11) $t \rightarrow \emptyset / \_ \_ \_ \_ \rightarrow$

These two rules can be formally conflated as in (12).

(12) $< \sigma > \sigma^+ \rightarrow < \sigma^+ > \sigma$

If we compare (8) and (9), Clark's version, against (10)-(11), the two alternatives appear to be equivalent. But independent considerations suggest that, even if one adopts the dynamic-tone framework for research, (10)-(11), or (12), is preferable to (8) and (9). Considerable evidence has been amassed in phonology that deletion is a very common structural change, especially of the sort considered here. This observation can be captured in a number of ways formally, one of them being the use of angle-brackets, as suggested in unpublished work by Morris Halle. In any event, the informal statement noted above (10), in which deletion is an elsewhere-effect following permutation, points directly to (12) as a unified account of the dynamic-tone analysis of the left-hand mutation of the L L words and L H words.

But such a result is, in fact, disastrous for the dynamic-tone analysis of the entire construction. For no longer is a rule such as (8) independently motivated, and no longer can it be extended to Clark's (46); and there is, then, no analysis available for the right-hand mutation of L H words to $'H^2H$.

In summary, then, we find Clark's analysis of the Igbo tonal mutations under discussion unsatisfactory because it fails to handle the data correctly, because it fails to state succinctly the generalizations that can be found in the data (above and beyond any mechanical problems), and because
the dynamic-tone system (as distinct from the specific analysis Clark proposes within the system) as the unacceptable property of presenting a less coherent and less highly-valued grammar as a whole when the individual sub-parts of the grammar are analyzed more carefully. Furthermore, contrary to Clark's claim, no consistent theoretical advantages do in fact arise in the dynamic tone framework vis-a-vis the autosegmental analysis.

3. Kikuyu

Turning now to the analysis of Kikuyu, Clark argues that the account given in Clements and Ford [1977] is faulty on two principal counts: first, it is overly abstract; and second, it is non-explanatory. We consider these criticisms in turn, after a brief review of the relevant features of the Kikuyu tone system.

Kikuyu words fall into classes according to their tonal influence upon following words. Words of one class induce "total downstep" on following words, i.e. they condition a lowering of the pitch register by an interval equivalent to the drop between a High and a Low. Words of the second class do not. In the analysis given in Clements and Ford [1977], words of the first class are characterized in the lexicon by the presence of a "downstep entity" (identified as a floating \( \underline{\text{L}} \) (extra-Low) tone in a subsequent study [Clements and Ford 1979]) finally in their lexical tone melody, while words of the second class are not. This downstep, or floating \( \underline{\text{L}} \) tone, serves as an "operator" which triggers the distinctive lowering (by a full step) of the pitch register upon which subsequent tones in the tone group are realized. It will be noted that this downstep is not an independent "morpheme" in any sense, but simply an element of the tonal tier characterizing any word. In this analysis the different tonal properties of the two classes of words are a consequence of the presence or absence of the word-final downstep.

Clark [1980] objects to the "extreme abstractness" of this analysis on two grounds. In the first place, floating tones, she notes, are "inaudible" (p.124). In contrast, "the dynamic-tone framework allows a very concrete representation of the downstep as a pitch drop (which is just what it is phonetically)" (p.131). But in what sense is a pitch change marker any more concrete than a floating tone? One cannot "hear" a pitch change marker;
rather, its presence in a tonal string is inferred from its effects upon the pitch contours of surrounding syllables. In Clark's analysis, pitch change markers occupy the boundaries between such units as the syllable and are thus no more audible than, for example, such "juncture" elements as word boundaries.

Clark's second criticism of the "abstractness" of the floating-tone analysis of downstep concerns the question of its learnability. Clark assumes that floating-tone analyses of downstep cannot be carried out on a universal basis, and that for languages other than Kikuyu, other (perhaps more "concrete") formal representations of downstep will be required. If this is true, then it would follow that the language learner, confronted with a downstep system, would have to learn which type of representation is involved in each given case. However, it is pointed out in Clements and Ford [1979:205] that "floating tones are well-documented in the languages of Africa, and it appears likely that the downsteps identified in other languages can be assigned a similar status... It is abundantly clear that present phonological theories provide an overly rich array of mechanisms for describing downstep. If we analyze downstep everywhere it occurs as a floating tone, we shall have imposed a desirable restriction on the number of analyses compatible with the data in any terraced-tone language." Clark does not offer an argument against this claim. Instead, she asserts that "there is no satisfactory way to attribute the downstep of Igbo to a floating low tone" (p.124). As should be clear from the discussion of section 2, we are in agreement with Clark in this respect: we attribute the introduction of downstep into Igbo tonal representations to the configuration stated in the structural description of (2), involving in particular the presence of a floating High tone. However, this does not commit us to the position that downstep in Igbo cannot be characterized as a floating Low tone. All we need to do in this respect is to interpret the symbol "!" in (2)-(5) as a floating Low tone. And indeed, we know of no convincing argument against such an analysis.

Clark's second main objection to the floating-tone treatment of downstep involves the "complexity and apparent arbitrariness" (p.124) of the rule of Downstep Displacement proposed by Clements and Ford. It will be recalled
that according to their rule, whenever a word of the downstep-final class ends in a High tone and the following word begins (in its isolation form) with a Low tone, the downstep is shifted to the right of the Low tone (or to the end of the maximal Low tone sequence). This Low tone (or Low tone sequence) assimilates in turn to the preceding High tone. We illustrate the effects of this rule with the following forms, in which the verb ndinarora
is a downstep-final form (these examples, like all those following, are taken from Clements and Ford [1977]):

\[
\begin{align*}
\text{(13) a. } & \text{ ndínářórá } \eta'játá \quad \text{ 'I didn't watch stars'} \\
\text{ b. } & \text{ ndínářórá } \eta'já'ąá \quad \text{ 'I didn't watch Ng'ang'a'} \\
\text{ c. } & \text{ ndínářórá } kéną'ąá \quad \text{ 'I didn't watch (a) crocodile'} \\
\text{ d. } & \text{ ndínářórá } mójérą'ąnáá \quad \text{ 'I didn't watch (an) examiner'} \\
\text{ e. } & \text{ ndínářórá } moáněkį \quad \text{ 'I didn't watch Mwaniki'} \\
\end{align*}
\]

As these examples show, the downstep lexically associated with the verb shifts across the maximal sequence of following Low tones, which themselves become High. Thus, if the downstep is shifted to the end of the phrase (where its phonetic effect is null), all Low tones become High (13e). In Clements and Ford [1977] Downstep Displacement was stated as follows:

\[
\text{(14) } \eta'játą / \text{ 'star'} / \eta'ją/ \text{ 'Ng'ang'a'} / \eta'ją / \text{ 'crocodile'} / \eta'ją / \text{ 'examiner'} / \eta'ją / \text{ 'Mwaniki'} / \eta'ją / \text{ 'crocodile'}
\]

Clark maintains that rule (14) "serves only to describe the facts and not to explain them" (p.124). In Clark's view, as we have noted, a linguistic theory provides a principled (and presumably, therefore, explanatory) account of a language to the extent that it describes that language in terms of rules that belong to a small set of strategies (specified by the theory) for "resolving" (or patching up) ill-formed representations. Clark proposes
an account of Downstep Displacement which is "principled" in these terms, "for the rule which effects this change is one of a small set of possible strategies for the resolution of an ill-formedness created by the insertion of a 'bare' pcm into the string" (p.131). We have already expressed our reservations with regard to this view of explanation; here we examine some of its consequences for the description of Kikuyu.

In Clark's description, tone levels are characterized by pitch change markers (pcm's) which precede the syllable or syllables whose tone they characterize. Downsteps (⁺) are inserted after words marked with the morphological feature "Class I" and then cliticized to the following word, should there be one. Four rules then apply, which we restate informally:

(15) a. Identical Pitch Change Marker Deletion (60) deletes any pcm which is identical to the first pcm preceding it; in the case of⁺, this rule does not apply within the word.

b. Downstep Displacement (67) moves the second of two adjacent⁺'s maximally far to the right, that is, to the end of the phrase or to the end of the next pcm, whichever comes first.

c. ⁺ Before ⁺ Deletion (69) deletes a ⁺ if the next following pcm is also a ⁺.

d. ⁺ Deletion (64) reduces any ++ sequence to⁺.

These four rules apply in the order given (see Clark's derivation (71) and her note 27). These rules, together with the rules of⁺ insertion and cliticization mentioned earlier, have no motivation other than that of describing the tonal changes which are described, within the Clements and Ford analysis, by the rule of Downstep Displacement (14). We stress this point: these rules do not account for any tonal phenomena not fully described by the floating-tone analysis of Kikuyu summarized above.

There are a number of inaccuracies in Clark's description which seriously weaken its claim to provide a viable alternative treatment of Kikuyu. First of all, rule (15c) is incorrect. This rule is intended to provide a description of forms which have undergone Downstep Displacement, such as those illustrated in (13) above. However, while (15c) gives correct results in these cases, it yields incorrect results elsewhere. For instance, it incorrectly raises the first of two successive Low toned "Class I" items to
High after a "Class II" item ending in a High tone; more generally, it incorrectly predicts that one will never find two successive "steps" downward in surface representation except where these are created by the operation of (15d). These problems are anticipated by Clark in her note 46, where she suggests that if (15c) proves to be incorrect, it should be eliminated and (15b) revised so that it not only permutes the second member of the ++ sequence but deletes the first. We assume this modification of rule system (15) in the following discussion.

A more serious problem arises when we consider the result of combining a "Class I" (downstep-final) word ending in Low tone with a word beginning with High tone. As we know, due to the downstep, the High tone will be realized at the same pitch level as the preceding Low tone, as in the following example, where ne is produced at the same pitch level as the preceding syllable:

(16) keāyārārō 'né keēyā 'the stile is good'

The input to rules (15) (as revised in the preceding paragraph) is the following (downsteps inserted after "Class I" words are circled):

(17) + kea + ya + rarō ō + ne + keē + ya ō

Identical Pitch Change Marker Deletion (15a) deletes the initial member of the +t sequence preceding ne. No further rules are applicable. We therefore have

(18) * ō keē ō + ya ō + rarō ō + ne ō ō keē ō + ya ō

The pitch rise on ne must somehow be eliminated. However, no rule is provided to accomplish this. Presumably, such a rule can be stated, but the point is that it will be "unprincipled" even within the terms of the dynamic-tone theory since it does not function to resolve an ill-formedness.

But most seriously, the rule of Identical Pitch Change Marker Deletion, which is crucially involved in most of Clark's derivations, is itself incorrect. The problem arises in this case with words that contain internal downsteps:

(19) ndōnˈfɛ moāyāhīnā 'I didn't see a weakling'
Here the first syllable of *moayahîna* is a step lower than the syllable immediately preceding it. The input to the rules of (15) is:

\[(20) \quad \dagger ndio\dagger ni\dagger re \dagger moa+\dagger ya+hî+\dagger na \dagger\]

Identical Pitch Change Marker Deletion deletes the initial \(\dagger\) of *moayahîna*. No further rules apply, and we derive the incorrect:

\[(21) \quad \dagger \dagger ndio \dagger \dagger ni \dagger \dagger re \dagger \dagger moa \dagger \dagger ya \dagger \dagger hî \dagger \dagger na \dagger\]

In this case the problem seems to be not one of oversight, but of principle. The overly restrictive theoretical vocabulary of the dynamic-tone framework does not allow us to draw a formal distinction between words containing H!H sequences and words containing HL sequences. Both are represented (in a total downstep system like that of Kikuyu) as \(\dagger \sigma \dagger \sigma\). Only word final HL sequences, and not H!H sequences, trigger Identical Pitch Change Marker deletion, but the dynamic-tone notation has no way of capturing this distinction. Consequently, forms like (19) apparently cannot be derived at all.

To summarize, the dynamic-tone framework—or at least the particular analysis offered by Clark within this framework—fails to capture the generalization incorporated in the rule of Downstep Displacement (14) proposed by Clements and Ford. The dynamic-tone analysis denies the existence of any such generalization. Each of the logically possible combinations of "Class I" words with following words is treated, in this system, by a different rule or rules:

A. "Class I" word ending in a High tone + word beginning in Low tone;
   Downstep Displacement (15b) applies:
   \[\dagger \sigma \dagger \dagger \sigma \rightarrow \dagger \sigma \dagger \sigma\]

B. "Class I" word ending in High tone + word beginning in High tone;
   \(\dagger\) Deletion (15d) applies:
   \[\dagger \sigma \dagger \dagger \sigma \rightarrow \dagger \sigma \dagger \sigma\]

C. "Class I" word ending in Low tone + word beginning in Low tone;
   Identical Pitch Change Marker Deletion (15a) applies:
   \[\dagger \sigma \dagger \dagger \sigma \rightarrow \dagger \sigma \dagger \sigma\]
D. "Class I" word ending in Low tone + word beginning in High tone; Identical Pitch Change Marker Deletion (15a) and an unspecified further rule apply:

\[ \downarrow \sigma \uparrow \sigma \rightarrow \downarrow \sigma \uparrow \sigma \rightarrow \downarrow \sigma \sigma \]

This system evidently makes use of a needless proliferation of rules. Even granting that the mechanical errors pointed out earlier can be overcome, there appears to be no possibility of achieving any significant increase in generalization within the dynamic-tone framework.

We shall not consider in detail a third and final objection raised by Clark, which involves the existence of a dialect with a slightly different version of Downstep Displacement (our (14)). Our response to this objection, which is based upon the allegedly unprincipled nature of (14) and which crucially appeals to rule (15c), is implicit in the above discussion.

4. Conclusion

As we mentioned at the outset, terraced-level tone systems should provide favored ground for analyses within the dynamic-tone framework, which describes all tonal phenomena uniquely in terms of downsteps (\(\downarrow\)) and up-steps (\(\uparrow\)). However, the analyses of downstep-related phenomena in Igbo and Kikuyu provided by Clark, considered strictly on their own terms, fail to provide the explanatory accounts that are offered as primary motivation for the dynamic-tone framework. We conclude that syntactic downstep in Igbo and Kikuyu remains most adequately characterized within the framework of autosegmental phonology as originally proposed in Goldsmith [1976] and Clements and Ford [1977].
REFERENCES

Clark, Mary. 1978. "A dynamic treatment of tone, with special attention to the tonal system of Igbo." PH.D. dissertation, University of Massachusetts at Amherst. [Distributed by the Indiana University Linguistics Club.]


This section is for short remarks on articles dealing with African languages which have appeared in Studies in African Linguistics or elsewhere and for contributions which are too short to constitute full articles. These may be short descriptive or historical statements of interesting phenomena in African languages or theoretical comments utilizing African language data.

Contributions to "Notes and Queries" should be less than 1000 words, including examples. No footnotes should be used, but references may be listed at the end.
A NOTE ON THE HAUSA VOICELESS LABIALS

Bello Ahmad Salim

In "Some Problems in Hausa Phonology", Greenberg [1941] discusses, among other things, the distribution of the voiceless labials and their relationship to /h/, against the background of "a general tendency in Hausa towards palatalization before front vowels and velarization before back vowels" (p. 322). Because of the complexity of the distribution of these sounds in such environments, Greenberg proposed that "in accordance with their treatment of these phonemes, we may divide Kano speakers into f -speakers and p -speakers" (p.322). The distribution of the sounds and their patterns of contrasts and replacements were set out thus:

\[
\begin{align*}
\text{f -speakers, where } /f/ &= [\phi]: \\
fa & faa \\
fY & fYa fYaa fYe fYee fYi fYii \\
h & haa he hee hi hii ho hoo hu huu
\end{align*}
\]

\[
\begin{align*}
\text{p -speakers, where } /p/ &= [p]: \\
p & paa pe pee pi pii po poo pu puu \\
pY & pYaa \\
h & haa he hee hi hii
\end{align*}
\]

Though undeniably "neat", such an analysis seems neither phonologically defensible nor bears any relationship to what actually obtains in the language. For one thing, there does not seem to be any phonologically plausible motivation for the non-palatalization and non-velarization of the voiceless labial(s) by the p -speakers except to assume that unlike the f -speakers who do palatalize and velarize, these speakers stopped applying such rules after the contrasts between the simple and the palatalized labial and /h/ became established.

Secondly, for the above division and subsequent pattern analysis to be a reality in the dialect, alternate realizations of words containing voiceless labials before front or back vowels should be noticeable not only in the speakers' realizations of native words, but also in their realizations of loans. That is, for such categories, two intradialectal alternate realizations of the same word should be observed. As the following examples indicate, however, such is not the case:
Regardless of the phonetic alternant a given speaker favours ([p], [f], or, as is at least now found with certain speakers, [f]), the variable and non-variable realizations of the voiceless labials before front or back vowels is uniformly the same. That is, for all speakers, the voiceless labial is obligatorily fronted (palatalized) before front vowels. Before back vowels, velarization is optionally applied. Therefore, the alternate realizations of words comprising voiceless labials are due not to the variant treatments of those sounds by p- or f-speakers, but to the differing persistence of the palatalization and velarization rules with respect to the voiceless labials. Further, contrary to the assumption on which the above division was made, the use of any of these sounds ([p], [f] or [f]) by a given speaker of Kano Hausa, is based not so much on such straightlaced divisions but, in general, on purely stylistic factors. However, it is entirely natural that certain speakers may, as a rule, prefer the use of one or the other of the phonetic variants in their speech.

The tacit acceptance of this proposition is probably the reason why all three alternants are, in current practice, both phonologically and orthographically (except in certain specific cases as recommended by the Working Party on Hausa Orthography [1972:3]) represented by a single symbol, f. Though the orthographic representation of these sounds by f may be accepted as simply a matter of convention and/or affectation, phonologically such a practice constitutes an unnecessary abstraction. This is so because the use of f as the underlying representation (or phoneme) of the voiceless labials is in reality a theoretically indefensible creation of an isolated and unnecessary phoneme class in the language. But since voiceless labials are a part of the phonetic inventory of the language, it is desirable that one of the phonetic alternates be used to represent the others in phonological analyses. Otherwise, all three will have to be indicated in all instances. Since the use of /f/ will constitute a theoretical misrepresentation, it will have to be replaced by another more plausibly acceptable form. One way of achieving this aim might be through the adoption of the model for representing variable representations, which the voiceless labials in Hausa are, of Natural Generative Phonology. The model for delimiting such a representation...
in this theory which rejects unnecessary abstraction (see Vennemann [1972; 1974a, b] and Hooper [1976]) is based on the assumption that variable representations of the same underlying form are relatable to one another by variable rules. Further, the use of such variable representations in speech is determined by the speech styles and tempos of the languages in which they occur. For this reason, Hooper [1976:112] suggests that "underlying representations should be based on the most explicit, naturally occurring spoken forms", i.e. forms used in the careful speech style. The variant forms used in the artificially explicit style (see Labov [1972:31]) and the more casual speech styles can then be derived from these by the use of adaptive or variable rules.

By adopting the above principles for the present case, and on the basis of the following observations with respect to the use of the voiceless labials in Kano Hausa, it is possible to determine which of the voiceless labial alternates can justifiably be used as the underlying representation of the voiceless labials:

1. The use of any of the voiceless labial surface realizations, [t], [p], or [φ] in the Kano dialect of Hausa is determined mainly by the social and/or conversational rules of the language applicable during the speech event.

2. But as a rule, the alternant used in the artificially explicit speech style (relatable in most cases to Hausa/English bilingual or pseudo-bilingual speakers) is [t]; the careful speech style alternant is [p] and the casual/fast speech style alternant is [φ].

3. All three alternants obey the same P-rules uniformly.

These observations and the principles that NGP advocates as the bases for representing underlying forms therefore suggest that the variable used in careful speech would be used as the underlying representation of the voiceless labials. The other variables (alternants) can then be derived from it, where necessary, in the following way:

1. /p/ > [t] / artificially explicit speech style
2. /p/ > [φ] / casual/fast speech styles
REFERENCES


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A RESPONSE TO CLEMENTS AND GOLDSMITH

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In their reply to my "On the treatment of syntactically-distributed downstep" (henceforth OTSDD), Clements and Goldsmith (henceforth C&G) [pp. 239-254 in this issue] make a number of criticisms, some of which are valid, but the majority of which are based on a misunderstanding of my argument or a failure to consider evidence which I referred to in the article but presented elsewhere. First of all, C&G's fundamental objection to my "conception ... of explanation in phonology" (p.240) is based on a misunderstanding of my argument. I do not believe, nor did I intend to suggest, that the "function of a linguistic theory is to 'explain' the contents of language-specific rules" (p.241). Rather my point was this: that since language acquisition depends on the recoverability of underlying forms from surface evidence, an adequate phonological theory must place rather tight restrictions on the rules which mediate between underlying and surface strings. The use which is made of "floating" tones in current level-tone theories runs counter to this goal, for these tones are employed very unconstrainedly in tone rules. To make matters worse, these tones also have idiosyncratic phonetic interpretations; for example, a floating low tone is not given a normal low-tone interpretation as a (relatively) low pitch but is, instead, interpreted as a drop in pitch between two tone-bearing units, or it may have no phonetic realization at all [Clements and Ford 1979].

I went on to argue that we can obtain a more constrained (hence more principled) treatment of the tonal phenomena which have been attributed to floating tones if we analyze the "triggering element" in these constructions as a dynamic tone (a rise or fall in pitch) and represent the rest of the contour in the same dynamic terms. Dynamic tone units, unlike level tone units, can be given reliable phonetic interpretations; for example, a pitch-drop marker (−) is always realized as a drop in pitch. Furthermore, the rules which govern the interaction of these units with the surrounding string are tightly constrained, for they conform to a specifiable set of rule "types", expressed formally as rule schema, none of which makes reference to the "floating" or "non-floating" status of the tonal units. By way of illustration, I list three of these rule types below:

1. A rule may delete a pitch change marker ("pcm") in the immediate environment of another pcm. Such rules take the form
   s.d. pcm₁ ... pcmⱼ (where "..." is less than or equal to one syllable)
   s.c. Delete pcm₁ (or pcmⱼ).

2. A rule may shift a pcm to the left in the immediate environment of another pcm. Such rules take the form
s.d. ... pcm\_i \text{pcm}\_j \text{(where "..." is less than or equal to one syllable)}

s.c. Move pcm\_i to the left of "...".

(3) A rule may shift a pcm to the right. Such rules take the form

s.d. pcm\_i ... \text{(where "..." is either a single syllable or mora, or else is the maximal phonological string which contains no pcm's)}

s.c. Move pcm\_i to the right of "...".

(See Clark [1978:Chapter IV], for a more complete list of dynamic-tone rule types along with a discussion of the range of variation within each type.)

As I observed in OTSDD, some rule types appear to have a phonetic motivation; for example, rules of types (1) and (2) apparently serve to simplify or break up sequences of pitch changes which are too close together for (easy) pronunciation. This observation is, of course, extraneous to my argument, which has to do with constraining the set of possible tone rules, particularly the rules by which "floating" tones interact with the surrounding string. I mention it here in order to respond to C&G's objection that the need for such rules indicates a problem in the theory. On the contrary, because the rules of syntactic combination are blind to phonological information, there is nothing to prevent them from generating phonological strings which are difficult or impossible to pronounce. For example, the rule which attaches the plural suffix to noun stems in English sometimes generates unpronounceable consonant clusters, e.g. the /ks8s/ of sixths. One function of the phonological component is to "fix up" (in C&G's words) the phonological string which comes to it from the syntactic component.

Now consider C&G's objection that my dynamic-tone analyses of Igbo and Kikuyu fail to capture generalizations which are inherent in their own autosegmental analyses. In some cases, it is difficult to find the generalization in question; for example, it is not clear to me what generalization is incorporated in [Clements and Ford's] rule of Downstep Displacement" (\( ^{1}L_\text{Q} \rightarrow H_\text{Q} ^{+} / H_\text{__} \)), which my analysis of Kikuyu "fails to capture"(p.252). In some cases, however, there is a real generalization at stake; for example, C&G's Igbo rule (2) \(( H \rightarrow ^{1}H / [H_{\text{affix}}]^# (T)^{+} _{__} \) in fact gives direct expression to the generalization that "all and only words with High tone on the stem" (p.244) undergo downstepping after the associative marker \((H_{\text{affix}})\). In contrast, my analysis, by treating the associative marker as a downstep, downsteps everything in this position; subsequent, independently-motivated rules then delete the downstep or mask its effect when the stem is low-toned.

C&G's argument here seems to be based on the assumption that every generalization which can be made about a construction should be expressed directly in some one rule. But this assumption cannot be maintained; surface generalizations are often the result of interaction between several different rules. Which generalizations are embodied in individual rules varies from one approach to another in ways that do not help to choose between them. For example, the rule which I state in (4) below gives direct expression to
the generalization that when the associative downstep precedes the prefix vowel of the noun with which it is associated, there is no change of pitch after that vowel. This generalization is not expressed in any one rule of C&G's analysis, but that seems to me to be of little importance, since the output forms which their rules generate correctly conform to the generalization.

In their more specific criticisms of my Igbo analysis, C&G fail to take into account evidence and arguments which I have given elsewhere. For example, consider their argument of (8)-(12), that if we eliminate my rule (44) \( +V \rightarrow _{0} / +_{(V)} \) —and they show that it is possible, even desirable, to do so—then my rule (46) \( +V \rightarrow _{0} / +(V) \) can no longer be seen as a generalization of that rule, a result which C&G see as "disastrous for the dynamic-tone analysis of the whole construction" (p. 246). This argument depends on the assumption that rules of the form of (46) are unnatural and depend for their justification on a generalization from other rules. In fact, however, rules like (46) are common; for example, as I showed in Clark [1978], there is a rule of this form in Mende, where the phrase \( +ke+n\)ya+Ti 'the uncle' becomes (optionally) \( +ke+n\)ya--Ti, with the + deleted. Thus, rules of this form must be provided for among the basic rule schemata, and the occurrence of such a rule should not occasion surprise, even if there is no independently-motivated rule for it to be generalized from. In fact, however, rule (46) does generalize. As I showed in Clark [1978:Chapter II, section 3.3], Igbo also has a rule of the form \( +V \rightarrow _{0} / +(V) \), which collapses with (46) as shown below:

(4) pcm \( +V \rightarrow _{0} / +(V) \) (DOMAIN: the phonological word)

Note that this generalized version of the rule, from Clark [1978], also takes care of \( ++ \) sequences, which I inadvertently neglected to account for in OTsnn, as C&G observe in (7).

To give another example, consider C&G's objection that it should not be necessary to specify that a rule applies over a syllable which consists of a syllabic segment only, but not over a CV syllable, as I have done in (4) above, and in my rule (48) \( [+V \ldots+] \). Again, I dealt with this question in Clark [1978], where I argued that the special behavior of such syllables has a phonetic basis in their unusually short duration, a result of their having undergone coalescence with the final vowel of the preceding word. (See Clark [1978:Chapter IV] for evidence that shorter syllables are in general more permeable to tonological processes.)

Finally, consider C&G's objection to the crucial ordering between my rules (48) \( [+V \ldots+] \) and (41) \( [+N] \), an ordering which they regard as unprincipled, since even if one accepts Selkirk's [1972] principle that rules which refer to syntactic bracketing are ordered before those which do not, I have not shown that these two rules must differ in just this way. In fact, however, I gave extensive evidence on this very point in the detailed analysis of Igbo which appears in Clark [1978:Chapters VI, VII, and VIII]. Moreover, even if the arguments I gave there should turn out to be
incorrect, so that the ordering of rules (48) and (41) must be specified arbitrarily, C&G would still have no grounds for complaint because their own analyses also make use of arbitrarily-specified crucial rule orderings; for example, their Igbo rule (2) must be ordered before their rule (1).

Turning now to Kikuyu, let me begin by saying that C&G are correct in their observation that my OTSDD analysis does not generate the correct output for their example (16)-(18). I believe this and other inaccuracies in the analysis can be corrected most satisfactorily by re-analyzing the downstep marker as an extra-large pitch drop (see Clark [forthcoming] for a revision of the analysis along these lines). Note that this change brings my analysis into closer conformity with that of Clements and Ford [1979], who analyze the downstep marker as an extra-low tone.

However, consider the very serious objection which C&G make in (19)-(20), namely that since my analysis does not provide different representations for the (phonetically identical) contours HL and H'H, and since my rule of Identical Pitch Change Marker Deletion, which deletes the second of a sequence of +'s, must apply in the environment of a word-final HL, there is in principle no way to prevent this rule from applying (erroneously) after H'H. Therefore, according to C&G, this rule will incorrectly delete the + at the beginning of + moa + ya + hi + na 'weakling' in their example (20), repeated below as (5):

(5) ndT)nir!re moayâhîpá (= + ndio + nî + rî + moa + ya + hi + na)

'I didn't see a weakling'

This problem is easily solved by adopting an analysis of verbs like ndT)nir!re which was originally suggested by Clements and Ford [1977] (henceforth C&F). C&F argue that the downstep which appears in the surface contours of such verbs is, at the underlying level, associated with the negative prefix ti; thus this particular verb has the underlying representation

(6) n + ti + cinirî
     L H L L L H

The downstep marker (') is moved to its surface position between the syllables nî and ri by the rule of Downstep Displacement. (C&G invoke additional rules of Vowel and Nasal Fusion and High Tone Dissimilation in the complete derivation of the surface form.)

We can mirror C&F's analysis within the dynamic-tone framework by assigning the verb ndT)nir!re the underlying representation

(7) +n + +ti + +cinirî

where the ( ) is the downstep marker. As in C&F's analysis, the rule of Downstep Displacement moves the pitch drop to the right, where it replaces the + between the syllables nî and ri. However, since Identical Pitch
Change Marker Deletion is ordered before Downstep Displacement, the + will still be present when that rule applies, and it will (correctly) block the deletion of the + at the beginning of +_moa+^ya+^hi+^na in (5).

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CONFERENCE ANNOUNCEMENT AND CALL FOR PAPERS

INTERNATIONAL COLLOQUIUM
ON THE CHADIC LANGUAGE FAMILY

An International Colloquium on the Chadic Language Family will be held at Hamburg University between September 15-18, 1981. This Colloquium will be held in the memory of Professor em. Dr. Johannes Lukas. During the Colloquium a Symposium on "Chadic and Afroasiatic" is planned. The following scholars have been invited to actively participate in the Symposium:

Prof. Dr. D. Cohen (Paris)
Prof. Dr. I.M. Diakonoff (Leningrad)
Prof. Dr. C. Gouffé (Paris)
Prof. Dr. J.H. Greenberg (Palo Alto)
Prof. Dr. H. Jungraithmayr (Marburg)
Prof. Dr. P. Newman (Leiden)
Prof. Dr. Ch. Rabin (Jerusalem)
Prof. Dr. R.G. Schuh (Los Angeles)
Prof. Dr. A. Zaborski (Krakow)

The Colloquium is open to all interested parties. Papers are invited on all aspects of Chadic linguistics. It is hoped that funds can be raised to cover part of the travel expenses for those participants from abroad who will present a paper.

The deadline for first registering is July 15, 1980. Please indicate also whether you need help with accommodation. All correspondence should be directed to

The Organizers
Chadic Colloquium,
Seminar für Afrikanische Sprachen und Kulturen
Von- Melle-Park 6
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Summary of contents: Editorial; Gestion du Laboratoire; Activités des Départements; Rapports de Mission; Soutenances de Thèses, Mémoires; Enseignements; Nouvelles acquisitions de la Bibliothèque du Laboratoire; les Livres et les Revues; Dernières parutions de la SELAF; Colloques, Congrès, Séminaires; Revue de Presse; Distinctions, Nominations, Promotions; les choses de la vie; Divers; Table des Matières.


In 1978, the Department of Anthropology, UCLA, established a series of lectures both to honor the memory of Professor Harry Hoijer (1904-1976) and to give recognition to the original contributions of eminent scholars in the field. As Professor Hoijer's particular expertise was in the interface of culture and language, these first essays are devoted to the field of linguistic anthropology. The essays in this volume are

J. Greenberg: "Universals of Kinship Terminology: Their Names and the Problem of Their Explanation"

D. Hymes: "Tonkawa Poetics: John Rush Buffalo's Coyote and Eagle's Daughter"

P.W. Friedrich: "Linguistic Relativity and the Order-to-Chaos Continuum"


This monograph, based on the author's nearly 40 years' experience in Central Africa, "...deals with Africanisms in the language and culture of America [and contributes]... to our understanding of Africanisms in American English, folklore, folksongs, folktales, and place names in the United States." A major contribution of the book is to demonstrate that not all Africanisms in America can be traced to the West African coast. "Chapter I introduces Tshiluba (Luba-Kasai), the Bantu language that serves as the basis for the linguistic identification of the Bantu speech survivals in the United States, and discusses its position in relation to other languages within the Bantu Nucleus. Chapter II covers the Atlantic slave trade, describing its relationship to the Bantu-speaking heritage of the United States. Chapter III deals with various ways of proving African content in American culture. Chapter IV presents and discusses possible Bantu place-names in seven southern
states. Chapter V deals with Bantu speech survivals found in folktales and songs, and Chapter VI describes procedures and categories used as a basis for the appended word list of possible Bantu origin." [Quoted sections are from the forward by Baruch Elimelech, pp. ix-x.]

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