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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. pcm_i ... pcm_j (where "..." is less than or equal to one syllable)

s.c. Delete pcm_i (or pcm_j).

(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 pcm_j (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 ... (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 /ksθs/ 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" ($^{!}L_Q \rightarrow H_Q{}^{!}$ / H__), 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) ($H \rightarrow {}^{!}H$ / $[H_{affix}]$# (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_{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) (↑ → Ø / ↓ __)—and they show that it is possible, even desirable, to do so—then my rule (46) (↑ → Ø / ↓(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 ↓ nya ↑ i 'the uncle' becomes (optionally) ↑ ke ˉ nyaˉ, 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 ↓ → Ø / ↓(V) __ , which collapses with (46) as shown below:

(4) pcm → Ø / ↓(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 OTSPD, 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) ($[\downarrow_{V}^{+N} \ldots \downarrow]$). 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) ($[\downarrow_{V}^{+N} \ldots \downarrow]$) and (41) ($\sigma\downarrow$), 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 ↑ɣa ↓hi ↑ɲa 'weakling' in their example (20), repeated below as (5):

(5) ndɪɔnɪ́ !rɛ́ mōāɣáhìɲá (= ↓ndiɔ ↑nī ↓rɛ ↓moa ↑ɣa ↓hi ↑ɲa)

'I didn't see a weakling'

This problem is easily solved by adopting an analysis of verbs like ndɪɔnɪ́!rɛ́ 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	+	ɔnirɛ
|		|		| | |
L		H!		L L H

The downstep marker (!) is moved to its surface position between the syllables ni and rɛ 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 ndɪɔnɪ́!rɛ́ the underlying representation

(7) ↓n + ↑ti⊕ + ↓ɔni↑rɛ

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 ni and re . 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↑ ɣa ↓hi↑ ɲa in (5).

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