CAUSATIVES, STATIVES, MONOSYLLABICS - THE EVIDENCE FROM VOWEL HARMONY

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The vowel harmony process of OluTsootso, a Bantu language of Kenya, affects vowels of certain suffixes according to the quality of the last vowel of the preceding root or suffix. Specifically, suffixal \( i \) appears when preceding vowels are high or low, while \( e \) appears when preceding vowels are mid. In the five vowel system of OluTsootso, suffixal \( i \) therefore appears when preceding vowels are \( i, u, \) or \( a, e \) appears when \( e \) or \( o \) precedes. The vowel harmony process then refers to the derivation of suffixal \( e \) from underlying /i/ when mid vowels precede.

There are varying conditions on the vowel harmony process which are best stated morphologically. The vowel harmony process for the applied suffix /il/ is optional in that \( i \) or \( e \) may appear when preceding vowels are mid.

(1) /Bek/ 'shave' /Bek-il/ + Bech-e11/1 'shave for'
/loB/ 'refuse' /loB-il/ + loB-e11/1 'refuse for'
/xup/ 'beat' /xup-il/ + xup-e1/1 'beat for'

In contrast, the vowel of the stative suffix /ix/ is obligatorily governed by the vowel harmony conditions, so that \( e \) must appear when preceding vowels are mid.

(2) /yeeng/ 'brew' /yeeng-ix/ + yeenj-e1/1 'brewed'
/tsom/ 'prick' /tsom-ex/ + tsom-ex/11x/1 'pricked'
/xup/ 'beat' /xup-ix/ + xup-e1x 'beaten'

But the causative suffix /i/, unlike Swahili and Chi-Mwani, never undergoes vowel harmony, and always surfaces as /1/

(3) /met/ 'blink' /met-il/ + met-e1/1 'cause to blink'
/toong/ 'remain' /toong-il/ + toon-e1/1 'make remain'

It is the purpose of this paper to discuss how a knowledge of these conditions on vowel harmony can be used to describe and
explain otherwise ambiguous and confusing morphophonemic alter-
nations. It will be shown that vowel harmony provides evidence
which is crucial in determining the correct analysis of some
interactions. The causative construction is discussed in section
I, the stative in section II, and the behaviour of certain "mono-
syllabic" roots in section III. In these constructions, the
analyses which receive supporting evidence from vowel harmony
considerations can be generalized to provide some rather interest-
ing and explanatory accounts of the phenomena in question. These
analyses will involve discussions of additional evidence beyond
vowel harmony, but in each case, the vowel harmony considerations
provide the initial evidence in favor of the analysis. A summary
of the findings is presented in section IV.

I The Causative Construction

The causative suffix /1/ conditions a process of 'liquid mutation' in which l and r become s when the causative follows:  

(4) /Bal/ 'be warm' /Bal-1/ → Bas-1 'make warm'
/Bir/ 'pass' /Bir-1/ → Bis-1 'make pass'

And when the reverse suffix /ul/ precedes the causative suffix, liquid mutation again applies  

(5) /Bis/ > Bis-ul, /Bis-ul-1/ → Bis-us-1 'make uncover'
/hide' 'uncover'

/naB/ > naB-ul, /naB-ul-1/ naB-us-1 'make rend'
'sew' 'rend'

2.1 If we next consider the causative-applied construction, we find data which conflicts with the above. The following surface forms seem to indicate that the underlying sequence of elements is /root-applied-causative/  

(6) ch11ng-11-1 'make carry for' < '?/ch11ng-11-1/
Baamb-11-1 'make sacrifice for' < '?/Baamb-11-1/
xup-11-1 'make beat for' < '?/xup-11-1/

Yet if these forms are underlyingly /root-11 (applied)-1 (causa-
tive)/, why isn't the l of the applied changed to s by the liquid
mutation rule, as was the case for the l of the reverse suffix?
Further complicating the issue are the surface forms of underlying l- and r-final roots in this construction.

(7) /kur/   ikus-il-1  'be satisfied' 'make satisfied for'  
     /hir/   hís-il-1  'be unconscious' 'make unconscious for'  
     /Bal/   Bas-il-1  'be warm' 'make warm for'  
     /kal/   ikas-il-1  'shut' 'make shut for'

The problem with these forms is that if the underlying sequence of morphemes is assumed to be /root-applied-causative/, then we must somehow account for these facts: (a) the root-final l's and r's are affected by liquid mutation, even though the causative suffix does not directly follow the root, (b) the l of the applied suffix is not affected by liquid mutation.

A proposal which might be advanced to account for these facts is that the underlying sequence of morphemes is actually /root-causative(il)-applied(il)/, and that a metathesis rule changes the applied /il/ to /il/. This proposal is schematized by the derivation below.

(8) /Bal - i (causative) - il (applied)/
     Bas-il-1  'make warm for'
     Bas-il-1  'make warm for'
     Basil  'make warm for'

In this way, the problems encountered above disappear, because (a) the root-final liquids are changed to s because the causative directly follows them, (b) the l of the applied suffix is not changed to s because the causative precedes the applied.

Although this proposal handles the data and clears up the problems discussed, the evidence from vowel harmony shows it to be incorrect. If we consider mid-vowel roots in this construction, we find the following
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(9) /met/ 'blink' metel1/metili1 'make blink for'
/chooñ/ 'be tired' chooñel1/chooñili1 'make tired for'
/leer/ 'bring' leesel1/leesili1 'make bring for'
/Bol/ 'rot' Bosel1/Bosili1 'make rot for'

These forms show that the underlying sequence of elements must be /root-applied-causative/, because it is only the vowel of the applied suffix /il/ which optionally harmonizes to e when mid vowels precede. That is, the derivation exemplified in (8) cannot be correct for these roots because it would require that the causative vowel i optionally surfaces as e, whereas elsewhere this never occurs (cf. forms in (3) above). According to the vowel harmony conditions, the vowel following these mid-vowel roots must be the vowel of the applied suffix /il/, because it is only this vowel which may surface as e when mid vowel roots precede. Thus, the proposal advanced in 3 is invalidated by this evidence.

5 Since the evidence from vowel harmony establishes conclusively that the applied suffix is followed by the causative, how do we account for the facts that (a) l- and r-final roots are affected by liquid mutation, (b) the causative suffix does not follow the root directly, (c) the causative suffix /i/ follows the /l/ of the applied, and yet the applied suffix is not changed to s? The following proposal is offered to account for these forms.

A causative stem-formation process is involved in these causative-applied forms. Briefly stated, a causative stem is analogically formed from simple causatives (cf. (4) above), and is then followed by the applied and causative suffixes. It is claimed that the causative suffix does not affect the /l/ of the preceding applied suffix, because once the final consonant of the stem has been changed to s, there is no need to affect the final /l/ of the suffix as well.

Since the causative formation process is different for roots followed by the applied suffix as opposed to roots followed by the reversive suffix, I shall next discuss some differences between the reversive and the applied constructions which may serve to motivate a distinction between these suffixes in terms of the proposal of causative stem formation.

5.1 We have seen that the /l/ of the reversive becomes s when the causative follows /Bis-ul-i/ → Bis-us-i 'make uncover'. In
addition, the actual root-final liquid does not change to s, just the l of the suffix /fuul/ 'dress,' /fuul-ul/ 'undress,' /fuul-ul-i/ → fwaal-us-i 'make undress.' This development can be accounted for in terms of a causative stem formation process by considering certain aspects concerning the productivity of the reversive suffix as compared to the applied, which behaves differently.

The reversive suffix is limited in that not every verbal root can be followed by it. In fact, it is impossible to predict which roots will allow this suffix to follow, because there does not seem to be a general semantic principle governing its appearance. This means that the occurrence or non-occurrence of the reversive is lexically determined, and turns out to be somewhat idiosyncratic. Thus, the reversive suffix is not productive derivationally, because there are rather severe lexical restrictions on its appearance. So although morphemic analysis shows that the reversive is a "suffix," its occurrence is determined lexically. It is not too surprising, therefore, that the causative formation process treats these reversive forms as if they were "root-like" elements, and thus changes the final l of the "compound root" to s.

The situation with respect to productivity of suffixes is completely different for the applied suffix. This suffix can appear with almost every verbal root in the language, and its occurrence can probably be predicted by (perhaps) universal principles. Its appearance is not idiosyncratic, or lexically determined, it must therefore be a "non-root" element, which should not, of course, be subject to a stem-formation process.

This causative stem-formation analysis gains further support from other causative constructions. When the limited and non-productive "expansive" suffix /VIV/ appears after certain roots, a causative form of the expansive may occur in which the final l of the suffix (and not of the root) is affected.

(10) /luul/ 'be sick' > lwaal-1ll1 'be very sick, sickly'
    /luul-1ll1-1/ → lwaal-1lls-1 'make sickly'

/fuul/ 'spit' > fuuts-ulul 'slobber'
    /fuuts-ulul-1/ → fuuts-ulus-1 'make slobber'

/tsux/ 'pour(water)' > tsush-1ll1 'sprinkle around'
    /tsux-1ll1-1/ → tsush-1lls-1 'splash around'
Much like the reversive, the expansive suffix idiosyncratically occurs with certain verb roots. Also, its phonological shape is non-predictable, in that the vowels must be determined lexically. Thus, like the reversive, this suffix is quite "root-like," and so its final _ undergoes liquid mutation when the causative follows.

In contrast, the reciprocal suffix /an/ occurs fairly freely, and is not limited idiosyncratically to certain roots (although these roots must be transitive). If we consider causative-reciprocal forms, we find that although the causative suffix follows the reciprocal, and does not follow the root, a causative stem for the liquid-final roots is formed.

\[
\begin{align*}
/Bir-an-i/ & \to \ Bisanî, \; \star\Biranî \; \text{"make e o pass"} \\
/kor-an-i/ & \to \ kosanî, \; \star\koranî \; \text{"make e o lose"} \\
/Bal-an-i/ & \to \ Basanî, \; \star\Balanî \; \text{"make e o warm"} \\
/Bol-an-i/ & \to \ Bosanî, \; \star\Bolanî \; \text{"make e o rot"}
\end{align*}
\]

The low vowel of the reciprocal suffix never conditions consonantal alternations, and thus cannot be responsible for the change of _ or r to s.

Another distinction can be made concerning these suffixes. It is striking that the causative stem-formation process applies to roots which are followed by suffixes which effect syntactic processes. In contrast, the causative stem-formation process does not affect roots when followed by suffixes which have no syntactic effect.

For example, the applied suffix has an effect on syntax which can be informally described as adding an (extra) object to the simple verb root.

\[
\begin{align*}
(12) \ a \ & \ e-sikam-aanga \quad \text{\"I kneel\"} \\
\ & \ I\-\text{kneel-tense} \\
\ b \ & \ e-sikam-\star\text{-aanga} \; \text{Ombooko} \quad \text{\"I kneel for Ombooko\"} \\
\ & \ I\-\text{kneel-applied-tense} \; \text{Ombooko} \\
\ c \ & \ \star\text{e-sikam-aanga} \; \text{Ombooko} \\
\ & \ I\-\text{kneel-tense} \; \text{Ombooko}
\end{align*}
\]

The reciprocal suffix can be characterized as a pronominalizing suffix for certain elements of conjoined sentences.
(13) a Keeya a-xup-aanga aBa-saatsa 'Keeya beats the men'
    Keeya he-beat-tense plural-man

b aBa-saatsa Ba-xup-aanga Keeya 'The men beat Keeya'
    men They-beat-tense Keeya

c Keeya neende aBa-saatsa Ba-xup-an-aange
    Keeya and men they-beat-reciprocal-tense
    'Keeya and the men beat each other'

Sentence c is presumably a reduced version of a conjoined sentence consisting of a and b.

When either of these suffixes is followed by the causative, the causative stem-formation process affects liquid-final roots.

5.3.2 In contrast, the reverse and expansive suffixes do not affect syntax—they simply change or enhance lexical meaning. Notice that this is another reason for considering these suffixes to be "root-like" elements. Thus, it is not surprising that a verbal form consisting of a root and a reverse or expansive suffix is treated as a root in terms of causative formation.

5.4 The reduplicated verbal construction also provides evidence for the causative stem-formation process. Reduplication seems to involve copying the verbal stem to the left, and inserting $a$ between the two occurrences of the root.

(14) /ch11ng/ 'carry' ch11ng-a-ch11ng 'carry and carry'
    /Bek/ 'shave' Bek-a-Bek 'shave and shave'
    /lum/ 'bite' lum-a-lum 'bite and bite'

When suffixed forms of roots appear in the reduplicated construction, apparently the verbal root is copied first, and only the right-most root is followed by the suffix.

(15) /lum-a-lum-1/ → lumalum1 'bite and bite for'
    /ch11ng-a-ch11ng-1/ → ch11ngach11n1l 'carry and carry for'
    /Bek-a-Bek-1/ → BekaBek1/el 'shave and shave for'

Yet when the causative follows 1- or r-final roots in this construction, a causative stem must be formed, because both occurrences of the root surface as s-final.
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(16) /lel-a-lel-1/ \rightarrow lesalesi 'make nurse and nurse'
/Bir-a-Bir-1/ \rightarrow BisaBisi 'make pass and pass'

But cf the following
/ch1ing-a-ch1ing-1/ \rightarrow ch1ingach1ingJi 'make carry and carry'
*ch11ngach1ingJi
/Bek-a-Bek-1/ \rightarrow BekaBechi 'make shave and shave'
*BechaBechi

Postulating a causative stem-formation process for these l- and r-final roots in the reduplicated construction accounts for the fact that root-final s appears in both instances of the root. This process creates a causative stem before reduplication, making it possible for s to appear in the copied root. Note also that it is not surprising that a stem-formation process would precede a morphological process like reduplication. On the other hand, a rule like phonetic palatalization applies only after the root has been copied. Since it is generally assumed that morphological rules like reduplication precede phonetic rules, then ordering palatalization after reduplication is also expected.

5.5 It turns out that the causative stem-formation process does not affect every root in the compound causative constructions discussed. As we have seen above in (16), the reduplicated-causative form for /ch1ing/, 'carry' is ch1ing-a-ch1ingJi, and not *ch11ng-a-ch11ngJi. And in the causative-reciprocal forms, the root /Bek/ 'shave' appears as Bek-an-i (< /Bek-an-1), and not *Bech-an-i 'make e o shave'. In these cases, the root-final segments g and k are not changed, and a causative stem is not formed.

5.5.1 It appears, then, that the causative stem-formation process must be limited in a specific way. This is summarized by the following:

(17) "The causative stem-formation process affects roots with certain final segments. These root-final segments must be subject to rules which are conditioned solely by the causative suffix."

The liquid mutation rule which changes l or r to s when the causative follows is such a rule, and therefore causative stem-formation affects l- and r-final roots. But the phonetic palatalization rule which applies to k, g, etc., is not conditioned solely by the causative, since any front vowel will trigger it (cf. examples in (1), (2), and (6) above). Roots containing segments subject to the
phonetic palatalization rule will not therefore undergo the causative stem-formation process.

5.5.2 This is further confirmed by the causative formation of certain ux-final verb roots. A morphophonemic process changes ux-final verb roots to us-final only before the causative suffix.

(18) ilux 'run' > ilus-1 'make run'
pulux 'fly' > pulus-1 'make fly'
ambusx 'cross' > ambus-1 'make cross'

Phonetic palatalization changes x to sh in non-causative constructions.

(19) ilux 'run' > ilush-1 'run for'
teex 'cook' > omu-teesh-1 'one who cooks, wife'
eshi-teesh-e 'which is cooked, food'

But in the causative-applied construction, only ux-final roots become us-final.

(20) pulux 'fly' > pulus-11-1 'make fly for/toward'
ilux 'run' > ilus-11-1 'make run for'
yayux 'melt' > yayus-11-1 'melt for'

In the causative-reciprocal construction, ux-final roots become us-final.

(21) pulux 'fly' > pulus-an-1 'make e o fly'
ilux 'run' > ilus-an-1 'make e o. run'

Thus, the causative stem-formation process affects ux-final verb roots in compound causative constructions. These roots undergo a morphophonemic change of ux to us in the simple causative form which is conditioned solely by the causative suffix. On the analogy of the simple causatives, a causative stem is formed, and appears in these compound causative constructions. In contrast, other x-final verbs which become sh by the phonetic palatalization rule do not change x to sh in the appropriate compound construction /teex-an-1/ → teexan1, *teeshan1 'make e o cook'. The case for the causative stem-formation process is therefore strengthened by the additional evidence provided by these ux-final roots.

To summarize the discussion of the causative, the first indication that a causative stem-formation process is involved in certain constructions comes from a consideration of vowel harmony conditions in the causative-applied forms. The evidence from vowel harmony discredits an approach involving the metathesis of the applied suffix, and indicates instead that some distinction must be made between the l-final reversion and expansive suffixes on the one hand, and the applied suffix /il/ on the other. It has been
proposed that a causative stem-formation process changes root-final segments in certain productive compound causative constructions (like the causative-applied and the causative-reciprocal), and in the reduplicated construction. Liquids of suffixes which are non-productive and idiosyncratic, and which do not affect the syntax of following NP’s, are changed to $s$, while the roots are unaffected, because these lexically dependent suffixes are considered to be more "root-like" than "suffix-like." An additional limitation on causative stem-formation is that the process only affects roots which have simple causative forms derived by non-phonetic, morphophonemic processes specific to the causative.

II. In this section, the stative construction will be discussed. It will be shown that vowel harmony considerations point to a generalized account of the process of stative formation, in which the notion "possible morpheme of a language" plays a crucial role.

1. It will be recalled that stative formation involves the suffixation of /ix/ and obligatory vowel harmony conditions.

(22) /naB/ 'sew' naB-ix 'sewn'
    /lim/ 'farm' lim-ix 'cultivated'
    /xup/ 'beat' xup-ix 'beaten'
    /loll/ 'see' loll-ix 'visible'
    /rem/ 'cut' rem-ix 'be cut'

2. Consider the following /i/-final verbal roots in the stative.

(23) ʰnaasi 'give trouble' ʰnaasix 'be troublesome'
      sim 'extinguish' simix 'extinguished'
      yuunji 'hurry(t v )' yuunjix 'be hurried'

Notice that the vowel preceding $x$ is short. There is no phonetic reason to expect that /i-ix/ sequences should reduce to $i$ because no such rule or process exists in the language. So, it might be proposed that the $i$ of the root is dropped, and the suffix /ix/ follows.

(24) /sim/ $\rightarrow$ /sim/, /sim-ix/ $\rightarrow$ simix

If, however, we consider /i/-final roots with mid-vowels in the preceding syllable, we find the following stative forms.
If it is proposed that the 1 of the root is dropped, and /ix/ follows, then we cannot explain how it is that ix, not *ex, appears in the surface form of these statives. Since vowel harmony is obligatory for the stative suffix, then either these forms are exceptions, or our analysis is basically incorrect.

3 An alternative analysis for these 1-final roots in the stative would be that a reduced form x of the stative suffix follows root-final 1. That is, /sheesi-x/ → sheesix, /simi-x/ → simix, etc. We would not need to propose that a phonetically unmotivated reduction rule applies to /1-ix/ sequences and produces the surface ix forms. Nor would the vowel harmony conditions be violated, because x, not 1x, follows these 1-final roots. Thus the evidence from vowel harmony serves to discredit our first proposal, and to lend support to an alternative.

4 We shall next consider statives of other root types to find further evidence of the appearance of /x/, a reduced form of the stative. After we have examined these forms, a general principle will be proposed which can be used to predict the occurrence of this reduced form of the stative suffix.

4 1 The reduced form /x/ of the stative appears when the stative of reversives is formed.

If it is proposed that the reduced form /x/ appears after the ul-final reversive forms, then there is phonetic motivation for the deletion of 1. Consonant clusters beginning with a non-nasal are never found in OluTsootso, so the deletion of 1 before x serves to prevent the surface appearance of such an ungrammatical cluster.

4 2 When the expansive suffix /VIVI/ appears before the stative, once again it is /x/ which is suffixed, while the final 1 of the expansive is deleted.
(27) raats-illl 'hemorrage' > raats-illl-x 'hemorraged'
   fi1ll-illl 'compressed' > fi1ll-illl-x 'compressed'
   Naan-ulul 'devour' > Naan-ulul-x 'devoured'

Thus, when 1-final suffixes are followed by the stative, the reduced form /x/ appears, which triggers the deletion of the preceding 1 of the suffix.

4.3 Apparently, this process has analogically spread to some non-suffixed 1-final roots, as the following examples show:

(28) futul 'pierce' futu-x 'be pierced'
   iBu 'give birth' iBu-x 'be born'
   aBu 'split open' aBu-x 'split open'
   ya81 'bury' ya81-x 'be buried'
   techel 'tremble' techel-x 'be shaken'
   itsulil 'remember' itsulil-x 'memorable'

Yet the following 1-final roots do not suffix the reduced form of the stative, but show ix or ex instead:

(29) ikal 'shut' ikal-ix 'be shut'
    yaakal 'sharpen' yaakal-ix 'be sharpened'
    tsaangal- 'lose taste' tsaangal-ix 'be tasteless'
    al
    ellel 'dangle' ellel-ex 'be dangled'
    fuumbel 'embrace' fuumbel-ex 'be enclosed'

Notice that a purely phonological distinction (based on either syllable count or the quality of the vowel preceding 1) cannot be proposed as a conditioning factor for the appearance or non-appearance of /x/.

However, the 1-final forms in (29) (which are followed by the full form of the stative /ix/) differ from the 1-final forms in (28) (in which 1 is deleted before /x/) in a way which turns out to have important implications for the process of stative formation. The 1-final forms in (29) cannot be analyzed as consisting of a root and a suffix of the language, whereas all the 1-final forms which involve the suffixation of /x/ consist of either (a) a root plus a suffix, or (b) a hypothetical root followed by a 'possible' suffix of the language. From this it is possible to propose the following general principle to account for when /x/, not /ix/, follows verbal forms in the stative.

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"If a verbal form can be analyzed as consisting of a root plus a suffix, then /x/, not /ix/, appears in the stative."

This principle then includes verbal forms which are actually suffixed, as well as those which are analogically analyzable as being 'suffixed,' so long as the 'suffix' resembles a 'possible' suffix of the language. For convenience and brevity, I will at times refer to both of these types of verbal forms as 'derived' forms, simply because verbal derivation in OluTsotso involves suffixation.

4.4 I shall next discuss in detail how it is that speakers analyze certain verbal forms as 'derived' and then contrast these with other verbal forms which are not analyzed as 'derived.'

4.4.1 If we re-examine the forms of (28), we see that these appear to consist of hypothetical roots followed by possible suffixes.

(31) /futul/ analyzable as /fut*-ul/ (root-reversive)
    /aBul/ " /aB*-ul/ (root-reversive)
    /yaBul/ " /yaB*-il/ (root-applied)
    /techel/ " /tek*-il/ (root-applied)

4.4.2 The above forms contrast with the forms in (29), because the latter cannot be analyzed as consisting of a hypothetical root followed by a 'possible' suffix.

Let us see why this is so. Consider the first three examples of (29), all of which end in -al. Since -al does not exist synchronically as a suffix, the segmentation representing the morphemic analysis as /root*-al/ is impossible. Thus, these verbal roots cannot be analyzed as derived forms of hypothetical roots, because the 'suffix' -al is not a 'possible' suffix of the language.

The verbal form /eleel/ is similar in that it may not be analyzed as either /el*-eel/ or /ele*-el/. In the former situation, the "suffix" would be ele, presumably from the applied /el/. Yet a lengthened version of el or el does not occur, and so *ele is not a 'possible' suffix. As for the segmentation /ele*-el/, no e-final verb roots exist in the language, and so *ele is an impossible root. Therefore, /eleel/ cannot be analyzed as a derived form of a verb, and so /ix/, not /x/, appears in the stative construction.
Finally, /fuumbel/ cannot be analyzed as hypothetical /fuumb*/ followed by el. Since the vowel harmony conditions require that the applied suffix /il/ appears (optionally) as el only when mid-vowel roots precede, then el could not possibly be the applied suffix occurring after /fuumb*/, a high vowel root. So, /fuumbel/ cannot be analyzed as a derived form of a verb, and is therefore followed by the full form of the stative, /ix/.

4.4.3 The principle proposed in (30) accounts for the appearance of /x/ in the statives of actual reversive and expansive forms of (26) and (27) respectively. Since reversives and expansives are obviously derived forms of verbs, /x/, not /ix/, appears in the stative construction.

4.4.4 Another actual derived construction that involves the suffixation of /x/ is the stative form of causatives. The following verbs surface with /x/ after the causative vowel /i/.

(32) kul 'buy' kus-i 'sell' kus-i-x 'sold'
kaal 'be O.K.' kaas-i 'repair' kaas-i-x 'repairable'
man 'know' man-i 'show' man-i-x 'shown'
kaal 'be imitative' kaas-i 'distract' kaas-i-x 'distractable'

These forms are in accord with the principle proposed in (30), since causatives are obviously derived forms of verbs.

4.5 Returning now to the stative forms of i-final roots first introduced in (23) and (24), it is clear that these are analogically analyzable as "causative" forms of simpler hypothetical roots. Since the final i resembles a possible suffix (the causative), roots like /sheesi/ can be analyzed as /shees*-i/, or 'derived'. And as the corroborating evidence from vowel harmony showed, /x/, not /ix/, is suffixed to these roots.

5 To summarize, stative usually involves the suffixation of /ix/, which surfaces as ex when preceding vowels are mid. The statives of i-final verbs appear to be violations of the vowel harmony process, at least if it is assumed that /ix/ is suffixed. If /x/ is postulated as the stative suffix in these forms, no violation of vowel harmony occurs. The appearance of /x/ as the stative can be predicted by the principle proposed in (30), which states that if a verbal form can be analyzed as a derived form, then /x/ appears in the stative. If such an analysis is impossible,
then the full form of the stative, /ix/, is suffixed. This principle has been shown to make correct predictions concerning the stative forms of reversives, expansives, certain 1-final verbs, causatives, and 1-final roots. In each case, then, the speaker's ability to analyze forms as 'derived' is crucial in determining the correct forms for the stative construction.

III The vowel harmony conditions provide evidence of a special vocalic process involving a set of certain verbal roots. These roots are of the phonological shape C or CV, differing from the canonical CVC form of most roots. They are referred to as "monosyllabic" roots in traditional grammars of other Bantu languages, and often occur with confusing and irregular alternations.

Some of these roots are listed below. In the simple infinitival form, final a appears after the root.

(33) /11/ 'eat' oxu-11-a 'to eat'
/ku/ 'fall' oxu-kw-a 'to fall'
/si/ 'grind' oxu-si-a 'to grind'
/nu/ 'drink' oxu-nw-a 'to drink'

The applied form for some of these verbs seems perfectly regular, since 1l appears as expected after the root.

(34) oxu-11-1l-a 'to eat for'
oxu-ri-1l-a 'to fear for'
oxu-kw-1l-1l-a 'to fall for'
oxu-fw-1l-1l-a 'to die for'

However, the following forms seem to surface with el as the applied suffix, and not 1l.

(35) oxu-si-el-a 'to grind for'
oxu-sh1-el-a 'to dawn for'
oxu-nw-eel-a 'to drink for'

Notice that these forms are apparent violations of vowel harmony, because 1l, not el, is expected to appear when preceding vowels are high. In fact, forms in which 1l is suffixed are ungrammatical: *oxu-si-1l-a, *oxu-sh1-1l-a, *oxu-nw-1l-l-a, *oxu-xw-1ll-a.

As was the case in the stative construction, we would like to account for apparent violations of the vowel harmony process in a
non-ad hoc way, rather than listing certain forms as exceptions. It turns out that other constructions involving the monosyllabic roots will provide evidence that these applied forms are not violations of the vowel harmony process.

2 If we examine the passives of these roots, in contrast with certain non-passive forms, we find evidence that (1) an extra vowel appears after the root in the passive, (2) B is inserted, (3) the passive suffix /u/ becomes  by glide formation.  

(36) oxu-11-a 'to eat' oxu-11-1-B-w-a 'to be eaten'  
oxu-ri-a 'to fear' oxu-ri-1-B-w-a 'to be feared'  
oxu-51-a 'to grind' oxu-51-e-B-w-a 'to be ground'  
oxu-nw-a 'to drink' oxu-nw-ee-B-w-a 'to be drunken'

What is of interest here is that the inserted vowels appearing after the roots in the passive forms are the same as those which appeared in the applied construction. For example, /l1/ was followed by i in the applied, and an added 1 appears in the passive /si/ appears with e following in the applied form (an apparent violation of vowel harmony), and e appears in the passive form as well.

3 In the following constructions, the monosyllabic roots appear with an extra vowel and the inserted ts.

(37) a habitual/continuous  
/Ba-li-ng-a/ → Ba-11-1-ts-aanga 'They eat'  
/Ba-si-ng-a/ → Ba-si-e-ts-aanga 'They grind'  
/Ba-kw-ng-a/ → Ba-kw-11-ts-aanga 'They fall'  
/Ba-nw-ng-a/ → Ba-nw-ee-ts-aanga 'They drink'

b reciprocal  
/-li-an/- → -li-1-ts-an- 'eat e o'  
/-si-an/- → -si-e-ts-an- 'grind e o'  
/-xw-an/- → -xw-ee-ts-an- 'pay e o dowry'

c stative  
/-li-1x/- → -li-1-ts-1x- 'edible'  
/-si-1x/- → -si-e-ts-ex- 'be ground up'  
/-kw-1x/- → -kw-11-ts-1x- 'fallen'  
/-nw-1x/- → -nw-ee-ts-ex 'potable'

Notice that here again the same vowel that appears after the root in the applied and passive forms surfaces in the above con-
structions It seems that once these vowels appear after the roots in these forms, $ts$ is inserted, apparently to prevent an ungrammatical sequence of three successive vowel morae from surfacing.  

4 It appears then that the monosyllabic roots condition the insertion of a vowel in certain constructions. It is likely that this vowel is determined lexically, because I can find no phonological features in the roots which would condition the appearance of $i$ as opposed to $e$. But once these vowels are lexically inserted, it appears likely that they condition the insertion of $ts$ in the passive forms and $ts$ in the above constructions, in order to prevent three successive vowel morae from surfacing.  

5 If we return now to the applied forms of the monosyllabics, we can account for the apparent violations of the vowel harmony process. It could be proposed that the vowels appearing before the $l$ of the applied suffix are in fact the lexically inserted vowels specific to each monosyllabic root, and that they are not the vowel of the applied suffix. In this way we can explain the otherwise remarkable coincidence that the applied forms which seem to be violations of the vowel harmony process all involve roots which condition the insertion of $e$ in other verbal constructions. And if it is the lexically inserted vowel which appears before the $l$ of the applied, then no violation of vowel harmony occurs, because that process involves suffixal vowels.  

Notice that it is also necessary to propose that the vowel of the applied suffix is deleted when the lexically inserted vowel appears, because, e.g., $liii$, and not $*li-li-il$ 'eat for' appears. Yet even this process can be motivated phonologically, because without it, the ungrammatical sequence of three vowel morae would surface.  

6 To summarize, monosyllabic roots condition the appearance of lexically determined vowels in various constructions. The evidence from the vowel harmony process for the applied indicates that these lexically inserted vowels appear before the $l$ of the suffix, and that the vowel of the applied is deleted. Under this proposal, forms which seem to be unexplained violations of the vowel harmony process are given instead an illuminating and generalized account.  

IV The vowel harmony conditions have been used in a number of verbal constructions to provide evidence in the determination.
of morphophonemic interactions. The vowel harmony conditions in the causative-applied construction provide the first indication that a causative stem-formation process should be proposed to account for some otherwise confusing morphophonemic alternations, found in other compound causative constructions. In addition, an interesting distinction between suffix types is motivated: some suffixes are more "root-like" than others, in terms of productivity and syntactic effect. This distinction became crucial for morphophonemic processes as well.

Vowel harmony provides evidence that the stative formation of i-final verb roots involves the suffixation of /x/, a reduced form of the full stative, /ix/. The appearance of /x/ turns out to be predictable in a more general account of stative formation, which states that the reduced form of the stative appears when verbal forms can be analyzed as 'derived'. The analysis of forms as derived depends crucially on what constitutes a 'possible' suffix in OluTsootso.

Finally, the vowel harmony conditions were used to show that applied forms of certain monosyllabic verb roots would have to be unexplained exceptions to the vowel harmony process, unless an alternative was proposed. It turns out that the exceptions to the vowel harmony conditions are all roots which require the lexical insertion of e in other verbal constructions. From this it has been proposed that the vowel preceding the i of the applied is also the lexically inserted vowel, not the vowel of the suffix.

In each case, then, the vowel harmony conditions are used to provide evidence for generalized and explanatory accounts of the causative, stative, and monosyllabic-root constructions in OluTsootso.

NOTES

1The OluTsootso dialect of (Olu)Luhya is found in Guthrie's Zone E 32 b, north and west of Lake Victoria. The research leading to this paper has been made possible by an NDFL Title VI Fellowship, which also provided funds for my informant, Mr O Tsuma, a native speaker of OluTsootso. I must thank Dr V Uchendu, Director of the African Studies Center at the University of Illinois, for enabling me to begin my investigation in the summer of 1974. The comments of Margie O'Bryan, Karen Dudas,
and Chuck Kisseberth have been most helpful. The symbols used in the text correspond to the IPA system, except that B represents [f], ch is [tʃ], sh is [ʃ], ng' is [ŋ], and ng is actually [ŋg].

2 A palatalization rule changes k, x, and q (in the nasal cluster ng) to ch, sh, and j respectively. ng' becomes ñ before front vowels, and h becomes y before l.

3 The situation in Chichewa has been related to me by Chuck Kisseberth in personal communication. The grammar by Ashton (p. 231) accounts for the Swahili data.

4 This is the result of an historical situation in which s is derived from *t and *d (the ancestors of the liquids r and l) when the so-called "super-high" vowel *i followed. The vowel of the causative was probably *i which has subsequently merged with *i to /i/ in OluTsooto; however, the alternations associated with *i have survived synchronically.

5 This suffix denotes that the action of the verb is carried out in a repetitive, grandiose, and/or unnecessary manner.

6 This development is discussed in Dalgish (under preparation). It is shown that uX-final verb roots are analyzed as derived forms of hypothetical ñl-final forms. The latter would of course change to us-final before the causative. There are some further complexities which do not affect the point made here, which is that this change is limited to the causative construction.

7 Cf. O'Bryan (1974). This topic was discussed in a paper delivered at the summer LSA meeting, 1975, by O'Bryan and the present writer.

8 It is likely that this was the verbalizing suffix *ad in proto-Bantu.

9 These could also be analyzed more abstractly as l- or r-final, as if the root-final 1 were the causative, and that the surface ñ is created by liquid mutation. But no corresponding l- or r-final form can be found, and so these are probably analyzed as s-l-final.

10 The term is unfortunate, since most Bantu roots are /CVC/ which should certainly be labelled monosyllabic as well. Apparently,
traditional writers included the final vowel \(-a\) in their descriptions of roots, so that /C/ or /CV/ roots became /C-a/ or /CV-a/, and therefore "monosyllabic," while /CVC/ roots are considered "bi-syllabic" (/CVC-a/)

11 The /C/ roots /h/ 'give' and /r/ 'put' are not discussed here

12 Glide formation changes /u/ to /w/, and compensatorily lengthens a following vowel (except /u/) Compensatory lengthening is blocked in word-final position, as no \(V_1V_1\) # sequences exist

13 B is inserted when the final vowel of a verbal root is followed by the passive /sheesi-u/ + sheesi-B-u Glide formation then changes the /u/ to /w/ /sheesi-B-u-/ + sheesiBw- 'be greeted'

14 The appearance of these vowels probably has an historical explanation Since most root-internal vowels are either short (V) or identically long (VV), the presence of non-similar root-internal vowels would not have been tolerated, and may have been dropped Now, they seem to be re-inserted. As for /s/, it is quite likely that this consonant, or some other, was lost for these roots (prior to the proto-stage, in fact), because most roots are /CVC/ It is now being re-inserted, perhaps to prevent the surface appearance of three successive vowel morae

15 Notice that in these cases, the appearance of the reduced form /x/ as the stative suffix would be phonetically motivated, in that it would serve to prevent three successive vowel morae from surfacing /li-i-x/ + /li-i-ix/ (in which the lexically determined vowel is inserted), this triggers the reduced form of the stative to appear as /x/ *li-i-x But this is ungrammatical, because /x/ appears only when verbal roots are analyzed as 'derived,' monosyllabic roots can never be analyzed that way

16 For a discussion of the numerous devices the language employs to prevent \(VVV\) sequences, cf. Dalgish, 1975

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