

RULE INVERSION IN CHADIC: AN EXPLANATION

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An alternative to the rule inversion solution in Kanakuru is presented along with some evidence from Pero. It is shown that the proposed analysis not only makes the rule inversion unnecessary but that it explains other facts in Kanakuru phonology as well, in particular it makes predictions about the verb final vowels in that language.

1. Introduction¹

Leben [1974] presented an alternative analysis for most of the instances for which Schuh [1972] has postulated a rule inversion. The most important case for which Leben did not present an alternative solution is the formation of verb and noun plurals in Kanakuru. Schuh [1974] defends the necessity of the rule inversion in Chadic by pointing that his proposal for the analysis of plurals in Kanakuru was not countered.

In what follows I will present an alternative analysis of plurals which will render the rule inversion unnecessary and will explain some facts which could not be explained by rule inversion.

Newman [1970] postulates the following diachronic rules for Kanakuru:

- (1) *T → r in which *T stands for *t, *d, or *d̂
 *P → w in which *P stands for *p, *b, or *b̂
 *K → h

¹This is the first opportunity which I have had to express my thanks to Paul Newman for his encouragement in the study of Pero and numerous discussions on the problems of Chadic linguistics. The work on Pero was conducted during A.Y. 1974/1975 with the help of the Ahmadu Bello University. The research grant from the Ahmadu Bello University is gratefully acknowledged. The present paper is a by-product of a larger project partially supported by the Council on Research and Creative Work, University of Colorado. I would like to thank David Rood who kindly read the paper and made helpful remarks on the style of the paper.

Thus in the following singular verbs the medial consonants are supposed to represent the result of these diachronic rules: (Schuh [1972:387])

(2)	<u>Singular</u>	<u>Gloss</u>	<u>Plural</u>
	dowe	'tie'	dope
	boi ← buwi	'shoot'	bupe
	pui ← puwi	'get out'	pupe
	muri	'die'	muti ²
	pori	'go out'	pođe

In order to account for the plural forms of these verbs Schuh postulates the inverse rules, by which:

(3) $r \rightarrow t$, $r \rightarrow d$, and $w \rightarrow p$

This account of the plural forms has two serious disadvantages, both noted by Schuh. One is that the r of the singular results in a t one time and in a d another time. In order to account for this fact Schuh proposes an explanation by which / t / in *mute* is a historical retention and the d in *pođe* is a recent replacement occasioned by what has been traditionally called analogical leveling.

The second difficulty, for which Schuh does not see an explanation, is why the stops in the plural form did not change to sonorants.

2. Analysis of the Plural Forms of Verbs

As an alternative solution I propose to treat the rules in Newman [1970] as synchronic rather than diachronic. Thus in the underlying forms of the verbs in the singular we would have stops rather than sonorants. The underlying forms would be:

²This is a mistake. It should be *mute*. Cf. Newman [1974:72].

- (4) 'tie' /dope/ → [dowe]
 'shoot' /bupe/ → *[buwi] → [boi]
 'die' /muti/ → [muri]
 'go out' /podfi/ → [pori]

The immediate advantage of this solution is that we do not have to postulate rather arbitrary rules by which $r \rightarrow d'$ one time and $r \rightarrow t$ another. One synchronic rule could account for the phonetic representation of the verbs in the singular:

- (5) Obstruent Weakening
 $C \rightarrow [+son] / V_V$
 [-cont]

In order to account for the plural forms of the verb I propose the following rule instead of the "hardening" postulated by Newman [1974:4] and Schuh [1972:388].

- (6) Reduplication
 $C V C V \rightarrow 1 2 3 3 4$
 1 2 3 4 [Plural]

The order of those rules should be explicitly stated as:³

Reduplication (6)

Obstruent weakening (5)

Rule (6) states that the second consonant of the verb is reduplicated to mark the plural. The underlying form of the plural stems derived from the verbs in (2) by rule (6) would be:

- (7) Plural
 /doppe/ 'tie'
 /buppe/ 'shoot'
 /puppe/ 'get out'
 /mutte/ 'die'
 /podde / 'go out'

³I am grateful to Russell Schuh for pointing this out to me.

There is no longer an environment for the application of the rule of stop weakening, thus answering Schuh's question of "why the stops in the plural were not always changed into sonorants". One must of course also postulate the following rules:

(8) /tt/ → [t:] /dđ/ → [d:] /pp/ → [p:]⁴

While the form of the plural is evidence for the claim that stop → sonorant is a synchronic rule, the following is presented as evidence that the plural form of the verb is indeed a result of the reduplication of the second consonant of the verb. The first part of the evidence is from Kanakuru.

Notice that there is a change of final *i* to *e* when the verb becomes plural, e.g.:

(9) m̀ur̀i m̀ut̀e 'die'
 p̀or̀i p̀od̀e 'go out'

Newman [1974:72] considers this vowel change to be a property of the plural verbs.

I would like to postulate the following rule in order to account for this change:

(10) *i* → *e* / ̤ C—

i.e., the vowel *i* becomes *e* when the preceding syllable of the verb

⁴There is an indirect indication that phonetically long consonants might exist in Kanakuru. There is no indication in Newman [1974] how the two abutting consonants are realized phonetically, and one cannot say what if any might be the difference in the pronunciation between 't' and 'tt' or 'k' and 'kk' in the words below.

e.g. atto	'her hand'	átè	'to dip out'
a bakke	'he ignored you'	àkeré	'to bite'
anni	'his hand'	àní	'to lie down'

It is of course quite possible that /tt/ → [t] and /kk/ → [k] in intervocalic position, and that what appears phonetically as [k] derives from the underlying /kk/ and what appears phonetically as [h] derives from the underlying /k/, etc.

is heavy (long). (Cf. Newman [1972] for the importance of this variable in Chadic.)

An examination of all the verbs in Newman [1974] has shown that all the verbs in Kanakuru which meet the above condition do have the *-e* ending, e.g.,

Verbs with the first syllable of the form CVV;

- | | | |
|------|-------|-------------------------|
| (11) | béelè | 'choose' |
| | bóorè | 'make a hole' |
| | bàaré | 'grow up' |
| | dúulè | 'bang against' |
| | góomè | 'be bothered by thirst' |
| | jáalè | 'spoil, deteriorate' |
| | wáarè | 'beat thing' |

Verbs which have the first syllable closed, or in other words, verbs which have the structure CVCCV, e.g.,

- | | | |
|------|--------|-------------------------|
| (12) | kwàhlé | 'fight' |
| | ángè | 'pay' |
| | ò̀ndé | 'squeeze' |
| | kùmbé | 'beseech, request of' |
| | làmbé | 'court or seek a woman' |

The above are only some of the examples of the verbs with the first syllable long. In view of this evidence, the change from *i* to *e* in the plural form is caused by the change in the syllabic structure of the verb from CVCV → CVCCV, i.e., the first syllable of the verb became heavy.

The trisyllabic verbs in Kanakuru have only the *-e* ending. Notice that those verbs have a stop rather than an expected continuant in intervocalic positions. It is postulated that the trisyllabic verbs in fact have the first syllable heavy, i.e. (C)VCCVCV. The following are

some of the examples of trisyllabic verbs from Newman [1974]:

(13)	bómbalè	'scrape'
	wòòbàré	'say good-bye to'
	yùmburè	'submerge under water'
	téngalè	'stir'
	shùmburè	'quiet'
	pàapàré	'punish, scold'
	mèngalè or múngulè	'metamorphose'
	kwàmbàré	'embrace'
	lámbarè	'become dull (knife)'
	géndalè	'roll heavy t. off t.'
	gúngulè	'bend out of shape'
	àkàré	'bite'
	àpàré	'shed, pour out'
	dwátalè	'break up'
	tàkàlé	'deceive'

Notice that the penultimate vowel is predictable from the first vowel of the verb. If the first vowel is high the penultimate (or the second vowel) is high as well and agrees in fronting with the first vowel. There are two exceptions to this rule, viz.

(14)	wúshilè	'scatter'
	díìbàré	'buy'

If the first vowel of the trisyllabic verb is other than 'i' or 'u' then the penultimate vowel of the verb is ə. This may be an indication that -le and/or -re may in fact be suffixes.

There is another class which almost exclusively ends in -e in Newman's corpus. The verbs in this class have a stop consonant at the on-

set of the second syllable. Newman [1970] lists six such verbs, but in the 1974 corpus there are more than fifty to be found with these characteristics. Those from the 1970 paper are:

- | | | |
|------|------|------------|
| (15) | àdé | 'eat meat' |
| | kàpé | 'sow' |
| | tùké | 'hide' |
| | díté | 'pick out' |
| | wúbè | 'knot' |
| | lákè | 'untie' |

Of the almost fifty verbs with a stop at the onset of the second syllable, only four have the vowel -i at the end of the word; the rest have the vowel -e.

The following list of exceptions is exhaustive:

- | | | |
|------|------|-----------|
| (16) | jópì | 'leak' |
| | lòpí | 'cave in' |
| | dèkí | 'drip' |
| | àbí | 'open' |

In addition, there are five verbs which have an alternation δ/w at the beginning of the second syllable. This alternation seems to be a product of the rule $w \rightarrow \delta$. For some Kanakuru speakers, w and δ are in free variation (cf. Newman [1974:4-5]). The following is an almost exhaustive list based on Newman [1974]:

- | | | |
|------|---------------|-----------------------|
| (17) | yé δ ì | 'ascend, climb' |
| | jí δ ì | 'screen off, dam off' |
| | dè δ í | 'ferment' |
| | dú δ ì | 'mix into paste' |
| | là δ í | 'want, look' |
| | lè δ ì | 'agree, answer' |

I would claim that the verbs which have a stop in intervocalic position in Kanakuru are actually plural verbs, formed by the reduplication (doubling) of the second consonant of the stem, just like the small group of verbs mentioned by Newman [1970, 1974:72] and by Schuh [1972]. According to the present analysis those verbs have the underlying form CVCCV. The reason why they were not analyzed by Newman as plural verbs was the fact that he apparently did not come across the counterparts with a sonorant at the onset of the second syllable, either because the singular forms of the verbs do not exist any more or because they were not a part of the corpus of data collected. In Newman [1974] there is at least one pair not recognized by Newman as representing the singular-plural contrast, viz.

(18) àrí 'eat' àdé 'eat meat'

From the formal point of view the verbs which have a stop at the onset of the second syllable do not differ from the recognized plural verbs mentioned at the beginning of this paper. Verbs ending in -e include in addition several verbs with sh [š] in intervocalic position. Concerning this consonant Newman [1974:2] writes: "Though phonetically a fricative, sh structurally fills the C slot in the voiceless stop series". Because of this characteristic it is assumed that those verbs do not differ structurally from other plural verbs.

(19) kàshé 'cut (fish)'
 gáshè 'drive away'
 dúshè 'pound'

It is assumed that the following verbs where the medial consonant is a liquid or nasal and the final vowel is e, are also plural verbs. It is thus possible that in Kanakuru there is no difference between the phonetic realizations of single and reduplicated sonorants.

(20) áìè 'pour (into a small calabash)'
 ámè 'pull'

bálè	'say'
mómè	'forget'

Liquids and nasals occur in the -i ending verbs as well, e.g.,

(21) àí	'see'
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The other evidence for a rule like (6) is from Pero, a language closely related to Kanakuru. The abundance of data allows for a thorough analysis of plural formation. Reduplication of the consonant in the second syllable is a device used in several classes of verbs to form the plural. The examples which follow are from the class in which reduplication is the only device used. Note that the examples are subject to the following rule in Pero:

(22)	C →	[+cont +voice]	/V__V
	[-glottal -cont -voice]		

This rule is further constrained depending on the quality and length of the surrounding vowels.

(23) <u>Gloss</u>	<u>Singular</u>	<u>Plural</u>
'eat'	/adù/ → [adu]	/adðò/ → [adðo] ⁵
'shoot, sting'	/becò/ → [pejò]	/beccò/ → [peccò]
'throw away'	/tedò/ → [tedò]	/tedðò/ → [tedðò]
'touch'	/nafù/ → [navù]	/naffò/ → [naffò]
'discuss'	/deefò/ → [deevò]	/deeffò/ → [deffò]
'open'	/afù/ → [avù]	/affò/ → [affò]
'cut'	/betò/ → [però]	/bettò/ → [pettò]
'stand'	/cetò/ → [cerò]	/cettò/ → [cettò]
'pour in'	/baato/ → [paarò]	/baattò/ → [pattò]
'hang'	/lookò/ → [lookò]	/lookkò/ → [lokkò]

⁵There is a change of gloss between the singular and the plural forms. The plural form means 'to eat something hard'. Cf. this verb in Kanakuru in (18).

The last two examples provide evidence that what really happens here is reduplication rather than "hardening". In Pero there is a constraint on the syllable structure similar to the constraint in Hausa: in closed syllables long vowels cannot occur. After reduplication of the second consonant in *paato* and *looko* the syllabic division produces an impossible structure *CVVCCV. Therefore the vowels in the first syllable are reduced. Conditions of the fieldwork on Pero did not allow for an instrumental description of the sound system; therefore, I can only offer an impressionistic description of the geminate stops in Pero. It seems that in the articulation of a geminate stop there is longer time between the stop of the air and its release than for simple stops. In terms of syllabic structure, in deliberately slow speech the stop is produced at the end of the first syllable and the release is at the beginning of the following syllable. If it is of any help, the time between the stop and the release in normal speech seems slightly shorter than in the normal articulation of geminate stops in Polish or Italian.

3. Plural of Nouns

It seems that one can postulate that the plurals of nouns in Schuh [1972:187] are formed by reduplication of the second consonant just as are the plurals of verbs. This is a common device in the Chadic languages, e.g. for Fyer, Jungraithmayr [1970:36] provides the following examples:

(24)	<u>Singular</u>		<u>Plural</u>
	ràdon	'bull'	rà-dd-dôn
	bat̀n	'bush'	ba-t̀t̀-ťín
	gwèné	'rooster'	gwe-ni-né

Reduplication is used as one of the devices for the formation of plural in the other Ron languages, e.g. Bokkos, Daffo and Butura (Jungraithmayr [1970]). In Hausa, reduplication of the second syllable is a part of the stem preparation for the formation of plural with the class of nouns which have the first syllable short (light) (Newman [1972:314]).

4. Conclusions and Implications

To recapitulate the results of the above analysis: 1. It has been postulated that the form of plural verbs and nouns in Kanakuru provides evidence that the underlying consonants in the verbs involved are stops rather than sonorants. 2. The evidence for the postulated rule of plural formation is provided by the formation of the plural in the closely related language Pero, and indirectly by the analysis of vowel endings in Kanakuru verbs.

The concept that the stop → sonorant change is synchronic rather than diachronic will have several implications for the analysis of Kanakuru, mainly in the reformulation of some of the rules in Newman [1974]. In the discussion below, P-1.1, etc. refer to the rules as given in Chapter 1 of Newman [1974].

Epenthetic shwa insertion:

(25) P-1.1. a. $(C_3)C_1C_2 \rightarrow (C_3)C_1\text{ə}C_2$

b. $d\bar{r} \rightarrow d\bar{e}r$

Instead of the rules in (25) I propose the following ordered rules:⁶

(26) 1. $C_1 \quad C_2 \quad + \quad C_3 \quad \rightarrow \quad C_1 \quad C_2\text{ə} \quad C_3$

[α place] $\left\{ \begin{array}{l} [- \text{nasal}] \\ [-\alpha \text{ place}] \end{array} \right\}$

2. $C_1 C_2 C_3 \rightarrow C_1 C_3$

Some examples of derivation from Newman [1974:3] reanalyzed:

- (27) /a/ /wupp/+ /to/ → / a wuppəto → [a wupəro] (cf. footnote 4) 'he
sold it to her'
/a/ /dadf/+ /to/ → / a dadfəto/ → [a dadəro] 'he sewed it for her'
/shi/ /kukk/+ /mai/ → /shi kukkəmai/ → [shi kukəmai] 'he is learning'
/a/ /dadf/+ /no/ → [a dadno] (Rule (26)2.) 'he sewed it for me'
/shi/ /wubb/+ /mai/ → [shi wubmai] (Rule (26)2.) 'he is knotting it'
(Newman [1974:6])

⁶I am grateful to John Jensen and Russell Schuh for helpful advice in formulating some of the rules. Any mistakes are of course my own.

The shwa insertion rule does not operate when only two consonants are involved:

- (28) /shit/ + /te/ → [shitte] 'steal it'
 /a/ /ak/ + /ko/ → [a akko] 'he honed it for you'

One can understand the phonetic form of Newman's example (p. 3) [a gup-təru] 'he forged (it)' if one derives it from the following underlying structures:

/gúpì/ 'to forge' + /ttə/⁷ (pre-pronoun form) (Newman [1974:73]) and /-tu/ (non-pronoun form) (Newman [1974:75]) of the ventive marker. Since the verb does not have the vowel ending before a suffix the form of the morphemes in this construction is /gúp/ + /ttə/ + /tu/.

After the stop weakening rule we obtain *gupttəru

After the rule 2 we obtain guptəru.

If one accepts that the stop → sonorant change is a synchronic rule there is no need to postulate existence of "archiphonemes" R, H, and W, and the rules in which those archiphonemes were involved would have to be changed. The intention in presenting the following alternatives to Newman's rules P -1.2 through P -1.6 is to show that such changes are possible. The examples are those that accompany those rules in Newman [1974].

⁷Newman postulates for this morpheme /tə/. However, this morpheme displays the same irregularity as many verbs have, viz. 't' is not weakened to [r]. E.g.,

à kòotè né 'he caught (and brought) me' kóì

nà àmtè wú 'I pulled them (here)' ámé

(One would expect *[àmè].)

I conclude therefore that this morpheme has the structure /ttə/.

Instead of P-1.2., given here as (29):

$$(29) \begin{Bmatrix} W \\ R \\ H \end{Bmatrix} \rightarrow \begin{Bmatrix} [-son] \\ [+son] \end{Bmatrix} / \begin{Bmatrix} [---\#] \\ [V---V] \end{Bmatrix}$$

one rule is proposed,

$$(30) C \rightarrow [+cont] / V---V$$

e.g., /mot/ 'oil' /mot/ + /i/ → [mori] 'the oil'

Instead of P-1.3 given here as (31):

$$(31) \text{ a. } \begin{Bmatrix} R \\ H \end{Bmatrix} \rightarrow \begin{Bmatrix} [-son] \\ [+son] \end{Bmatrix} / \begin{Bmatrix} [\alpha cor] \\ [-\alpha cor] \end{Bmatrix} \text{ ---}$$

b. W → [+son] / C---

the following rule is proposed:

$$(32) C \rightarrow [+son] / \begin{matrix} C \\ [-\alpha cor] \end{matrix} \text{ ----}$$

$$\begin{Bmatrix} [-lab] \\ [\alpha cor] \end{Bmatrix}$$

e.g., /a jaŋ/ + /te/ → [a jaŋre] 'he cured her'

/a/ + /shen/ + /ke/ → [a shenhe] 'he remembered you'

Rule P-1.5, given here as (33):

$$(33) \begin{Bmatrix} W \\ \langle R \rangle \\ \langle H \rangle \end{Bmatrix} \rightarrow [+son, +nas] / \text{----} \begin{matrix} C \\ [+son, +nas] \\ \langle \alpha cor \rangle \end{matrix}$$

could be rewritten as (34):

$$(34) \begin{matrix} C \\ \begin{Bmatrix} - glott \\ \langle - lab \rangle \\ \langle \alpha cor \rangle \end{Bmatrix} \end{matrix} \rightarrow [+nasal] / \text{---} \begin{matrix} C \\ \begin{Bmatrix} + nasal \\ \langle \alpha cor \rangle \end{Bmatrix} \end{matrix}$$

- e.g. /a dup/ + /no/ → [a dumno] 'he mixed it for me'
 /a kət/ + /ne/ → [a kəne] 'he tested me'
 /a dək/ + /mu/ → [a dɛŋmu] 'he built it for us'
 but /a dək/ + /no/ → [a dɛhno] 'he built it for me'

The last rule which is involved in Newman's P-1.6 Stop/sonorant specification (C_1 of an abutting pair), which consists of three rules and one exception, given here as (35):

- (35) a. $W \rightarrow [-son] / \text{----}C$
 b. $H \rightarrow [+son] / \text{----}C_{[\alpha son]}$
 c. $R \rightarrow [-\alpha son] / \text{----}C_{[\alpha cor]}$

(Exception: $R \rightarrow r / \text{----}$)

Instead of these four rules, the following two could do if one accepts the existence of the underlying stops:

- (36) $C \rightarrow [+son] / \text{----} \left\{ \begin{array}{c} C \\ [-cor] \\ [+cor] \\ [+son] \end{array} \right\}$
 $[+cor]$
- $\left[\begin{array}{c} C \\ -ant \\ -cor \end{array} \right] \rightarrow [+son] / \text{----} \left[\begin{array}{c} C \\ +son \end{array} \right]$

Some examples of derivation, using the modified rules, are given in (37).

- (37) a. 'he stole a bow' [a shir rəha]
 /a:/ /shiti/ 'steal' rəha 'bow'
 /a/ /shit/ + /rəha/
 [a shir rəha] by rule (36)

- b. 'her tongue' [yilihro]
 /yilik/ 'tongue' /to/ 'her'
 /yilik/ + /to/
 /yilik/ + [ro] by rule (32)
 [yilihro] by rule (36)

The modified rules account for all the examples with which Newman illustrates his original rules. They must, however, be treated as tentative for Kanakuru, since I did not have the possibility of checking them against the complete corpus of data.

The advantages of the above analysis over the previous analyses are the following:

1. It explains satisfactorily the phonetic form of the large class of verbs which have a stop in intervocalic position. This fact was not previously understood, cf. Newman [1974:4]. Instead of fifty, only four verbs remain unexplained.
2. It explains the vowel change from *i* → *e* in the verbs of Kanakuru. Previously, *-i* and *-e* were considered to be unpredictable verb endings (Cf. Newman [1974:40], Newman 1975:78).
3. It is no longer necessary to postulate the existence of archiphonemes along with systematic phonemes to account for the phonetic form of the Kanakuru verb.
4. The phonological rules are less numerous and more general.

The most important conclusion of this paper is that the stop → continuant sound change is not a diachronic but a synchronic rule in Kanakuru and that there is no need for unnatural rules (cf. Hyman [1974:178]) in order to explain the formation of plurals of verbs and nouns in Kanakuru. This together with Leben's discussion of the postulated rule inversion in Hausa (Leben [1974]) indicates that if there is a rule inversion in Chadic it remains to be shown.

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