THIS BOOK IS OF POOR LEGIBILITY DUE TO LIGHT PRINTING THROUGHOUT IT'S ENTIRETY.

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A GENERATIVE PHONOLOGY OF THE
MOROCCAN ARABIC VERB

by

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A MASTER'S THESIS

submitted in partial fulfillment of the
requirements for the degree

MASTER OF ARTS

Department of Speech

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1976

Approved by:

[Signature]
THIS BOOK CONTAINS NUMEROUS PAGES THAT WERE BOUND WITHOUT PAGE NUMBERS.

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ACKNOWLEDGEMENTS

I wish to thank all the members of my supervisory committee. My special thanks go to Dr. James L. Armagost without whose enlightening comments, advice and help, this work would have stayed at a much more preliminary level. I also wish to thank IIE for their financial support. Finally, I wish to thank those friends who have shown patience at difficult moments.
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Moroccan Arabic is the language spoken in the extreme northwestern part of Africa, Morocco. It is spoken by approximately eighteen million people. With this number of people speaking the language there are, obviously, dialectal variations which characterize different regions. The dialect described in this work is what might be called, broadly speaking, the Central Urban Dialect of Moroccan Arabic. This calls for a cautionary remark. Since I had to change residence from Meknes to Rabat, some changes have occurred in my dialect. These changes were by no means either voluntary or conscious. They were brought about by social constraints and impositions of what is and what is not "prestigious" speech. This, in short, is to say that the dialect described here is the Central Urban Dialect with slight variations.

More crucial to the import of this work is the background of Moroccan Arabic. Before the final quarter of the Seventh Century A.D., there was no such thing as Arabic in Morocco. What was spoken there is Berber, a Hamito-Semitic language distantly related to Arabic. The Arab invasion beginning in the late 600's introduced what was, I believe, very close to what is nowadays referred to as Standard Arabic, or Classical Arabic. This because the invaders originated from Damascus, the base of Arab civilization and culture.
Later Spain was invaded and Arabic was introduced there, too. The invaders were mainly Moroccan Berbers headed by Arab conquerors. A great deal of movement from Morocco into Spain and vice versa, as well as intermarriages between Moroccans and Spaniards, occurred at the time. In the Fifteenth Century, after the Christians gained back Spain, Spanish Jews and converted Muslims, as well as the Moroccan invaders, returned to Morocco. Finally, various European invasions into Morocco took place.

This brief sketch may hint at all the kinds of people, with their various backgrounds, that had to learn Arabic and eventually mold what will come to be known as Moroccan Arabic. This should account for the tremendous changes that the language has undergone, to the point of non-intelligibility with other dialects of Arabic. Comparing grammars of Classical and Moroccan Arabic, one would expect to find many changes, additions and losses of phonological rules. As these changes might simplify the grammar of Classical Arabic, so they might also add complications. In the case of Moroccan Arabic, it seems these changes have both added complications into and simplified the grammar of the language. In the case of the consonantal stems the grammar has been simplified and in the case of the passive participle of the triliteral verbs it has been complicated.
In the first section, I will deal with triconsonantal stems; in a second section I will deal with quadriciconsonantal stems; a third section will take up triliteral stems with a medial vowel; and the last section will deal with triliteral stems with a final vowel. The conclusion will summarize briefly what has been achieved in this work and point out some of the problems that have been encountered.
SECTION I

VERBS WITH UNDERLYING TRICONSONANTAL STEMS

This section will be divided into two parts. One will deal with what Harrell (1962) calls sound stems and the other with what he calls doubled stems. Sound stems are those that have three different consonants. Double stems are those that end in two geminates.

A. SOUND TRICONSONANTAL STEMS

Consider:

1. $xda^m_t$ I worked
2. $xda^m_ti$ you worked
3. $xda^m$ he worked
4. $xda^m_at$ she worked
5. $xda^m_na$ we worked
6. $xda^m_tu$ you (plural) worked
7. $xa^dmu$ they worked

I am going to posit here a triconsonantal underlying stem, namely /xdm/, and propose a few rules that will account for the occurrence of the vowel in the stem. As far as the suffixes are concerned, for the first and second persons singular, the underlying suffixes are going to be, respectively, /-it/ and /-iti/ although they emerge as $[-t]$ and $[-ti]$. Similarly, the underlying suffixes for the first and second persons plural will be respectively /-ina/ and /-itu/, although they are realized phonetically as $[-na]$ and $[-tu]$. A rule to be given below will account for the
elision of /-i/ in the relevant environments. The suffixes for the other persons are identical in underlying representation and derived form.

One might state a rule which will insert the vowel in the stem as (I).

(I) EPENTHESIS

\[ \emptyset \rightarrow \tilde{a} / \text{CC-} C \tilde{J} \]

With this rule the schwa will be inserted correctly in such items as \[ \text{x*dant} \] and \[ \text{x*dantu} \]. If we look at \[ \text{x*dmat} \] and \[ \text{x*dmu} \], however, we notice that the schwa shows up between the first two consonants of the stem, not between the last two. We might hypothesize a process of metathesis triggered by the vowel immediately following the stem in these forms. Metathesis has not been triggered in items 1, 2, 5 and 6 because the rule which deletes the underlying /i/ acts earlier in the derivation. A rule which might account for the movement of the schwa could be formulated as (II).

(II) METATHESIS

\[ \text{CCVC} \tilde{V} \rightarrow 13245 \]

\[ \text{stem 1234} \rightarrow 5 \]

This rule has to be restricted to the stem so that it does not affect such vowels as the /a/ in /x*dma+t+u/ (she worked it).

Now that the vowel insertion is accounted for, for all
the items of the data, let us return to \( \text{x} \text{d} \text{m} \text{t} \text{n} \text{i} \text{t} \), \( \text{x} \text{d} \text{m} \text{i} \text{t} \text{i} \), 
\( \text{x} \text{d} \text{m} \text{n} \text{n} \text{a} \) and \( \text{x} \text{d} \text{m} \text{n} \text{t} \text{u} \). It was assumed earlier that the underlying suffixes in these four items are respectively \(-i/-it/-iti/-ina/\) and \(-itu/-it/\). We need a rule of Syncope that would elide the \(/i/\). This rule would have to be ordered before Metathesis -- so that we do not generate ungrammatical forms as argued above. For the moment it will be stated as follows:

(III) SYNCOPE

\[ i \rightarrow \emptyset / C \rightarrow C \]

Here is a complete derivation of the above data:

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>xdm+it</td>
<td>xdm+at</td>
<td>xdm+itu</td>
<td>xdm+u</td>
<td>UNDERLYING REPRESENTATION</td>
<td></td>
</tr>
<tr>
<td>xdm+t</td>
<td>------</td>
<td>xdm+tu</td>
<td>------</td>
<td>SYNCOPE</td>
<td></td>
</tr>
<tr>
<td>xdm+m+t</td>
<td>xdm+m+at</td>
<td>xdm+tu</td>
<td>xdm+u</td>
<td>EPENTHESIS</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>xdm+m+at</td>
<td>------</td>
<td>xdm+u</td>
<td>METATHESIS</td>
<td></td>
</tr>
<tr>
<td>xdm+nt</td>
<td>xdm+mat</td>
<td>xdm+tu</td>
<td>xdmu</td>
<td>DERIVED FORM</td>
<td></td>
</tr>
</tbody>
</table>

Let us now consider the imperfective form of the same verb.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{n} \text{x} \text{d} \text{m} \text{a} \text{m}</td>
<td>I work</td>
</tr>
<tr>
<td>\text{t} \text{x} \text{d} \text{m} \text{a} \text{m}</td>
<td>you (masculine) work</td>
</tr>
<tr>
<td>\text{t} \text{x} \text{d} \text{m} \text{a} \text{n}</td>
<td>you (feminine) work</td>
</tr>
<tr>
<td>\text{y} \text{x} \text{d} \text{m} \text{a} \text{m}</td>
<td>he works</td>
</tr>
<tr>
<td>\text{t} \text{x} \text{d} \text{m} \text{a} \text{m}</td>
<td>she works</td>
</tr>
<tr>
<td>\text{m} \text{x} \text{d} \text{m}</td>
<td>we work</td>
</tr>
<tr>
<td>\text{t} \text{x} \text{d} \text{m}</td>
<td>you (plural) work</td>
</tr>
<tr>
<td>\text{y} \text{x} \text{d} \text{m}</td>
<td>they work</td>
</tr>
</tbody>
</table>

In addition to the stem, we have prefixes that denote the
imperfective and suffixes that denote the plural and feminine singular. The prefixes show up either as $Ca-$ or as $C-$, since
the earlier occurrences of $\overline{\text{a}}$ were predictable, we might
ask whether the $\overline{\text{a}}$ in the imperfective suffixes is likewise
predictable. I am going to suggest that in the underlying
representation the prefixes are of the form $C-$ rather than $Ca-$,
and that there is a rule of Moroccan Arabic which breaks up
initial consonant clusters of more than two consonants. A
second Epenthesis rule might be formulated as follows:

$\text{(IV) EPENTHESEIS 2}$

$\emptyset \rightarrow \partial \text{ / } \# \text{ C } \rightarrow \text{ CC}$

This rule has to be ordered after Metathesis so that it does
not apply to items such as the first and second persons
plural, yielding the ungrammatical forms $\overline{\text{netaxadmu}}$ and
$\overline{\text{metaxadmu}}$. Here is a derivation of the items under dis-
cussion:

\[
\begin{align*}
n+x|d&m & \quad t+x|d&m & \quad n+x|d&m+u & \quad t+x|d&m+u & \text{ UNDERLYING REPRESENTATION} \\
n+x|d&m & \quad t+x|d&m & \quad n+x|d&m+u & \quad t+x|d&m+u & \text{ EPENTHESIS} \\
\text{-----} & \quad \text{-----} & \quad \text{-----} & \quad \text{-----} & \text{ SYNCOPE} \\
\text{-----} & \quad \text{-----} & \quad n+x|d&m+u & \quad t+x|d&m+u & \text{ METATHESIS} \\
\partial+e+x|d&m & \quad \partial+t+x|d&m & \quad \text{-----} & \quad \text{-----} & \text{ EPENTHESIS 2} \\
\partial+x|d&m & \quad \text{t}+x|d&m & \quad nx|d|mu & \quad tx|d|mu & \text{ DERIVED FORMS}
\end{align*}
\]

This analysis is a possible way of accounting for the data. But if we look at EPENTHESIS 2 we see that in some cases it
inserts the schwa in the same environment where Metathesis moves it, for instance: \[x\dot{d}mat\] and \[x\dot{d}mu\]. So with a little alteration in the rules we might be able to simplify the analysis. We have two Epenthesis rules separated in the rule ordering and we have an intervening Metathesis rule whose work can be done by Epenthesis 2, at least in some cases. One could, then, consider the possibility of collapsing the two Epenthesis rules and omitting the Metathesis rule. Now the crucial items, from the data considered so far, are

\[
x\dot{d}mt \\
x\dot{d}m \\
x\dot{d}mat \\
x\dot{a}dm \\
x\dot{a}dmu \\
\]

In the first two items we see that the schwa is inserted in the environment

\[
(V) \quad C \quad C \quad \{#\} \\
\quad \text{stem} \quad \{C\}
\]

The word boundary environment will also insert the rightmost schwa in \[n\dot{a}dm\]. In the items \[x\dot{d}mat\] and \[n\dot{a}dm\] the leftmost schwa is inserted in the environment \(C - CCV\).

In \[tx\dot{a}dm\] it is inserted in the same environment except that we have an extra \(C\) to the left of the environment, but that will not be crucial to the statement of the rule. Integrating the above environments into the rule, Epenthesis may be stated as follows:
(VI) EPENTHESIS

\[ \emptyset \rightarrow \text{\(\varepsilon\)/C} \rightarrow \text{stem} \{\text{C}\} \{\text{a}\} \]

\[ \text{CV} \{\text{b}\} \]

Environment (a) of rule (VI) has to be restricted to stems so that we do not generate \^[\text{xdm\at}\text{]} after Syncope has applied. Syncope will have to be ordered before Epenthesis in order to create the appropriate environment in forms such as \^[\text{xd\varepsilon\at}\text{]} (from /\text{xdm+it}/)^6. Syncope will be formulated in the same way as earlier.

This present analysis will, therefore, save us the cost of the Metathesis rule that was posited in the earlier analysis. At this point we have a Syncope rule and a revised Epenthesis rule ordered in this order, instead of the four rules formulated earlier. The evaluation metric would clearly favor the present analysis over the former. Let us see, now, how this analysis accounts for the data:

<table>
<thead>
<tr>
<th></th>
<th>\text{xdm+it}</th>
<th>\text{xdm}</th>
<th>\text{xdm+at}</th>
<th>\text{n+xdm}</th>
<th>\text{t+xdm+u}</th>
<th>\text{UNDERLYING REPRESENTATION}</th>
<th>\text{SYNCOPE}</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{xdm+t}</td>
<td>---</td>
<td>------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>\text{-----}</td>
<td>\text{xd\varepsilon}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
</tr>
<tr>
<td>\text{xdm+at}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{n+xd\varepsilon}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
</tr>
<tr>
<td>\text{-----}</td>
<td>\text{-----}</td>
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<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
</tr>
<tr>
<td>\text{xd\varepsilon}</td>
<td>\text{xdm+at}</td>
<td>\text{n+xd\varepsilon}</td>
<td>\text{t+xdm+u}</td>
<td>\text{-----}</td>
<td>\text{EPENTHESIS (a)}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
</tr>
<tr>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
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<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
<td>\text{-----}</td>
</tr>
</tbody>
</table>

Now that the superiority of the later analysis has been
proved, the earlier one will not be given any further atten-
tion.

Consider now the Active Participles of the verb under
consideration:

\[
\begin{array}{ll}
xad\dot{\alpha}m & \text{masculine singular} \\
xad\alpha m & \text{feminine singular} \\
xadmin & \text{plural}
\end{array}
\]

We notice that the active participle has \([E]\) in its stem,
and this never occurs in the perfective or the imperfective.
For the masculine singular, we see that \([a]\) occurs in the
environment:

\[
\begin{array}{c}
C \rightarrow C \circ C
\end{array}
\]

If we postulate a rule to this effect depending merely on
phonological environment, then the rule will apply also to
the perfective and instead of \([xad\dot{\alpha}m]\) we would end up with
\(*[xad\alpha m]\). The formation of active participles is apparent-
ly sensitive to both the syntactic and the phonological en-
vironments of the verb stem. Assuming the feature \([\text{Partic-
iple}]\), and anticipating a later discussion of passive parti-
ciples, I will posit the following rule for the active parti-
ciples under consideration.

\[
(VII) \text{ACTIVE PARTICIPLE FORMATION}
\]

\[
\begin{array}{c}
\emptyset \rightarrow a / #C \\
\text{Participle} \\
\text{Passive}
\end{array}
\]

The suffixes /a/ (feminine singular) and /in/ (plural) are
similar to the suffixes in the perfective forms given earlier,
and will not be given further attention. One question arising here is whether these forms undergo any other phonological rules. The intermediate form /xədəm/ meets the structural description of the (a) subrule of Epenthesis, which will insert the schwa, giving /xədəmma/.

Consider, finally, the passive participles of the same verb:

\[
\begin{array}{ll}
\text{məxədum} & \text{masculine singular} \\
\text{məxəðuna} & \text{feminine singular} \\
\text{məxədumin} & \text{plural}
\end{array}
\]

What has been said about active participles will apply, with additions, to passive participles. I assume an early rule, roughly as follows:

**(VIII) PASSIVE PARTICIPLE FORMATION**

\[
\begin{array}{c}
\text{stem} \\
[\text{CCC}] \\
\rightarrow m+ \text{CCuC} / [+ \text{participle} \\
[+ \text{passive}]
\end{array}
\]

The suffixes, clearly, are as in the active participles.

What other rules might apply? The form of the plural meets the structural description of Syncope, but if this rule applies, we will generate /məxəduminn/. This would be the form of the plural at the end of the derivation, that is after undergoing subsequent Epenthesis. How can we prevent Syncope from applying to the above item? Syncope must be restricted so that it applies to /xədəm+ina/, but not to /m+xədum+in/. The rule could be revised as follows:
(IX) SYNCOPE
\[ i \rightarrow \emptyset / C + \rightarrow C \langle y \rangle \langle \text{nasal} \rangle \]

The addition to this rule is that /n/ has to be followed by a vowel in order for /i/ to be elided. The schwa insertion in the passive participles will be effected by subrule (c) of Epenthesis in a straightforward way.

B- DOUBLED TRICONSONANTAL STEMS

Consider:

- məddit: I handed over
- mədditi: you handed over
- mədd: he handed over
- məddat: she handed over
- məddina: we handed over
- mədditu: you (plural) handed over
- məddu: they handed over

To account for the above data, we would have to revise both Syncope and Epenthesis. Syncope could have a restriction added to it as follows:

(X) SYNCOPE
\[ i \rightarrow \emptyset / CiCj + \rightarrow C \langle y \rangle \langle \text{nasal} \rangle \]
condition: \( i \neq j \)

This will prevent /i/ from being elided in this category of verbs. As for Epenthesis, the schwa will be inserted by Subrule (c) in all the items under discussion except the third person singular \( \text{mad} \). If we do not constrain the rule, subrule (a) would apply and we would generate \( *\text{madad} \).
We must prevent Epenthesis from breaking up geminates as follows:

\[
\begin{align*}
\emptyset & \rightarrow \emptyset / Ci \rightarrow C : \{\#, \ i\neq j\} \\
\text{stem} & \rightarrow C \{V\} \\
\end{align*}
\]

Now the third person singular will be generated by subrule (c). Here is a derivation of some of the items under discussion.

\[
\begin{array}{cccc}
\text{mdd}+\text{it} & \text{mdd} & \text{mdd}+\text{itu} & \text{mdd}+u \\
\text{madd}+\text{it} & \text{madd}+\text{itu} & \text{madd}+u \\
\text{madd}+\text{it} & \text{madd}+\text{it} & \text{madd}+u \\
\text{madd}+\text{it} & \text{madd}+\text{it} & \text{madd}+u \\
\text{maddit} & \text{madd} & \text{madditu} & \text{maddu} \\
\end{array}
\]

Consider, now, the imperfective of the same verb:

\[
\begin{align*}
\text{mmadd} & \quad \text{I hand over} \\
\text{tmadd} & \quad \text{you (masculine) hand over} \\
\text{tmaddi} & \quad \text{you (feminine) hand over} \\
\text{ymadd} & \quad \text{he hands over} \\
\text{tmadd} & \quad \text{she hands over} \\
\text{mmaddu} & \quad \text{we hand over} \\
\text{tmaddu} & \quad \text{you (plural) hand over} \\
\text{ymaddu} & \quad \text{they hand over} \\
\end{align*}
\]

In these cases the schwa will be inserted by Epenthesis subrules (c) and (d) with no new changes in the rule.

Consider the participles of such verbs:
madd  masculine singular active
madda  feminine singular active
maddin  plural active
m₅m₅d₅d  masculine singular passive
m₅m₅d₅da  feminine singular passive
m₅m₅d₅din  plural passive

These forms are perfectly regular and will be given by the rules posited earlier for sound stem participles (pp. 10 and 11). The only other rule that will have to apply is Epenthesis (c) to insert the schwa after the first segment in the passive forms. Here is a derivation of some imperfective and participle forms:

<table>
<thead>
<tr>
<th>t+mdd+i</th>
<th>mdd+in</th>
<th>mdd+a</th>
<th>UNDERLYING REPRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mdd+in</td>
<td></td>
<td>ACTIVE PARTICIPLE FORMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m+mdud+a</td>
<td>PASSIVE PARTICIPLE FORMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SYNCOPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EPENTHESIS (a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EPENTHESIS (b)</td>
</tr>
<tr>
<td>t+mdd+i</td>
<td>m+mdud+a</td>
<td>EPENTHESIS (c)</td>
<td></td>
</tr>
<tr>
<td>t+mddi</td>
<td>maddin</td>
<td>mmduda</td>
<td>DERIVED FORM</td>
</tr>
</tbody>
</table>

Here is a summary of the rules posited so far.

(XII) ACTIVE PARTICIPLE FORMATION

\[ \emptyset \rightarrow a / \#G \]

\[ + \text{participle} \]

\[ - \text{passive} \]
(2) PASSIVE PARTICIPLE FORMATION

\[
\begin{array}{c}
\text{[CC]} \rightarrow m^+ \text{ CCuC} / \\
\text{stem} \quad [\text{+ participle}]
\end{array}
\]

(3) SYNCOPE

\[
\begin{array}{c}
i \rightarrow \emptyset / \text{CiCj} + \quad \text{C } \{V\} \\
\text{condition } i \neq j
\end{array}
\]

(4) EPENTHESIS

\[
\begin{array}{c}
\emptyset \rightarrow \emptyset / \text{Ci} \quad \text{C} \{\# \text{, } i \neq j\}
\end{array}
\]

These rules will account for all the verbs which have an underlying triconsonantal stem. It should be pointed out, however, that there is cause for some concern. Why is it that both Syncope and Epenthesis (a) have identical restrictions on the CC clusters? This duplication looks suspicious even if not formally counted by the evaluation metric. Note also the duplication (this time counted) within Epenthesis itself: (a) and (d) are similar, though apparently uncappable; and the C outside the stem bracket in (b) is, in some uncaptured sense, the same C as that before \{V\} in (c) and (d).
SECTION II

VERBS WITH UNDERLYING QUADRICONSONANTAL STEMS

Consider the following verb forms and their underlying representations:

\[\text{dr\text{dr}t} \quad /\text{drdr} + \text{i}/ \quad \text{I sprinkled}\]
\[\text{dr\text{dr}na} \quad /\text{drdr} + \text{i}n\text{a}/ \quad \text{we sprinkled}\]
\[\text{td\text{dr}dr} \quad /\text{t} + \text{drdr}/ \quad \text{you sprinkle}\]
\[\text{yd\text{dr}dr} \quad /\text{y} + \text{drdr}/ \quad \text{he sprinkles}\]

The above items will be accounted for by the rules that have been posited so far. Both schwas in each item will be inserted by Epenthesis. Now, consider these other forms of the same verbs and their underlying representations.

\[\text{dr\text{dr}rat} \quad /\text{drdr} + \text{at}/ \quad \text{she sprinkled}\]
\[\text{dr\text{dr}ru} \quad /\text{drdr} + \text{u}/ \quad \text{they sprinkled}\]
\[\text{td\text{dr}rdri} \quad /\text{t} + \text{drdr} + \text{i}/ \quad \text{you (feminine) sprinkle}\]

If we apply Epenthesis, as it stands now, to the above forms we will generate the following ungrammatical forms:

\[*/\text{dr\text{dr}rat}/\]
\[*/\text{dr\text{dr}ru}/\]
\[*/\text{td\text{dr}rdri}/\]

Therefore, Epenthesis will have to be revised so that we can accommodate these forms. The new form of the rule will look as follows:

\[\text{(XIII) EPENTHESIS}\]

\[\emptyset \rightarrow \text{d} / \left[\text{Ci} \rightarrow \text{C}_{j}\right] \text{stem}\{\text{C}_{i}, \text{C}_{j}\} \quad \{\text{a}\}\]

\[\left\{\text{C}_{i} \quad \text{C}_{j}\right\} \quad \{\text{b}\}\]

\[\{\text{C}_{i} \quad \text{V}_{i}\} \quad \{\text{c}\}\]

\[\{\text{C}_{i} \quad \text{C}_{j} \quad \text{V}_{i}\} \quad \{\text{d}\}\]
This rule will now accommodate such items as \[ t\epsilon\delta r\delta \epsilon \]. The left stem bracket has been added so that prefix consonants do not allow the rule to apply incorrectly. For instance, after subrule (a) has introduced the rightmost schwa in \( t\epsilon\delta r\delta \epsilon \), the next subrule that would apply is the largest expansion of (c) and we would generate *\[ t\epsilon\delta r\delta \epsilon \] instead of \[ t\epsilon\delta r\delta \epsilon \]. The stem bracket prevents that from happening, so that when angled bracket material is not considered, (c) will break up the CCC cluster in the stem.

Let us now turn to the participles of this category of verbs\(^9\). Consider the passive participles:

\[
\begin{align*}
\text{m\epsilon\delta r\delta \epsilon} & \quad \text{masculine singular} \\
\text{m\epsilon\delta r\delta \epsilon \epsilon} & \quad \text{feminine singular} \\
\text{m\epsilon\delta r\delta \epsilon \epsilon \epsilon} & \quad \text{plural}
\end{align*}
\]

Our rule of Passive Participle Formation will not yield the above forms, since it only deals with tri consonantal stems. Let us revise it and generalize it to include this category of verbs:

\[ \text{(XIV) PASSIVE PARTICIPLE FORMATION} \]

\[
\begin{array}{c}
\text{stem} \\
\text{CCC} \langle C \rangle \\
\text{m+ CCC(u)C} \langle C \rangle / \\
\text{[+participle]} \\
\text{[passive]}
\end{array}
\]

The use of the angled bracketing in this rule guarantees that when we have a passive participle, quadric consonantal stems will not have the vowel \[ u \] and tri consonantal stems will. After this rule applies, Epenthesis will insert the
schwas in the correct environments. Now, here is a derivation of some of the quadriconsonantal forms:

<table>
<thead>
<tr>
<th>drdr+ina</th>
<th>drdr+at</th>
<th>t+drdr+i</th>
<th>drdr [ + participle ]</th>
<th>drdr [- passive ]</th>
<th>UNDERLYING REPRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>---------------------</td>
<td>---------------</td>
<td>ACTIVE PARTICIPLE FORMATION</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>m+drdr</td>
<td>PASSIVE PARTICIPLE FORMATION</td>
<td></td>
</tr>
<tr>
<td>drdr+na</td>
<td>------</td>
<td>-------</td>
<td>----</td>
<td>SYNCOPE</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>m+drdr</td>
<td>EPENTHESIS (a)</td>
<td></td>
</tr>
<tr>
<td>drdr+na</td>
<td>------</td>
<td>-------</td>
<td>----</td>
<td>EPENTHESIS (b)</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>ddr+at</td>
<td>EPENTHESIS (c)1</td>
<td></td>
</tr>
<tr>
<td>ddr+na</td>
<td>------</td>
<td>-------</td>
<td>----</td>
<td>EPENTHESIS (c)2</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>----</td>
<td>EPENTHESIS (a)</td>
<td></td>
</tr>
<tr>
<td>ddrna</td>
<td>ddrat</td>
<td>tdadr</td>
<td>mdrd</td>
<td>DERIVED FORM</td>
<td></td>
</tr>
</tbody>
</table>

Here is a summary of the rules, as they stand at this point:

1. **ACTIVE PARTICIPLE FORMATION**
   
   \[ \emptyset \rightarrow \text{a} / \# \text{C} \]
   
   \[ \phantom{\emptyset} \rightarrow \text{a} / \# \text{C} \]
   
   \[ \text{[ + participle ]} \]
   
   \[ \text{[ - passive ]} \]

2. **PASSIVE PARTICIPLE FORMATION**
   
   \[ \text{stem} \rightarrow m+CC\text{u}C \text{C} \]
   
   \[ \rightarrow m+CC\text{u}C \text{C} \]
   
   \[ \text{[ + participle ]} \]
   
   \[ \text{[ - passive ]} \]
(3) SYNOCOPE

\[ i \longrightarrow \emptyset / C_iC_j + \longrightarrow C \langle v \rangle \]

\(<\text{nase}\>)

condition \(i \neq j\)

(4) EPENTHEISIS

\[ \emptyset \longrightarrow \emptyset / \langle \left[ C_iC_j \right] \rangle \]

\[ \langle C \rangle \]

\[ \langle \text{stem} \rangle \]

\[ \{\# , i \neq j\} \]

\(\{c\}\)

\(\{d\}\)
SECTION III: VERBS WITH AN UNDERLYING MEDIAL VOWEL

Consider:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>foqat</td>
<td>I woke up</td>
<td>I got scared</td>
</tr>
<tr>
<td>foqti</td>
<td>you woke up</td>
<td>you got scared</td>
</tr>
<tr>
<td>faq</td>
<td>he woke up</td>
<td>he got scared</td>
</tr>
<tr>
<td>faq(\dot{t})</td>
<td>she woke up</td>
<td>she got scared</td>
</tr>
<tr>
<td>faqna</td>
<td>we woke up</td>
<td>we got scared</td>
</tr>
<tr>
<td>faqtu</td>
<td>you (pl.) woke</td>
<td>you (pl.) got</td>
</tr>
<tr>
<td>faqu</td>
<td>they woke up</td>
<td>they got scared</td>
</tr>
<tr>
<td>nfiq</td>
<td>we wake up</td>
<td>I get scared</td>
</tr>
<tr>
<td>tfiq</td>
<td>you (masc.) wake</td>
<td>you (masc.) get</td>
</tr>
<tr>
<td>tfiqi</td>
<td>(fem.) wake</td>
<td>you (fem.) get</td>
</tr>
<tr>
<td>yfiq</td>
<td>he wakes up</td>
<td>he gets scared</td>
</tr>
<tr>
<td>tfiq</td>
<td>she wakes up</td>
<td>she gets scared</td>
</tr>
<tr>
<td>nfiqv</td>
<td>we wake up</td>
<td>we get scared</td>
</tr>
<tr>
<td>tfiqu</td>
<td>you (pl.) wake</td>
<td>you (pl.) get</td>
</tr>
<tr>
<td>yfiqv</td>
<td>they wake up</td>
<td>they get scared</td>
</tr>
<tr>
<td>fiq</td>
<td>wake up! (masc.)</td>
<td>get scared!</td>
</tr>
<tr>
<td>fiqi</td>
<td>wake up! (fem.)</td>
<td>get scared!(fem.)</td>
</tr>
<tr>
<td>figu</td>
<td>wake up! (pl.)</td>
<td>get scared!(pl.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>you drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>he drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>she drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>we drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>you (pl.) drove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>they drove</td>
</tr>
</tbody>
</table>
For the preceding data, I am going to postulate that the stems are of the form CVC. The underlying consonants stay the same; there are no alternations. The complexity lies in defining what the underlying vowels are. I will propose that the underlying stem vowel for the set of data under A is /i/, that of B is /a/, and that of C is /u/. The reasoning behind this is that in the imperfective and the imperative the stem vowel for A always emerges as əɪ̯, that of B as əɑ̯, and that of C as əu̯. Now, how do we account for the alternations in the perfective?

At first view, the occurrence of əɑ̯ in the various forms seems to result from the stem vowels being reduced when followed by two consonants. One could posit a rule that would state that in this category of verbs, when a vowel is followed by two consonants, it gets reduced. This would work out correctly only if we extend Syncope to these forms so that we have the two consonants following the vowel to be reduced. A closer look at the data shows that the schwa is in the same environment where subrule (b) of Epenthesis would insert it. So a better way to account for the data is by an ad hoc deletion of the medial vowel prior to Epenthesis. This will not only allow Epenthesis to apply but it will also feed into Syncope. As we will see in a later section, the rule that deletes the vowel here should be specified in such
a way that it will only apply to this category of verbs. This category of verbs will, arbitrarily, be called Vb₃ verbs and the rule will be stated as follows:

(V) VOWEL DELETION

\[ V \rightarrow \emptyset \left[ + \text{perfective} \right. \]
\[ \left. - Vb₃ \right] \]

This rule has been restricted to the perfective, because it should not apply to the imperfective and imperitive. It will have to be ordered before Syncope, so that the suffix /i/ gets deleted, setting up the environment for Epenthesis.

Let us now consider the third person forms, namely:

faq xaf saq
fäät xafät saqät
fäqu xafu saqu

We see that these forms, consistently, have a medial [a] no matter what the underlying stem vowel is. It could be suggested that a readjustment rule states that the medial vowel of Vb₃ verbs becomes [a] in the third person forms of the perfective. One could also posit that [a] is inserted by a phonological rule. Since there seems to be no clear way of deciding which is better, I opt for the latter choice. The rule will be of the form:

(VI )THIRD PERSON FORMATION

\[ V \rightarrow a \left[ + \text{perfective} \right. \]
\[ \left. + \text{3d person} \right] \]
\[ + Vb₃ \]

This rule will have to be ordered before vowel deletion
which must be prevented from deleting the vowel in these forms. I will specify that VOWEL DELETION applies to forms other than third person.

(XVII) VOWEL DELETION

\[
V \rightarrow \emptyset / \begin{bmatrix} + \text{perfective} \\ - 3\text{d person} \\ + Vb_3 \end{bmatrix}
\]

But notice that (XVI) and (XVII) are collapsible as follows:

(XVIII) PERFECT READJUSTMENT

\[
V \rightarrow \{\emptyset\} / \begin{bmatrix} + \text{perfective} \\ - 3\text{d person} \\ + Vb_3 \end{bmatrix}
\]

Now consider:

faqṭ
xafṭ
sagṭ

It was posited earlier in the sections dealing with triconsonantal and quadriconsonantal stems that the underlying suffix for the third person singular feminine is /-at/. In the above items it shows up as [–at], but since this is not an environment where we would expect an insertion of [a] by Epenthesis, I will assume that the suffix /a/ has been reduced.\(^1\) I will posit a vowel reduction rule to account for the third person singular feminine of these verbs.

(XIX) SUFFIX VOWEL REDUCTION

\[
a \rightarrow \emptyset / VC + \;
\]

where V is a full vowel.

This rule will have to be ordered after Perfect Readjustment.
Here is a representative derivation of the stems discussed above:

\[
\begin{array}{ccccccc}
\text{fiq} + \text{it} & \text{xaf} + \text{ina} & \text{ṣug} + \text{itu} & \text{ṣug} & \text{fiq} + \text{at} & \text{UNDERLYING REPRESENTATION} \\
\text{---} & \text{---} & \text{---} & \text{ṣag} & \text{faq} + \text{at} & \text{PERFECT READING (a)} \\
\text{fq} + \text{it} & \text{xf} + \text{ina} & \text{ṣg} + \text{itu} & \text{---} & \text{---} & \text{PERFECT READING (b)} \\
\text{---} & \text{---} & \text{---} & \text{faq} + \text{t} & \text{SUFFIX VOWEL REDUCTION} \\
\text{fq} + \text{t} & \text{xf} + \text{na} & \text{ṣg} + \text{tu} & \text{---} & \text{---} & \text{SYNCOPE} \\
\text{faq} + \text{t} & \text{xəf} + \text{na} & \text{ṣəg} + \text{tu} & \text{---} & \text{---} & \text{EPENTHESIS (b)} \\
\text{faq} + \text{t} & \text{xəf} + \text{na} & \text{ṣəg} + \text{tu} & \text{ṣag} & \text{faqət} & \text{DERIVED FORM} \\
\end{array}
\]

Let us now turn to the participles of these verbs.

**Active Participles**

\[
\begin{array}{ccc}
\text{fayəq} & \text{xayəf} & \text{sayəg} & \text{masculine singular} \\
\text{fayqa} & \text{xayfa} & \text{sayga} & \text{feminine singular} \\
\text{faygin} & \text{xayfin} & \text{saygin} & \text{plural} \\
\end{array}
\]

We see that the verbs with /fiq/ as underlying stems follow a very similar pattern of the triconsonantals, i.e. \( a \) is inserted after the first segment from the left. But the underlying /i/ becomes the corresponding glide \( y \). A rule could be formulated to this effect:

\[
(XX) \quad \text{VOWEL GLIDE ALTERNATION}
\]

\[
i \rightarrow y / a
\]

Since the other verbs follow the same pattern as /fiq/, I will assume that in the active participle their underlying...
vowel undergoes an ad hoc change to /i/ before the above rule applies. This change will be accounted for by the following rule:

(XXI) VOWEL CHANGE

\[
V \rightarrow i / \left[ + \text{participle} \right. \\
- \text{passive} \\
\left. + \text{Vb}_3 \right]
\]

This rule has been restricted to \( \text{Vb}_3 \) in anticipation of its non-application to the verbs discussed in the following section. It will have to be ordered before Perfect Readjustment, Active Participle Formation and Vowel Glide Alteration.

Here is a derivation of the active participles of these verbs:

\[
\begin{align*}
\text{fi}q & \quad \text{xaf}+a & \quad \text{sug}+\text{in} & \quad \text{UNDERLYING REPRESENTATION} \\
\text{fai}q & \quad \text{xaif}+a & \quad \text{saig}+\text{in} & \quad \text{VOWEL CHANGE} \\
\text{fay}q & \quad \text{xayf}+a & \quad \text{sayg}+\text{in} & \quad \text{ACTIVE PARTICIPLE FORMATION} \\
\text{fay}q & \quad \text{xxxx} & \quad \text{xxxx} & \quad \text{VOWEL GLIDE ALTERATION} \\
\text{fay}q & \quad \text{xayfa} & \quad \text{sayggin} & \quad \text{EPENTHESIS (a)} \\
\end{align*}
\]

Consider the passive participles of these verbs:

\[
\begin{align*}
\text{mfi}q & \quad \text{mxuw}+\text{af} & \quad \text{nguwr}+\text{ag} & \quad \text{masculine singular} \\
\text{mfiiyq} & \quad \text{mxuw}+\text{fa} & \quad \text{nguwr}+\text{ga} & \quad \text{feminine singular} \\
\text{mfiiyq} & \quad \text{mxu}+\text{fin} & \quad \text{nguwr}+\text{gin} & \quad \text{plural}
\end{align*}
\]

One could, at this point, formulate another Passive Participle Formation rule for this category of verbs. It could be stated as:

(XXII) PASSIVE PARTICIPLE FORMATION II

\[
\text{Vb}_3 \rightarrow m \left[ \text{CVGCG} \right] / \left[ + \text{participle} \right. \\
\left. + \text{passive} \right]
\]
where the initial CV and final C would be the same as the underlying initial CV and final C of the stem. Then we could have a rule that would determine what the glides are going to be. The rule would be of the following form:

(XXIII) BACKNESS ASSIMILATION

\[
G \rightarrow [\text{back}] / V \rightarrow [\text{back}]
\]

This rule would allow us to put the correct glides in the correct environment. In other words, we would choose \([\text{back}]\) glides when they are preceded by a \([\text{back}]\) vowel, and \([\text{back}]\) glides when they are preceded by a \([\text{back}]\) vowel.

To generate the correct passive participles for this category of verbs, we would still need an additional rule to determine what the stem vowel is going to be, since there is an alternation between \([\text{i}]\) and \([\text{u}]\) in the above forms. Notice that we get a \([\text{-round}]\) vowel before a \([\text{-round}]\) glide. The rule could be stated as follows:

(XXIV) VOWEL - GLIDE ASSIMILATION

\[
V \rightarrow [\text{round}] / G \rightarrow [\text{round}]
\]

Here is a representative derivation of the passive participles under discussion:

<table>
<thead>
<tr>
<th>Underlying Representation</th>
<th>Passive Participle Formation II</th>
<th>Backness Assimilation</th>
<th>Vowel Glide Assimilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>fiq</td>
<td>xaf</td>
<td>sug</td>
<td></td>
</tr>
<tr>
<td>mfiGGqa</td>
<td>mxaGGfin</td>
<td>msuGGgin</td>
<td></td>
</tr>
<tr>
<td>mfiyyga</td>
<td>mxawwfin</td>
<td>msuwgggin</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------</td>
<td>-----------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>uxuwwfin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
mfiyyqa  mxuwufin  mgwuwgin  DERIVED FORMS
Now, these rules seem to work correctly. Anticipating the
data to be analyzed in the following section, we will have
to restrict these rules to the passive participle of Vb₃ verbs
because they will conflict with some items to be considered
next. I will leave this problem unresolved at this point.
Because further investigation into the generality of these
rules has proved vain and unproductive, I will not include
them in the following summary. Therefore, accounting for
these passive participles in a more adequate manner will re-
main a residual problem.

Here is now a summary of the rules:

(1) VOWEL CHANGE
    \[ V \rightarrow i / \begin{array}{c}
    \text{+ participle} \\
    \text{- passive} \\
    \text{+ Vb₃}
    \end{array} \]

(2) ACTIVE PARTICIPLE FORMATION
    \[ \emptyset \rightarrow a / \#C \begin{array}{c}
    \text{+ participle} \\
    \text{- passive}
    \end{array} \]

(3) VOWEL Glide ALTERNATION
    \[ i \rightarrow y / a \]

(4) PERFECT READJUSTMENT
    \[ V \rightarrow \{\emptyset \} / \begin{array}{c}
    \text{+ perfective} \\
    \text{+ 3d person}
    \end{array} \]

(5) SUFFIX VOWEL REDUCTION
    \[ a \rightarrow a / \text{VC} + \text{C#} \]
    where V is a full vowel
(6) PASSIVE PARTICIPLE FORMATION
\[
\begin{align*}
\text{stem} \left(\text{ccc} \langle c \rangle\right) \rightarrow c \ m+ c \ c \ {u} \ c \ \langle c \rangle / \left[\text{+ participle} \ \text{+ passive}\right]
\end{align*}
\]

(7) SYNCOPE
\[
i \rightarrow \emptyset / \text{CiCj} + \rightarrow c \ \langle y \rangle
\]
condition \(i \neq j\) \(\text{<}\text{nasal}\)

(8) EPENTHESIS
\[
\emptyset \rightarrow \varepsilon / \text{stem} \left(\text{ci} \rightarrow c \ j \left\{\left[\begin{array}{l}
\text{stem} \left(\text{c}, i \neq j\right)
\end{array}\right\} \begin{array}{l}
\text{c} \ \langle y \rangle
\end{array}\right\} \right) \}
\]
(a)\(\text{c}\)
(b)\(\text{c}\)
(c)\(\text{c}\)
(d)\(\text{c}\)
SECTION IV. VERBS WITH AN UNDERLYING FINAL VOWEL

Consider the following:

PERFECTIVE:

knit = I smoked  bdit = I began
kniti = you smoked bditi = you began
kma = he smoked bda = he began
knat = she smoked bdat = she began
kmia = we smoked bdina = we began
knitu = you smoked bditu = you began
kmaw = they smoked bdaw = they began

IMPERFECTIVE:

neknmi = I smoke nebda = we begin
tekmi = you smoke tebda = you begin
tekmi = you (fem.) smoke tebday = you (fem.) begin
yekmi = he smokes yebda = he begins
tekmi = she smokes tehda = she begins
neknmi = we smoke nebda = we begin
tekmi = you smoke tebdaw = you begin
yekmi = they smoke yebdaw = you begin

IMPERATIVE:

kmi  smoke! (masc.) bda  begin! (masc.)
kmi  smoke! (fem.) bday begin! (fem.)
kmiw  smoke! (plural) bdaw begin! (plural)

ACTIVE PARTICIPLES:

kami  badi
kanya  badya
kamyn  badyin

PASSIVE PARTICIPLES:

mekmi  mabdi
mekmiya  mabdiya
mekmiyin  mabdiyin

I am going to propose that these verbs are of the form CCV. The underlying consonants are obvious since the consonants that emerge in the derived forms are the same all
the time. The choice of the underlying vowel will again be based on the frequency of occurrence. The underlying representation for the verb meaning "to smoke" is then /kma/ and that of the verb meaning "to begin" will be /bda/. Looking at the third persons of the perfective, we see again that they all have [a·] in them. So, the earlier rule which places [a·] in the third persons of the verbs accounted for in Section III will apply here too. But on the other hand, we do not want it to delete the stem vowel in the non-third person forms. If it did, when these forms reached Syncope, they would meet its structural description and it would delete the /i/, setting them up for Epenthesis so that we would end up with ungrammatical forms such as *[kamt] for [knit]. To avoid this Perfect Readjustment will be revised as follows:

(XXV) PERFECT READJUSTMENT

\[
\begin{align*}
    V & \rightarrow \{a\} / \begin{cases}
        \text{[stem]} & \text{[3d person]}
    \end{cases} \quad \begin{cases}
        \text{[c]} \\ (a)
    \end{cases} \quad \begin{cases}
        \text{[perfective]} \\ (b)
    \end{cases}
\end{align*}
\]

This rule will apply to Vb verbs to delete the vowel of the non-third person forms and change the stem vowel of the third person forms into an [a·]. It will apply to the verbs in this section, to change the stem vowel of all the forms to an [a·]. This will prevent Syncope from applying to these verbs. Notice also that we do not need to specify this rule to any category of verbs. It will apply to the
appropriate forms only, given just the phonological environment. Now we need a rule to delete the \( \hat{a} \) of the non-third person forms of the verbs under discussion.

\begin{align*}
(XXV) \quad \text{STEM VOWEL DELETION} \\
\hat{a} & \rightarrow \emptyset / \hat{a} + VC
\end{align*}

This rule will have to be ordered after Perfect Readjustment and after Syncope. We still need a rule that accounts for the change of /u/ into \( \hat{u} \) in the third person plural of the perfective. It will be stated as:

\begin{align*}
(XXVI) \quad \text{VOWEL-GLIDE ALTERNATION} \\
u & \rightarrow \hat{u} / \hat{a} \rightarrow \hat{u}
\end{align*}

We need a closely similar rule to account for the endings of the plural forms of the imperfective and the imperative. This rule will change /u/ into \( \hat{u} \) either after /a/ or after /i/. Instead of writing separate rules for these, I am going to extend the environment of rule XXVI to all vowels. Therefore, Vowel-Glide Alternation will be revised to become

\begin{align*}
(XXVII) \quad \text{VOWEL-GLIDE ALTERNATION} \\
u & \rightarrow \hat{u} / \hat{u} \rightarrow \hat{u}
\end{align*}

This rule will account for all the forms ending in a glide discussed so far.

Notice that a similar change of vowel into a glide occurs in the second person feminine of the imperfective as well as the feminine form of the imperative of the verb meaning "to begin". The change in this case, though, is
from /i/ into $\{v\}$, similar to the one encountered in the active participles in section III. Comparing this alternation with the one stated in rule XXVII, we see that a $\{+\textrm{back}\}$ vowel changes into a $\{+\textrm{back}\}$ glide, whereas a $\{-\textrm{back}\}$ vowel changes into a $\{-\textrm{back}\}$ glide. This calls for a generalization that will account for all these alternations, and rule XXVI will be extended and generalized as follows:

(XXVIII) Vowel-Glide Alternation

$$V_i \rightarrow G \rightarrow V_j$$

where $V_i \neq V_j$

This rule will account for all the items ending in a glide discussed so far. It had to be restricted to different vowels so that it does not apply to the feminine imperative form, for instance, which has an underlying representation /kmi + i/ and gets realized as $\{kmi\}$. Since this rule has been generalized to more data it will have to be ordered after Perfect Readjustment and some other rules posited below. Consider, now, the feminine forms of the second person singular imperfective and the second person singular imperative of /kmi/ their respective underlying representations are /t+kmi+i/ and /kmi+i/. A rule of Vowel Coalescence will account for them.

(XXIX) Vowel Coalescence

$$V_iV_i \rightarrow V_i$$

condition $i=i$
The ordering of this rule with the rest of the rules is not crucial. I will arbitrarily order it after Stem Vowel Deletion. Here is a derivation of some of the forms discussed so far in this section.

```
<table>
<thead>
<tr>
<th>kmi+iti</th>
<th>kmi</th>
<th>bda+ina</th>
<th>t+bda+i</th>
<th>t+kmi+i</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERFECT READJUSTMENT (a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>kma+i</th>
<th>kma</th>
<th>bda+</th>
<th>t+bda+</th>
<th>t+kmi</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERFECT READJUSTMENT (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>km+i</th>
<th>bd+ina</th>
<th>t+kmi</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM VOWEL DELETION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>kma+i</th>
<th>bda+</th>
<th>t+kmi</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOWEL COALESCE</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>t+</th>
<th>t+bd</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOWEL GLIDE ALTERNATION</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>t+</th>
<th>t+k</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPENTHESIS (c)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>kma</th>
<th>bdina</th>
<th>t+bd</th>
</tr>
</thead>
<tbody>
<tr>
<td>DERIVED FORMS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

The participles will not be discussed since their investigation has proved fruitless. I will leave them unaccounted for at this time. Here is a final summary of rules in their order of application:

(1) **Vowel Change**

\[ V \rightarrow i \left[ + \text{participle} \right] \left[ - \text{passive} \right] \left[ + \text{Vb}_3 \right] \]

(2) **Active Participle Formation**

\[ \emptyset \rightarrow a / \#G \left[ + \text{participle} \right] \left[ - \text{passive} \right] \]
(3) **PERFECT READJUSTMENT**

\[ v \rightarrow \{ _{a}^{v} \} / \left[ \begin{array}{c}
+ \text{perfective} \\
\leq 3 \text{d person}
\end{array} \right] \langle c \rangle \ (a) \]

(4) **SUFFIX VOWEL REDUCTION**

\[ a \rightarrow \emptyset / \text{VC} + \rightarrow \text{C#} \]

where V is a full vowel

(5) **PASSIVE PARTICIPLE FORMATION**

\[ \text{stem} \left[ \begin{array}{c}
\text{ccc} \\
\langle c \rangle
\end{array} \right] \rightarrow \text{m+CC(}'u'\text{) CC} \langle c \rangle / \left[ \begin{array}{c}
+ \text{participle} \\
+ \text{passive}
\end{array} \right] \]

(6) **SYNCOPE**

\[ i \rightarrow \emptyset / c_{i}c_{j} + \rightarrow \text{C(}'\text{nasal}\text{'}/v\rangle \]

condition: \( i \neq j \)

(7) **STEM VOWEL DELETION**

\[ a \rightarrow \emptyset / \rightarrow + \text{VC} \]

(8) **VOWEL COALESCEENCE**

\[ v_{i}v_{i} \rightarrow v_{i} \]

where \( i = i \)

(9) **VOWEL-GLIDE ALTERNATION**

\[ v_{i} \rightarrow g \]

\[ v^{\text{back}} \rightarrow v^{\text{back}} \]

(10) **EPENTHESIS**

\[ \emptyset \rightarrow / \left[ \begin{array}{c}
\text{stem} \\
\langle c_{i} \cdots c_{j} \rangle
\end{array} \right] \left\{ \begin{array}{c}
\text{stem} \{ 'c', i \neq j \} \\
\langle c \rangle \\{ 'v' \} \\
\langle c \rangle \\{ '#' \}
\end{array} \right\} (a) \]

\[ (c)_{1} (d)_{2} \]
CONCLUSION

In this work I have tried to account for some aspects of the phonology of the Moroccan Arabic verb. The data that I have discussed is representative of the great majority of verbs in Moroccan Arabic. This is not based on statistical facts but on the basis of casual observation of the verbs that occur in normal daily conversation. The data has been arrived at, mainly, through introspection.

The rules that have been posited account for most of the data that has been discussed. Some problems seem to remain unresolved, though. For example, one notices in the Epenthesis rule, the duplication in the environments (b) and (c). One can also find a duplication of the restriction on Syncope and environment (a) of Epenthesis. Finally, certain participles seem to require a number of ad hoc adjustments or restrictions leading to greater complexity and some rules that apply to only a handful of forms. Such apparent idiosyncratic behavior makes it impossible to formulate interesting linguistic generalizations. Therefore, some of those participles have been left unaccounted for after long and vain investigation. This might lead one to assume that Moroccan Arabic is going through change. The assumption seems to be valid and a diachronic study might be in order.

In this thesis, I have given a brief historical account
of the background of Moroccan Arabic. I have accounted for
the majority, almost the totality, of the verbs of Moroccan
Arabic with a minimum number of rules. Ideally, this thesis
would have included other aspects of the phonology of Moroccan
Arabic, but given the time factor and the total lack, to my
knowledge, of other generative work on Moroccan Arabic, this
thesis had to be restricted to its present form. I hope
this work will be a step ahead towards a more comprehensive
and hence more serious account of the language.
FOOTNOTES

1. This problem of non-intelligibility of dialects has been raised by Michael Brame in a footnote to his article "On Stress Assignment in Two Arabic Dialects". He also raises the question of whether Palestinian and Maltese can still be called dialects of Arabic. I hold comparable reservations with respect to Moroccan Arabic.

2. The verb considered in this section is representative of all the verbs which have an underlying stem consisting of three different consonants. This is the only productive verb in Moroccan. Here is a partial list of verbs behaving like /xRN/: /ktb/ 'write', /rbt/ 'tie', /brb/ 'drink', /nRj/ 'sleep', /xRz/ 'go out', /br/ 'disappear', /blR/ 'swallow', /shR/ 'repair', /dbr/ 'slaughter', /slR/ 'boil'.

3. This and subsequent rules should of course be stated more formally -- that is in distinctive features. For ease of presentation, I will continue to formulate rules rather informally.

4. This rule has been formulated as a Transformational rule following Chomsky and Halle (1968). See particularly p. 360 and following.

5. Henceforth, I will refer to the analysis that has been exposed so far as the "earlier analysis", the parallel analysis that will be expounded will be referred to as the "later
analysis".

6. It might appear, at this point, that an analysis without Syncope, hence no underlying /i/ in the suffixes, is preferable. The motivation for Syncope will be clearer later in this work.

7. The verb discussed in this section is representative of all the verbs which have an underlying stem consisting of three consonants, the last two being geminates. Here is a partial list of verbs behaving like /mdd/: /smm/ 'smell', /hlt/ 'put', /hll/ 'open', /hkk/ 'scratch', /rad/ 'return', /šdd/ 'close', /mll/ 'get tired of', /fkk/ 'untie', /lf/ 'wrap', /šq/ 'split'.

8. The verb discussed in this section is representative of verbs such as: /frg/ 'blow', /bsbs/ 'to make the sound "bss"', /srstile/sr/ 'scream', /blld/ 'civilize', /bssl/ 'to misbehave', /bššd/ 'to go in a roundabout way', /skkn/ 'to accommodate', /hddn/ 'to calm', /mrmd/ 'dirty something'.

9. This category of verbs has only passive participles. A semantic or syntactic study might be enlightening as to the reasons for this gap. Since this is not the point of this work, I will leave it unaccounted for.

10. The verbs discussed in this section are representative of such verbs as: /sal/ 'ask', /bat/ 'spend the night', /nal/ 'win': /šuf/ 'look', /duq/ 'taste', /šum/ 'fast': /šig/
'realize'; /t̟iːh/ 'fall', /ʐɪb/ 'bring'.

11. This calls for a general observation about Moroccan Arabic. From the vowel reduction in Ɡfɒʔt, from what has been considered earlier in this work and from observation of much more data from Moroccan Arabic, it can be concluded that this language does not allow too many full vowels in a single word. This is why, when analyzing Moroccan Arabic speech, one encounters so many schwas. These are either inserted or are the result of reducing full vowels. This will, hopefully, be explored in more depth in subsequent research.

12. The verbs discussed in this section are representative of such verbs as: /ʐli/ 'mislay', /ksi/ 'clothe', /nfi/ 'exile', /bki/ 'cry', /hnni/ 'bend', /rd̟a/ 'approve', /bra/ 'recover from an illness', /bta/ 'be late', /r̟sa/ 'bribe', /sha/ 'forget'. 
BIBLIOGRAPHY


A GENERATIVE PHONOLOGY OF THE
MOROCCAN ARABIC VERB

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AN ABSTRACT OF A MASTER'S THESIS
submitted in partial fulfillment of the
requirements for the degree

MASTER OF ARTS

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1976
ABSTRACT

This work attempts to account for the different forms of the Moroccan Arabic verb from a transformational-generative point of view. I have tried to determine what the underlying representations for these verbs and their affixes are and what sorts of rules apply to them.

I discuss four categories of verbs. They represent the quasi-totality of Moroccan Arabic verbs. The first two categories are verbs that have triconsonantal and quadri-consonantal underlying stems. The rules that generate the finite forms of these verbs are a rule of Epenthesis and a rule of Syncope.

The other two categories of verbs that are discussed are triliteral verbs; one of them has a medial vowel and is of the form CVC, and the other has a final vowel and is of the form CV. Rules of Perfect Readjustment, Stem Vowel Deletion and Vowel-Glide Alternation have been posited to account for the various forms of these verbs. Some of the forms have shown too many idiosyncrasies, and investigation had to be stopped at a time when it seemed to be unproductive.

An introductory section gives a brief historical sketch with the factors that might have helped form what is now Moroccan Arabic. The conclusion points out some of the problems in this work.