# Girawa and Natural Phonology

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# GIRAWA AND NATURAL PHONOLOGY[1]

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## 0. Introduction

A number of linguists in recent years have been dissatisfied with the amount of abstractness allowed by the theory of phonology as proposed by Chomsky and Halle in The Sound Pattern of English (1968) and others. In the articles and books written on the subject, this dissatisfaction and the rebuttal to it became known as the Abstractness Controversy. One outcome of this controversy was a theory called Natural Generative Phonology (hereafter NGP). This was proposed by Theo Vennemann and Joan B. Hooper. It is a radical departure from the standard theory especially in limiting grammars to only surface structures. The many aspects of this theory are explained most fully in An Introduction to Natural Generative Phonology by Joan B. Hooper (1976).

As far as is known, there has not been a discussion of the NGP model using data from a language of Papua New Guinea. So this paper will be a discussion first of the phonological data of the Girawa[2] language of Madang

Province in a fairly standard generative model and then a discussion of some of the principles of NGP and whether Girawa confirms or weakens those principles. Girawa is interesting in two areas, that of vowel sequences and the complexity of the verb structure. The principles will be taken from Hooper's book and discussed more fully in the second part. Of interest especially are the No-Ordering Condition and the Consonant Strength Hierarchy.

## 1. Girawa Phonology

The following is a short sketch of the segments and rules that make up Girawa phonology. The analysis is given in a model presented by Chomsky and Halle in The Sound Pattern of English (1968). I will be presenting the segemental structure of the consonants and vowels along with a chart of distinctive features. I will not try to represent the redundancies in this paper. I will then go on to discuss the vowel sequences and various analyses involving them. Most of the rules will then be presented. And then a section of the morphophonemics of the verb classes.

### 1.1 Contrastive Segments

There are seven consonant units, six vowel units and two glides. The following is a chart showing these units:

| | Labial | Alveolar | Post Alveolar |
|---|---|---|---|
| Stop | p | t | ʔ |
| Fricative | | s | |
| Nasal | m | n | |
| Liquid | | ɾ̆ | |
| Glide | w | | y |

| | Front | Back |
|---|---|---|
| High | i | u |
| Mid | ɛ | o |
| Low | æ | a |

Chart 1

The following is a distinctive feature matrix of all the phonetic units of the Girawa language. The previous chart dealt with the systematic phonemes of Girawa, this chart presents the systematic phonetic units of the language. The features used are those that will appear later in the rules.

Distinctive Feature Matrix

| | p | b | $p^h$ | t | d | $t^h$ | $\breve{d}$ | ? | s | m | n | $\breve{r}$ | $\breve{l}$ | w | ɓ | y | dž | i | e | ɛ | æ | u | o | ʌ | a |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cons | + | + | + | + | + | + | + | + | + | + | + | + | + | - | + | - | + | - | - | - | - | - | - | - | - |
| syl | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + |
| son | - | - | - | - | - | - | - | - | - | + | + | + | + | + | - | + | - | + | + | + | + | + | + | + | + |
| ant | + | + | + | + | + | + | + | - | + | + | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| cor | - | - | - | + | + | + | + | - | + | - | + | + | + | - | - | - | + | - | - | - | - | - | - | - | - |
| cont | - | - | - | - | - | - | - | - | + | - | - | - | - | + | + | + | - | + | + | + | + | + | + | + | + |
| voice | - | + | - | - | + | - | + | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| high | - | - | - | - | - | - | - | - | - | - | - | - | - | + | - | + | + | + | - | - | - | + | - | - | - |
| back | - | - | - | - | - | - | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | + | + | - | + |
| low | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - | + | - | - | - | + |
| round | - | - | - | - | - | - | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | + | + | - | - |
| delrel | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | - |
| tense | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + | + | - | + | + | + | - | + |
| lat | - | - | - | - | - | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| asp | - | - | + | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| nasal | - | - | - | - | - | - | - | - | - | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Chart 2

## 1.2 Vowel Sequences

Girawa, like a good number of other Papuan languages, has a number of vowel sequences. The following chart shows what sequences occur. These are the phonemic units with the exception of e which is predictable preceeding and following vowels, as in these sequences. The top line on the chart is the first vowel of the cluster and the vertical line to the left is the second member.

| | i- | u- | e- | a- | æ- | o- | |
|---|---|---|---|---|---|---|---|
| -i | | ui | ei | ai | æi | oi | I |
| -u | iu | | eu | au | æu | ou | |
| -e | ie | ue | | | | eo* | |
| -a | ia | ua | ea | | | oa | II |
| -a | (a)iæ | uæ | | | | | |
| -o | io | uo | | | | | |

Chart 3

These sequences fall into two different sections as shown in the chart. The first section (marked I) consists of those sequences that have the high vowels as the second member. Various pyscholinguistic tests have shown that speakers perceive these as very closely knit units or single syllables. Section II consists of sequences where the high vowel is the first member of the sequence or where neither member is high. The tests showed the perception of these sequences to be less closely knit that the first section or as two syllables.

The sequences with the high vowel as a member are complete in the chart. There are three occurances of two non high vowels together and one of these does not appear on the surface -eo- as in /apewo/. These then are the underlying sequences which other rules will deal with. I am not completely convinced that this /w/ is inserted. I would prefer it as part of the word. There is only one occurance.

The high vowels, i and u, in open syllable words tend to act like vowels but when preceeded and followed by vowels will become less vowel - like, y and w respectively. This can be shown in the following rule which is two different processes for glide formation.

(1) Glide Formation Rule

A. $[+\text{high}] \longrightarrow [-\text{syl}] \;/\; V\_\_\_\_\_\begin{bmatrix} V \\ -\text{high} \end{bmatrix}$

B. $\emptyset \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{high} \\ +\text{rd} \end{bmatrix} \;/\; \begin{bmatrix} +\text{syl} \\ +\text{rd} \\ -\text{hi} \end{bmatrix} + \_\_\_\_\_ \begin{bmatrix} +\text{syl} \\ +\text{back} \\ +\text{low} \end{bmatrix}$

The rule states that the high vowels /i,u/ will become the glides /y,w/ respectively between vowels, the second of which is non-high. The second part of the rule is the insertion of the glide between the segments o and a in certain words.

Examples:

| | | | |
|---|---|---|---|
| | iu + en | | o + am |
| (1) | iw + en | (1) | ow + am |
| | iwen* 'our(dl)' | | [owam] 'I will get (it)' |

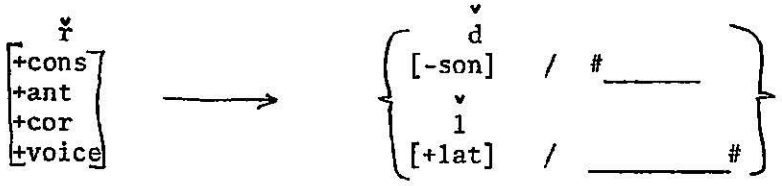
There are a few forms that seem to contradict this rule, i.e. [roat] ro-at 'men'. With the morpheme break, it would fit the structural description man-at of the rule. However if a further modification [+verb] were added to the second section, this would be taken care of. Further investigation needs to be made concerning the actual phonetic output of these words.

Note: Any form that is starred (*) means that a later rule will affect it.

1.3 Phonological Rules and Processes

In any language, there are a set of rules that govern the pronunciation of segments in certain environments. In Girawa, these processes occur to show the significant units of the language. One interesting process concerns the glides that have been added as a result of the Glide Formation Rule. These undergo further changes. There are some independently motivated glides also that cannot be explained by the Glide Formation Rule, i.e. /ewaɾ̆/ 'cassowary' /wa/ 'no', /uyɛk/ 'wallaby'.

(2) Deflapping Rule

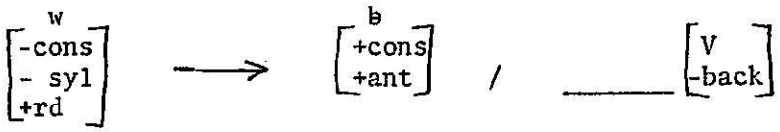


The liquid /ř/ is realised as a voiced alveolar flap [d̆] word initially. This segment also becomes a lateral flap [l̆] in the word final position.

Examples:

| | | | | | |
|---|---|---|---|---|---|
| | řo | řoim | asiř | iřa?os | |
| (2) | do | doim | asil | ---- | |
| | [d̆o] | [d̆oim] | [asil̆] | [iřa?os] | |
| | 'man' | 'I hear' | 'woman' | 'slippery' | |

(3) Spiratization Rule

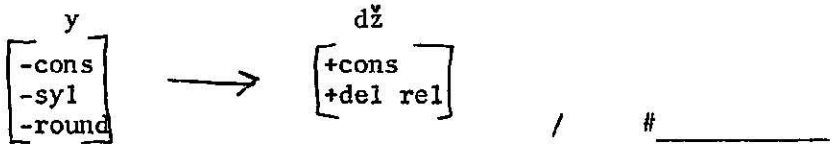


The labiovelar glide /w/ is realized as the bilabial fricative [ƀ] in the environment preceeding a front vowel.

Examples:

| | | | | | |
|---|---|---|---|---|---|
| | wæs | wɛr | nɛwæu | wa | owo |
| (3) | ƀæs | ƀɛr | nɛƀæu | — | — |
| | [ƀæs] | [ƀɛr] | [nɛƀæu] | [wa] | [owo] |
| | 'greens' | 'mango' | 'big' | 'no' | 'what' |

(4) Affrication Rule

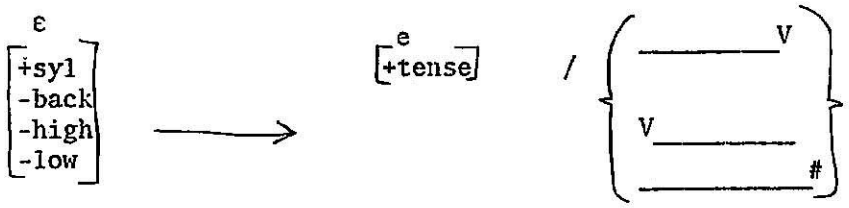


The palatal glide /y/ in the word initial position is realized as the alveo-palatal affricate [dž̆].

Examples:

| | | | |
|---|---|---|---|
| | yamai | yɛt | yo |
| (4) | džamai | džɛt | džo |
| | [džamai] | [džɛt] | [džo] |
| | 'lizard' | 'arrow' | 'net bag' |

(5) Vowel Tensing Rule

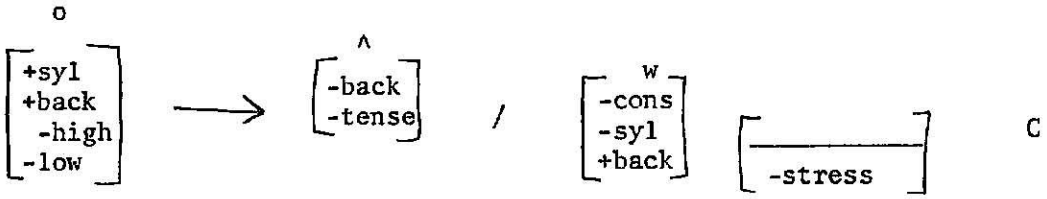



This rule states that the vowel /ɛ/ will become [+tense] in the environment preceeding or following another vowel, or just before word break.

Examples:

| | | | |
|---|---|---|---|
| | ɛtɛina | pɛu | kurtɛ |
| (5) | ɛteina | peu | kurte |
| | [ɛteina] | [peu] | [kurte] |
| | 'small' | 'he comes' | 'hurry' |

(6) Vowel Unrounding Rule




In this rule the vowel /o/ loses its tenseness and is then unrounded and centralized in the environment of an unstressed closed syllable following /w/. Other vowels tend to become [ʌ] in fast speech, in unstressed syllables.

Examples:

ouwon

(6) ouwʌn

[ouwʌn]

'he got (it)'

(7) Voicing/Aspiration Rule (Optional)

$$\begin{bmatrix} p,t \\ +cons \\ +ant \end{bmatrix} \longrightarrow \left\{ \begin{bmatrix} b,d \\ +voice \end{bmatrix} \quad / \quad \left\{ \begin{bmatrix} +syl \\ +nasal \end{bmatrix} \right\} \_\_\_\_ V \right\}$$

$$\left\{ \begin{bmatrix} p^h, t^h \\ +asp \end{bmatrix} \quad / \quad \left\{ \begin{bmatrix} +syl \\ +nasal \end{bmatrix} \right\} \_\_\_\_ V \right\}$$

$$\left\{ \begin{bmatrix} p^h, t^h \\ +asp \end{bmatrix} \quad / \quad \# \_\_\_\_ V \right\}$$

This rule states that the bilabial and alveolar stops may optionally be voiced between vowels or following a nasal. It may also be optionally aspirated at any time. The voicing may also come word initial.

Examples:

| | | | | |
|---|---|---|---|---|
| | po | tai | tau? | ?ampai |
| (7) | $p^h$o | $t^h$ai | dau? | ?ambai |
| | [$p^h$o] | [$t^h$ai] | [dau?] | [?ambai] |
| | 'pig' | 'again' | 'his ear' | 'middle' |

I have not been also to formulate an adequate stress rule as yet. There are no real contrasts to show that it is significant but neither can it be accurately predicted. Stress tends to fall on the second syllable of polysyllabic words: [a'nur] 'tree type', [sa'rat] 'comb, horn'. There seems to be some grammatical conditioning of stress. It is on the first syllable of words that denote a specific type of something, ['ma 'musi] 'taro type', [i'san 'dʒɛpi] 'my brother-in-law'. The imperative form of the verb is stressed on the first syllable also, ['mano] 'go!'. But in other cases, there seems to be no discernible reason, ['nepsis] 'stuffy nose', ['sorit] 'tree fern'.

1.4 Girawa Verb Rules

The independent verb in Girawa seems to divide itself into 3 or 4 different classes, depending on the vowel following the stem. Stems are minimal, often only one letter. The following chart shows the three major classes of verbs in two tenses, present and future. There is a sub-class of the Third Class verbs that all end in r. These are surface forms.

| Present | 1st Class | 2nd Class | 3rd Class |
|---|---|---|---|
| 1 sing | pɛm | mom | oim |
| 2 sing | pɛm | mon | oum |
| 3 sing | peu | mou | ou |
| 1 dl | pɛmur | momur | oumur |
| 2/3/ dl | peir | moir | oir |
| 1 pl | pɛm | mom | oum |
| 2/3 pl | pei | moi | oi |
| Future | | | |
| 1 sing | pæm | mam | owam |
| 2 sing | pæm | mam | owam |
| 3 sing | pæi | mai | owai |
| 1 dl | pæmur | mamur | owamur |
| 2/3 dl | pæyeir | mayeir | owayeir |
| 1 pl | pæm | mam | owam |
| 2/3 pl | pæyei | mayei | owayei |

Chart 4

It seems there is no distinction between 1st and 2nd singular, however there are distinct forms in the past. While there is not a great deal of variation morphophemically, there is enough that it is difficult to write consistent rules for all three classes. Classes are assigned arbitratily, although 'come' verbs are in Class 1 and 'go' verbs are in Class 2, for example nem 'I come down' nom 'I go down'.

In the previous analysis (Gasaway and Sims, 1977a), these were first presented as a part of the affix, which meant at least three different forms of each affix. At that time the forms were simply presented with no attempt at explanation or generalization. Another solution which was suggested was to make the class vowel a part of the stem and enter this form into the lexicon. I feel that there are two arguments against this solution. First, this vowel will optionally delete under certain conditions usually the presence of a dependent (medial) verb ending.

Examples: peiani? piani? 'having come'

moiani? miani? 'having done'

Second, there is a rule operating in the language that also affects this vowel. When the aspect marker is present in the verb string, the verbs all take the Third class vowel. This rule may be formulated as follows:

(8) any stem + aspect $\longrightarrow$ 3rd Class

As a result of these two processes, I felt that separating this particular vowel away from the rest of the affix string would simplify matters and lead to greater generalization of the Girawa verb. This vowel will be called the class vowel. This class vowel is inserted in the verb string and the Class Vowel Rule (10) will determine its quality according to tense and class.

The verb affix string could be formalized as follows:

(9) verb $\longrightarrow$ +stem $\pm$ object marker $\pm$ aspect + class V +pers +num +tense

The last three suffixes are interrelated in their function, many having a portmanteau effect. The following table shows the three classes with morpheme breaks giving the underlying forms. Separating the class vowel also brings to light the variation in the 3rd Class vowel and rest of the suffixes. If we posit an underlying vowel of the same quality that is subsequently deleted with a Vowel Elision Rule, it shows that the Person-Number-Tense suffixes are all the same for all classes.

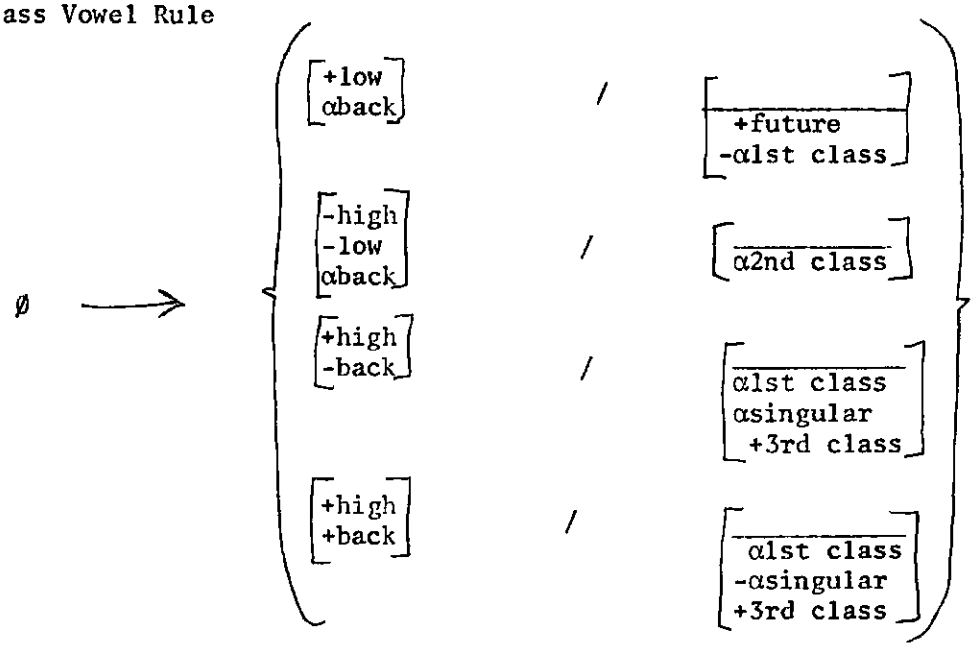
The following paradigm shows the forms of the verb after the class vowel has been inserted and before Vowel Elision or U-insertion Rule have operated.

| Present | 1st Class | 2nd Class | 3rd Class |
|---|---|---|---|
| | 'come up' | 'do' | 'get' |
| 1sg | p-ɛ-m | m-o-m | o-i-m |
| 2sg | p-ɛ-m | m-o-m | o-u-m |
| 3sg | p-e-u | m-o-u | o-u-u |
| 1dl | p-ɛ-m-r | m-o-m-r | o-u-m-r |
| 2/3 dl | p-e-i-r | m-o-i-r | o-i-i-r |
| 1 pl | p-ɛ-m | m-o-m | o-u-m |
| 2/3 pl | p-e-i | m-o-i | o-i-i |
| Past | | | |
| | p-ɛ-m-in | m-o-m-in | o-i-m-in |
| | p-ɛ-m-on | m-o-m-on | o-u-m-on |
| | p-e-u-on | m-o-u-on | o-u-u-on |
| | p-ɛ-m-r-in | m-o-m-r-in | o-u-m-r-in |
| | p-e-i-r-in | m-o-i-r-in | o-i-i-r-in |
| | p-ɛ-m-un | m-o-m-un | o-u-m-un |
| | p-e-i-in | m-o-i-in | o-i-i-in |
| Future | p-æ-m | m-a-m | o-a-m |
| | p-æ-m | m-a-m | o-a-m |
| | p-æ-i | m-a-i | o-a-i |
| | p-æ-m-r | m-a-m-r | o-a-m-r |
| | p-æ-iei-r | m-a-iei-r | o-a-iei-r |
| | p-æ-m | m-a-m | o-a-m |
| | p-æ-iei | m-a-iei | o-a-iei |

Chart 5

I would now like to present and discuss the rules that apply to the verb affix string as given in Rule (9).

(10) Class Vowel Rule




This disjunctively ordered rule states that in the future, first of all the class vowel becomes [+low] and is either front or back depending on whether a first class verb is present or not. First class verbs take æ [-back] while the other two classes take a [+back]. The other three subrules deal with cases that are non-future. If the first or second class occurs, the vowel will be either o in second class and e in the first class. The third class requires two subrules to show the alternation in the past and present. The vowel i occurs with first person singular or non-first person non-singular, while u occurs with first person non-singular and non-first person singular.

Following the Class Vowel are three suffixes that indicate the person, number and tense of the verb. These three are interrelated and somewhat complex. The first affix gives the person and number, and vary according to person and number and sometimes tense.

(11) Person Rule

$$\emptyset \longrightarrow \left\{ \begin{array}{lll} u & / & [+sing, +3rd\ pers, -future] \\ i & / & \left\{ \begin{array}{l} [-singular, -1st\ pers] \\ [+future, +3rd, +singular] \end{array} \right\} \\ iei & / & [+future, -singular, -1st\ pers] \\ m & / & \left\{ \begin{array}{l} [+1st\ pers] \\ [+second\ pers, +sing] \end{array} \right\} \end{array} \right\} \quad / \quad \underline{\qquad} \#$$

Future seems to affect the person especially in the non-first persons. The u occurs with third person singular, while i occurs with other non-first persons in the future.

When the number is dual, there is an additional number rule.

(12) $\emptyset \longrightarrow r \; / \; [+dual]$

Past tense is another suffix added to the person and number already put into the verb string.

(13) Tense Rule

$$\emptyset \longrightarrow \left\{ \begin{array}{lll} un & / & [+pl, +1st\ pers] \\ on & / & [+singular, -1st\ person] \quad / \quad \underline{\qquad} \# \\ & & \qquad\qquad\qquad\qquad\qquad\qquad [+past] \\ in & / & \underline{\qquad} \\ \emptyset & & \quad / \quad \underline{\qquad} \# \\ & & \qquad\qquad [-past] \end{array} \right\}$$

When the dual rule applies the resulting forms for the first person would be -mr-. This sequence is not very acceptable especially at the end of words. So there is an additional rule which inserts the u in between these segments.

(14) U-insertion Rule

$$\emptyset \longrightarrow u \;/\; m \_\_\_\_ r$$

This rule also applies optionally to some nouns; omri? omuri? 'my husband'.

One other rule is needed to complete the rules needed for derivation. It is an Elision Rule.

(15) Elision Rule

$$\begin{bmatrix} V \\ \alpha round \\ +high \end{bmatrix} \longrightarrow \emptyset \;/\; \_\_\_\_\_ + \begin{bmatrix} V \\ \alpha round \\ +high \end{bmatrix}$$

A vowel followed by a like vowel elides in the environment of a morpheme break.

Sample derivations for the verb suffixes.

(a)

| nin | + CIV | + 1st | + dl | + pr | |
|---|---|---|---|---|---|
| nin | o | m | ur | ø | |
| ___ | o | ___ | ___ | ___ | (10) |
| ___ | ___ | ___ | ___ | ___ | (11) |
| ___ | ___ | ___ | r | ___ | (12) |
| ___ | ___ | ___ | ___ | ø | (13) |
| ___ | ___ | ___ | ur | ___ | (14) |

nin + o + m + ur + ø

ninomur 'we two are sleeping'

(b)

| stem | + CIV | + Pers | + Num | + Tense | |
|---|---|---|---|---|---|
| tan | e | i | ø | in | |
| - | - | - | - | - | (10) |
| - | - | i | - | - | (11) |
| - | - | - | ø | - | |
| - | - | - | - | in | (13) |
| tan | + e | + i | + ø | + in | |
| - | - | ø | - | - | (15) |

tanein 'you(pl) sat'

(c)

| ?o | stem | + CIV | + Pers | + Num | + Tense | |
|---|---|---|---|---|---|---|
| +3rd class | ?o | a | - | - | - | (10) |
| +2nd pers | | | | | | |
| +sing | - | - | m | - | - | (11) |
| +future | - | - | - | ø | ø | (13) |
| | - | wa | - | - | - | (1B) |
| | ?o + | wa + | m + | ø + | ø | |

?owam 'you(sg) will come down'

(d)

| p | stem | + asp | + CIV | + Pers | + Num | + Tens | |
|---|---|---|---|---|---|---|---|
| +1st class | | | | | | | |
| +hab aspect | p | ia | - | - | - | - | (9) |
| +1st pers | - | - | i | - | - | - | (8)(10) |
| +singular | | | | | | | |
| +present | p | - | - | m | - | - | (11) |
| | - | - | - | - | ø | ø | (13) |
| | p + | ia + | i + | m | | | |

piaim 'I habitually come up'

2. Natural Generative Phonology

As I sad before, Joan B. Hooper and Theo Vennemann formulated a theory known as Natural Generative Phonology (NGP) which they felt answered and corrected the faults they saw in traditional generative phonology (TGP). Hooper says,

> "The major advantage of natural generative theory over previous generative theory is that it gives a realistic representation of linguistic competence by constraining the theory to allow only a small subset of the grammars allowed by the unconstrained theory." (Hooper, 1976, xi).

I will be discussing a few of the hypothesis of NGP as they relate to Girawa phonology and make an evaluation of whether the theory can help in the analysis and understanding of Girawa and its sound system.

In her book, An Introduction to Natural Generative Phonology (1976), Hooper states concerning the theories of NGP and TGP,

> "The difference between the theories lies in the derivation of morphophonemic alternations....The alternations that NGP would describe directly as a function of morphological and lexical categories. TGP describes as a result of abstract phonological representations and ordered rules." (22)

This condition states that rules will apply sequentially but that they will be allowed to apply more than once whenever the structural descriptions are met, which is a departure from the standard theory.

Hooper (1976, 14ff.) proposes five types of rules that are possible in NGP. While rules are not ordered in themselves, the types of rules may have their initial application in a certain order. The first that could apply are the syllabification rules which insert syllable boundaries in the appropriate places in the phonological string. This kind of rule can apply at any stage of the derivation. In fact it does apply after every rule to reinterpret the syllable. Second are the word formation rules which show the order and types of morpheme in a word. These are also called the morphological spellout rules which determine what the morpheme actually looks like. Third, the morphophonemic rules (MP-rules) apply. These rules relate allomorphs to each other. They contain lexical or morphological information as part of the conditioning environment. Fourth, there are the phonetically conditioned (P-rules) that refer only to the phonological features and boundaries such as syllable and pause boundaries. Last, there are <u>via</u>-rules which relate lexical entries to each other.

> "The difference between P-rules and MP-rules is worth emphasizing, because it is one of the most important innovations in NGP, and because it makes strong claims about the nature of language.... In NGP a rule expressed in phonetic terms must actually correspond to the physical details of articulation." (Hooper, 1976, 15-16).

In Girawa there appears to be ordered relationship between the Glide Formation Rule and the Elision Rule.

| Examples: | o+u+u+on | | o+u+u+on | |
|---|---|---|---|---|
| | o+u+w+on | (1) | o+∅+u+on | (15) |
| | ---- | (15) | o+∅+w+on | (1) |
| | o+u+w+ʌn | (6) | o+∅+w+ʌn | (6) |
| | [ouwʌn] | 'he went down | *owʌn | |

The order to get the correct output has to be (1) then (15) because otherwise the wrong form emerges.

There is a form [owʌn] 'why' owo + n → owʌn. Another example of rule ordering to get the right output is in the case that the P-rule Spirantization (3) needs to be ordered after the Glide Formation rule (1).

| Examples: | koæp | | koæp | |
|---|---|---|---|---|
| | kowæp | (1) | ---- | (3) |
| | kobæp | (3) | kowæp | (1) |
| | [kobæp] | 'bird type' | *kowæp | |

Just these few examples show that some ordering is necessary in Girawa. An NGP argument in this latter case is that rules may apply more than once when the structural descriptions are met so that the Spiratization rule (3) would apply again after the Glide Formation rule (1) in the second example and give the correct form.

The No-ordering Condition then does not seem to hold here in Girawa nor does it offer a greater generalization of the phonological processes.

## 2.2 Syllable Structure and Consonant Strength Hierarchy

Two areas of NGP that have been of much interest are syllable structure and consonantal strength values. Hooper proposes that "the smallest phonological unit that may be multisegmental ... is the syllable." (1976, 189). Syllable structure conditions are the main environments of phonological processes. Positing a syllable as part of the theoretical basis of language will help explain some of the regularities and some of the seeming irregularities, so says Hooper. There are differences in what can occur in the different positions in the syllable. Can these differences be generalized in any way? Hooper argues that one way they can be generalized is through consonantal strength values.

A hierarchy of the consonants of a language will explain the constraints on the syllable structure. A rough hierarchy of decreasing strength might be:

obstruents
nasals
liquids
glides
vowels

So when a segment is "strengthened" in some process, the principle is that is moves up on the strength scale.

Hooper diagrams the syllable in the following way:

| MARGIN | | | | NUCLEUS | | | MARGIN | | |
|---|---|---|---|---|---|---|---|---|---|
| Least vowel-like | | | | Most vowel-like | | | Less vowel-like | | |
| Obst. | nasal | liquid | glides | vowels | glides | liquid | nasal | obstr. | |

Chart 6

Hooper presents evidence for different occurances of consonants in the two margins of the syllable. She posits that the first position in the syllable is the strongest one. Consonant strength hierarchies are formulated by a cover feature strength of consonants with the strength of the syllable position, "we can develop an explanation for phonotactic constraints on segments..."(Hooper, 1976, 197).

For Girawa, the consonant strength hierarchy could be diagramed as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | d | $t^h$ | | | |
| y | r̆ | m | | b | $p^h$ | | p | |
| w | l̆ | n | ɓ | d | s | ? | t | dž̆ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

This hierarchy follows the one proposed by Hooper. It is based on the phonetic segments. Vennemann (1972) says,"...I base my strength hierarchies on synchronic phonological rules, including syllabification rules. It is, of course to be expected that these . . . merge into a single concept of a partly universal, partly language-specific relational hierarchy of segments." (7).

The affricate [dž] was put above the other obstruents because it occupies a very strong position at the beginning of the word. "There is evidence at least in some languages that affricates are even stronger than plain stops .... Intuitively, at least, affricates seem in some sense stronger than plain stops, since their articulation involves two steps, a full closure and a constricted release, instead of only one." (Hooper, 1976, 214). In Girawa, the pattern pressure shows that [dž] is a single segment. In two related languages to Girawa, Sihan and Kein, the affricate [dž] is reduced to a single segment.

| | | | | | | |
|---|---|---|---|---|---|---|
| Girawa | [džo] | 'net bag | [džas] | 'mushroom | [džɛm] | 'I eat' |
| Sihan | [doř] | | | | [degena] | |
| Kein | [zo] | | [zai] | | | |

These two languages reduce the affricate rather than let it carry so much weight.

The separation of the stops into two categories; /p,t/ and /?/ reflects the difference in the distribution of /?/. The glottal stops does not participate in the Voicing/Aspiration Rule (7). In other dialects of Girawa, the /?/ becomes /k/. i.e. [asa?] [asak] 'grandfather'
The relationship between /?/ and /k/ are reflected in related languages in the following ways.

In initial syllable and word positions, /k/ weakens to the voiced velar stop /g/:

| | | | | | |
|---|---|---|---|---|---|
| (1) | Girawa | Kein | Bemari | Amele | |
| | [komu]<br>[?omu] | [gamu] | [gemuk] | [gemug] | 'husband' |

In Sihan, it retained the voiceless counterpart: [kemuk]

| | | | | | | |
|---|---|---|---|---|---|---|
| (2) | Girawa | Kein | Sihan | Bemari | Amele | |
| | [kɛrawau]<br>[?ɛrawau] | [galanig] | [kana?] | [gerani] | [gana?] | 'skin' |
| (3) | [?eir] | [geil] | [dakeir] | | [yagɛl] | 'moon' |

In the final position /?/ deletes, thus giving more evidence for the relative weakness of the syllable final position.

| (3) | Girawa | Sihan | Bemari | Kein | Amele | |
|---|---|---|---|---|---|---|
| | [asa?] | [asia] | [asi] | | [asi] | 'grandfather' |

In the first consonant position in the syllable in Girawa, most of the phones can occur. Two areas are problematical. The two glides /y,w/ become obstruents; /w/ $\longrightarrow$ [b] in the syllable initial position, but /y/ $\longrightarrow$ [dž] in only word initial positions, while it remains /y/ in word medial and syllable initial positions.

i.e. [džo] 'net bag' [uyarim] 'taro type'

This is one of the areas in NGP as proposed by Hooper that has not been explored yet, when the word structure conditions interact with the syllable structure conditions.

One segment, the lateral flap [l̆], only occurs in the word final position and never in the syllable initial position.

There is very little limitation as to the relative strength of the consonants in the syllable final position. As I have mentioned above [dž] does not occur here. Since [dž] is the strongest of the consonants, it would seem logical that it would occur only in the word initial position. But this may be conditioned by factors outside the range of the Syllable Structure Conditions.

The phonological processes appear to support this hypothesis with a few reservations and would seem to add to the generalizations of the consonants and their positions.

2.3 Vowel Insertion

When words are borrowed from English or Tok Pisin, the words frequently undergo changes to make them more acceptable to Girawa speakers. The words that have initial consonant clusters usually have a vowel inserted between the two consonants. Hooper gives two universal principles for this vowel: 1) it must always be a minimal vowel or 2) its features are copied from a nearby segment (235ff). In Girawa, this vowel seems to be a high vowel, usually /i/ or /u/. I have no evidence that this a minimal vowel but the synchronic evidence seems to point that way. The examples show either a minimal vowel or a copy from the next vowel.

| Girawa | Pisin | English |
|---|---|---|
| si'?in | sskin | skin |
| su'?ul | skul | school |
| '?iris | gris | grease |

The U-Insertion Rule (14) gives further evidence that /u/ at least is inserted in certain cases. The /u/ of the dual verb forms is not copied from any surrounding vowels. Does this mean that this is the minimal vowel as Hooper posits?

The relationship between /i/ and /u/ in Girawa is an interesting and complex one. There is evidence that they are in contrast: /is/ 'I', /us/ 'dust'. But there is also evidence that they share a relationship different from those of other vowels. They may vary in certain words preceding stops.

/itut ~ utut/ 'tobacco'

/ipin ~ upin/ 'river bed'

And as you have seen before there is a variation in the verbal affixes for the 3rd class verbs as well as tense changes:

/u/ 3sing, pres/past and /i/ 3sing future

This evidence would seem to show that /i/ and /u/ are weak in allowing this kind of variation and therefore would be the logical segments that would be inserted in epenthesis and would give evidence for Hooper's hypothesis.

2.4 Consonant Clusters

Girawa has a number of consonant clusters that occur word medially. Hooper proposes a condition that requires that a syllable initial C be stronger than the immediately preceding syllable final C"(1976, 220). For a majority of cases in Girawa, consonant clusters seem to follow this rule.

| | p | t | ? | s | m | n | r | w | y |
|---|---|---|---|---|---|---|---|---|---|
| p | — | pt | p? | ps | — | · | — | — | — |
| t | tp | — | t? | — | — | — | — | tw | — |
| ? | — | ?t | — | — | ?m | ?n | — | ?w | — |
| s | sp | — | s? | — | sm | sn | — | — | — |
| m | mp | — | m? | ms | — | mn | mr | mw | — |
| n | np | nt | — | ns | nm | — | nr | nw | — |
| r | — | rt | r? | rs | rm | rn | — | rw | — |
| w | — | — | — | — | — | — | — | — | — |
| y | — | — | — | — | — | — | — | — | — |

Chart 7

There are a number however, that seem to contradict this condition.

[sibɛtbɛt] 'hawk' [aiə?na?] 'small amount'

[aismari] 'on the other side' [ɛsnin] 'net bag top'

[?omri] 'my husband' [nɛpsis] 'stuffy nose'

In some words, it may be because of reduplication, in others the modification could be made for morpheme boundaries between the consonant clusters. So the condition could be modified to include no reduplication, no pause, and no morpheme boundary. But we are still left with a few words that do not conform: [ɛsnin] 'net bag top' [sarwau?] 'snails' [unwowou] 'bird type', [nɛpsis] 'stuffy nose'

So while a majority of cases in Girawa support Hooper's hypothesis, there seem to be a number of exceptions to the rules. As exceptions grow it would cast some doubt upon this hypothesis.

3. Conclusion

I set out in this paper to discuss Girawa in the light of Natural Generative Phonology. Does NGP offer any better generalizations for the data presented or are things more complicated?

The Girawa data seems to offer fairly conclusive evidence that at least two of the rules the Glide Formation Rule and the Elision Rule need to be ordered in respect to each other. If the No-Ordering Condition is adhered to, I feel the rules would be much more complex to accommodate them.

In the Consonantal Strength Hierarchy and the Syllable Structure Condition Girawa does offer some evidence for the validity of these principles. The P-rules of Girawa show a strengthening in the syllable initial position with a weakening in the other positions, but the theory does not attempt to explain word position as opposed to syllable position which seems important to Girawa rules. The comparative evidence again gives weight to the Consonantal Strength Hierarchy and I think that this concept could be adapted to show generalization in language that were not formulated before.

There has not been very much research done on the subject of vowel epenthesis, and its argument for a scale in vowels. Hooper has opened a new avenue of exploration that could be profitable for typology of Papuan languages.

One of the strong claims of NGP concerns limiting the grammar to only surface forms. I hope that I have shown in Girawa that the verb classes on the surface do not show very much generalization but when underlying vowels

are posited, the Person-Number-Tense suffixes become much more regular and able to be generalized. This I feel is a serious drawback to the NGP theory in not allowing these to be posited.

In conclusion, while there are some isolated principles that may be helpful in looking at language, the overall theory seems to have too many areas that are questionable at least in the light of Girawa.

Notes

[1] This paper was presented at the first meeting of the International Conference on Papuan Linguistics, Goroka, Papua New Guinea, September 1982. I would like to thank Dr. Donald Burquest and Wietze Baron for many helpful comments on the other drafts of this paper. The errors are, of course, all my own.

[2] The Girawa language is spoken by over 3000 people who live 30 miles southwest of Madang town in the Madang Province of Papua New Guinea. There are over 20 small villages in the western foothills of the Finisterre Range at the headwaters of the Sogeram and Kokon Rivers.

Girawa together with Munit and Kein form the Kokon family of languages in the Mabuso Stock, Madang SuperStock (Z'graggen, 1975). Four distinct dialects have been observed. The dialect reflected in this paper is that spoken at Sai village, which is just south of the center of the whole language.

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