

ATR HARMONY IN KARIMOJONG:  
JUSTIFICATION FOR A STRATAL OPTIMALITY THEORY

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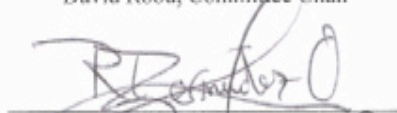
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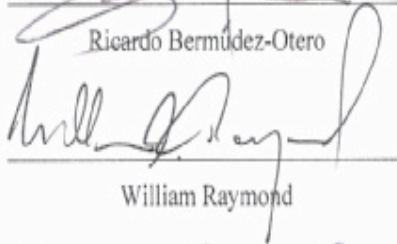
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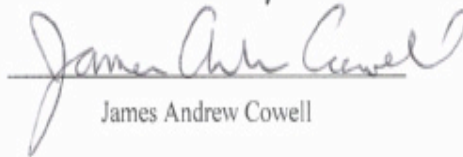
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ABSTRACT

A study of ATR harmony patterns indicates that a serial derivation model best accounts for the surface forms of Karimojong verbs. Five affix types in verbal complexes in the language may undergo harmony, trigger it or remain neutral, resulting in three separate harmony domains: bidirectional root-controlled harmony, [-ATR] suffix-controlled harmony, and [+ATR] suffix-controlled harmony. ATR specification may also be determined by adjacency effects. The [-ATR] suffix-controlled process is proposed in part to emanate from the phonologization of tongue retraction required to pronounce the itive suffix [-Ar]. The continuation of consonant voicing produces a [+ATR] feature that will block even dominant [-ATR] processes. Ease of perception and a desire to conserve vowel height information are proposed to be responsible for an [ATR] dissimilation rule affecting stem-final mid and high back vowels. The presence of neutral vowels in active affixes is accounted for by a system of a headmarking and feature percolation within a hierarchical prosodic word (PW) structure that channels the ATR specification to recipient vowels. The feature specification of the dominant prosodic word node and the domains of consonant generated features explain the outcome of the intersection of harmonic domains. This system explains surface forms under two major theoretical frameworks: rule-based theory and Optimality Theory.

Three morphophonological levels that can be identified by the application or absence of ATR harmony: a first level where bidirectional root-controlled harmony and [-ATR] suffix controlled harmony apply, a second level dominated by [+ATR] suffix control, and a third level without ATR harmony processes. These levels are proposed to reflect three separate periods in the history of the language. The incorporation of a given affix is tied to its behavior under ATR harmony rules, which assigns its level of affixation.

Transitional phases of incorporation demonstrate diachronic evolution in the language. Pronominal prefixes are largely neutral, but those found in high-frequency narrative forms alternate under dominant suffix-controlled harmony processes and are indicative change in progress. Tense/Aspect/Mood (TAM) markers also show both neutral and phonologically active behaviors. Frequentive suffixes with differing behaviors provide evidence for the genesis and evolution of reduplicated derivational suffixes, a sub-process in the evolution in the agreement system, indicated by patterns of differentiation, uniformity, and loss in TAM marker paradigms.

By accounting for surface forms within multiple theoretical frameworks, combining synchronic and diachronic explanation, accommodating the AGREE constraint family to account for harmony domains within P-structure and proposing the DOMAIN C constraint family to account for the effects of consonant-generated features, this thesis makes a contribution to the proposals of universals in the field of phonology and forms part of the Amphichronic Program (Kiparsky, 2004, 2006, 2007). The extent to which the proposed constraints and constraint families constitute universals should be the subject of further research.

## ACKNOWLEDGMENTS

This thesis written to fulfill the requirements of a Master of Arts degree in Linguistics at the University of Colorado at Boulder is, by the very nature of the topic and of linguistic practice in the U.S. state university system, a product of my development in two departments with distinct orientations. It is not only that, however. I have been truly blessed by the generosity of phonologists, descriptive linguists and Africanists across the country and around the world, all of whom have been willing to provide me with information and advice. The acknowledgment of those who contributed is therefore a most complex, but very gratifying task.

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The list of other collaborators is lengthy and my gratitude toward them immense. Gerrit Dimmendaal made himself available to my committee to explain any aspects of Eastern Nilotic important for their evaluation, and provided critiques, encouragement and the opportunity to exchange ideas on grammaticalization in Nilotic. Dave Odden critiqued theoretical arguments at different stages, answered questions and stimulated a lively exchange of ideas. Lise Menn urged me to delve more deeply into what constituted an airtight level ordering argument, and John Goldsmith served as devil's advocate in that quest. Bryan Gick, J.R. Westbury and Daniel Recasens gave helpful advice and sent papers bearing on co-articulation effects. Important assistance in African and evolutionary linguistics was also provided by Tom Givon, Larry Hyman, Manuela Noske, Bernd Heine, Michael Ahland and Jo Rubba. Kie Zuraw suggested readings on prosodic word structure. Michael Kenstowicz also helpfully provided one of his papers that I had difficulty obtaining. I look forward to future exchanges with these outstanding professionals.

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## PREFACE

This analysis of ATR (Advanced Tongue Root) harmony patterns in Karimojong ties an attention to descriptive detail, functional explanation, and the structure of the language to the formulation of a theoretical argument. It is also a first step within Eastern Nilotic to address the concerns of the Amphichronic Program (Kiparsky, 2004, 2006) which considers synchronic and diachronic explanations as parts of a unified theoretical framework.

Two concerns must be presented at the outset. The first is the quality and reliability of the data. The analysis presented here depends upon published grammars as data sources and the data in grammars of related languages to resolve areal issues. This makes the issue of the quality of the data and the abilities of those who collected them an issue. The main data source is Bruno Novelli's (1985) *A Grammar of the Karimojong Language*, written in an older version of IPA with the expressed purpose of making a contribution to the scientific study of the language. This grammar is 541 pages long, includes contextual usages, and nearly 170 pages dedicated to full verbal paradigms of a position class analysis, which allow for observations of historical changes taking place across morphological structures in the language. Other sources of information are Novelli's (1987) *Small Grammar of the Karimojong Language*, Fr. M.A. Mantovani's (1963) *An Introduction to the Karimojong Language*, and Fr. G. Bertinazzo's (1982) *Introduction to Karimojong Grammar*, all pedagogical grammars.

All of these authors were Catholic missionaries dedicated to service in Africa. Novelli was affiliated with the Comboni fathers, and was trained in linguistics and introduced to the Karimojong language by Fr. Pasquale Crazzolaro, an accomplished linguist who in the course of his career authored grammars of Acholi, Luo, Logbara, and Pokot. Novelli studied Social Anthropology at the Catholic University of Milan and completed his thesis on the Lotuho people of southern Sudan. He is the author of several anthropological works on the Karimojong people, including *Aspects of Karimojong Ethno-sociology* (1988), *Karimojong Traditional Religion* (1999) and *The Karimojong: A Resilient People* (1995).

Novelli was widely respected as a prodigious learner and speaker of Karimojong, which he employed in his pastoral and educational duties for over twenty-five years beginning in 1972. In 1989, he established the Diocesan Cultural Center to teach Karimojong language and culture to newcomers to Moroto province in Uganda. The 1985 grammar, based on approximately eight years' work in the field, is widely considered within

Nilotic language circles to reliably report segmental values. As he did not make use of the concept of downstep in the preparation of tonal paradigms and texts, his tonal transcriptions are considered to be in need of verification.<sup>1</sup> The grammar can be considered a reliable source with which to track ATR harmony patterns. Nonetheless, the behavior of voiceless vowels and the presence of [q] as opposed to [ɑ] in [+ATR] environments need to be confirmed with instrumental methods. Novelli did not report the presence of [q] in [+ATR] environments; as explained in §2.2 and §4.1, its presence is assumed based on the results of recent ultrasound research and the realities of coarticulation (Hardcastle and Hewlett, 1999). Whether the vowel within a [+ATR] harmony domain is [q] or transparent [ɑ] does not change the argument for a separate morphophonological level and therefore the basic assertion of this thesis—that the facts of the Karimojong phonology-morphology interface make a serial derivation model most plausible.

The second concern is the scope of the work. It is most accurately viewed as an attempt to conjoin the world of language description, typology and diachronic explanation with that of phonological theory and synchronic explanation. It also spans theoretical paradigms as ATR harmony phenomena are analyzed from the perspective of rule-based theory (RBT) and Optimality Theory (OT). Nevertheless, both the world of language description, typology and diachronic explanation and that of synchronic explanation and its theoretical paradigms purport to deal with the universals of language or Universal Grammar (UG) in some form. How is it that these two worlds, which in scientific practice represent subfields of linguistics that communicate poorly, be unified into a theoretical whole?

Pioneering work in African language typology (Greenberg, 1966; Heine, 1970) equated universals with typological generalizations. Under the Amphichronic Program universals—violable constraints—are distinguished from typological generalizations—historically contingent descriptive generalizations. Typological generalizations are considered to be the result of the applications of the universals, which provide the format for language specific rules in RBT, and which constitute the constraints in OT, which make up UG.

Hence, Karimojong under the criteria of Heine (1970) is classified as a Type C language, characterized by a main VSO word order and a secondary SVO order, prepositions, and the genitive pronoun following the noun it modifies. It is a vowel harmony language and its sound inventory includes voiceless vowels. These are examples of typological generalizations. As will be seen in Chapter 4, grammatical change in Karimojong

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<sup>1</sup> Opinion of Gerrit Dimmendaal, in personal communication.

shows universally attested processes as well as marked, language-specific processes that are part of rules and constraints in the grammar. At the level of the phonology, voiceless vowels show alternations that are attested cross-linguistically — they convert into oral vowels or glides word-medially. The complex nature of the ATR harmony system demonstrates the combined action of multiple rules or constraints. On the one hand, there is the tendency for harmony processes to spread throughout the word. On the other hand, this is influenced by the degree of affix incorporation, coarticulation, and the extent to which articulatory factors are phonologized. As discussed in Chapters 4 through 6, all of these represent rules/constraints acting on a given structure—the structure of the morphology-phonology interface and the phonological structure of the Karimojong word.

This thesis therefore promotes a unified view of the linguistics enterprise, tying description and diachrony to theoretical pursuits, and employing competing theoretical frameworks to account for the data. Regardless of the theoretical framework employed, one theoretical issue predominates in the work: whether parallel or serial derivation best accounts for the data. This is presented in the first chapter, which serves as the introduction.

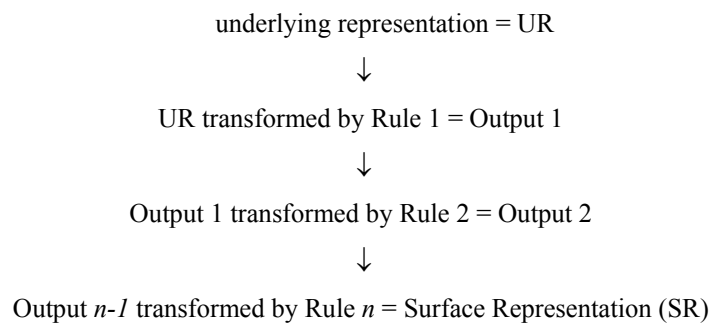
## 1.0 Introduction: Parallel versus Serial Derivation

The justification of a theoretical principle in phonology must concern itself with what constitutes a valid model and sound principles of evidence and argumentation. The approach in this thesis includes those principles proposed by John Goldsmith (1990). A good analysis must show connections among the basic facts of the respective language's phonology. Models of phonological analysis should apply to a wide range of languages, provide insights into the historical connections among them, and show connections to psychological theories. If conflicts arise between the state of the art in psychological theory with that in linguistic theory, new paths should be forged toward their resolution.

Phonological processes can be likened to footprints marking a trail of evidence of the storage of linguistic forms, and the processing and realization of outputs. In general, phonologists need to find out if the rules or constraints governing alternations are sensitive to morphological, syntactic and prosodic domains, whether they apply between words and even what constitutes a word in a given language. Work with languages of various types inspires different theoretical proposals regarding the relationship between phonology and morphology, the two fields with syntax, the nature of prosody, and the structure of the lexicon. This work focuses on evidence from the morphology-phonology interface in Karimojong to propose that serial derivation best accounts for the facts in the language.

Historically, the concept of *serial derivation* under rule-based phonology (Chomsky & Halle, 1968) was the first to appear to explain the process of transformation of the underlying form into the attested surface form. It passes through a series of intermediate representations resulting from the application of successive phonological rules as shown in (1).

### (1) Serial Derivation



There can be differences in how this process is said to be implemented (McCarthy, 1999). Rules can be stipulated to occur in a certain order; they can be organized into blocks on levels defined by specific linguistic criteria, and the derivation process itself can be defined as passing through one or more sets of rules in successive cycles. Independently of how a given theory may organize serialism, there is a time metaphor involved in the process of converting the UR into the SR.

An alternative explanation for processing of output forms arose with the proposal of Optimality Theory (Prince and Smolensky, 1993). According to the tenets of the theory, the surface form is determined by an interaction between markedness and faithfulness constraints. Constraints are ranked in a hierarchy, and which phonological phenomena are surface-true depend on the results created by this hierarchical ranking. The derivation occurs in one-step, with the interactions of constraints producing the output form occurring simultaneously, *in parallel*. For this reason, the one-step derivation is referred to as *parallel derivation*.

Nonetheless, two phenomena occurring across the world's languages cannot be entirely accounted for by parallel derivation. The first is phonological opacity (Kiparsky, 1971, 1973). Phonological opacity under serialism is defined as a situation where phonological generalizations present in the language are not surface true or surface apparent. This is explained under serialism either that previous derivational steps obliterate the conditions under which a given generalization applies, or that subsequent derivational steps mask its effect. It is a matter of controversy from a parallelist perspective whether or not opacity constitutes a problem to be resolved. Attempts to account for it while preserving the concept of parallel derivation have led to alternative analytical strategies. Among them are Sympathy Theory, Output-Output Correspondence (OOC) and Uniform Exponence (UE), discussed in §6.4.2 through §6.4.4. It has been shown that Sympathy Theory, which has fallen into disuse, in effect incorporates a derivational step into a framework that claims to be one-step process and raises critical questions for models of learnability. OOC and UE are based on an assumption that it is permissible for grammars to use other output forms as part of candidate evaluation. Arguments in OOC and UE, however, must be highly principled, as they can be easily reduced to the circular argument in which a form is justified merely on the basis that other forms like it exist in the language. The purpose behind the development of a grammar in the first place was to provide an explanation, from first principles, of its forms and structures. Roca (1997) and others sustain that the opaque forms are mathematically impossible for OT to resolve, and therefore require a change in the rules under which OT operates.

The second phenomenon challenging the parallel derivation model occurs where the domains of application of phonological rules are governed by the language's morphology. In the case of an agglutinating language like Karimojong, phonological rules apply to some affixes, while others remain neutral. In most of these cases, a simple parallel derivation model is not possible or plausible, and a model for the morphology-phonology interface is a necessary requirement for an explanation of the data in the language. A series of proposals to explain the phonology-morphology interface is under the framework of Lexical Phonology, or LP (Kiparsky, 1982). The importance of LP is that it can be accommodated within a variety of theoretical proposals, which allows it to figure prominently in the debate over parallel and serial derivation models.

One of the changes made to the basic formulations of OT to accommodate opacity and morphologically-conditioned phonology is the incorporation of a serial derivation model into a system of constraints. This is known as Lexical Phonology-Morphology Optimality Theory (LPM-OT) or Stratal Optimality Theory (Kiparsky, 2000; Roca, 1997; Rubach, 1997; Idsardi, 1997; Bermudez-Otero, 2000, 2003, forthcoming). One reason for adopting a hybrid model and preserving aspects of the parallel model is that OT addresses issues that long posed problems for RBT: conspiracies, blocking, triggering, and the need to address issues of typology and learning of language—since it has become evident that human beings do not learn languages in a series of ordered rules akin to a 1970's-era computer.

This thesis advocates a stratal optimality-theoretic model, but likewise accounts for the data within a rule-based framework. Chapter 2 provides basic information about Karimojong morphology and phonology. Data on ATR harmony processes in the language are systematically analyzed in Chapter 3. Chapter 4 presents historical explanations for the synchronic data and a three-level lexical phonology model that accounts for both synchrony and diachrony. Chapter 5 places the model within the first of two theoretical frameworks: rule-based autosegmental theory. It does so within a theoretical proposal that accounts for the specifications of neutral and epenthetic vowels, phenomena which are problematic for systematic explanations for the behavior of vowels. Chapter 6 develops, in a step-wise fashion, an optimality-theoretic ranking argument for the three-tier LP model presented in Chapter 4. It likewise shows that parallel derivation, in any of its forms, does not provide the most plausible account for the data in Karimojong. Chapter 7 presents conclusions and proposals for further research.

Let us begin the discussion with a look at the Karimojong data in the following chapter.

## 2.0 Structure

A description of ATR harmony in Karimojong and the study of the morphology-phonology interface in the language entail an examination of the grammar from the phonemic to the word level. This chapter includes information on vowels and consonants and issues related to them, verb morphology, affixes classified by their behavior, and an analysis of types of harmony with a description of adjacency effects that bear upon the harmony span. This begins with the consonant inventory in §2.1.

### 2.1 Consonant Inventory

The consonant inventory of Karimojong is shown below in (2). The information is taken from Novelli (1985).<sup>2</sup> Karimojong consonants may have bilabial, dental, alveolar, palato-alveolar, palatal, velar and glottal places of articulation. Manners of articulation from plosive to approximant are represented in the consonantal phoneme inventory. Consonants *p, b, t, d, k, g, l, m, n, s, z, tʃ, dʒ, w, j* and *ŋ* in the language are described by Novelli as having ‘English value’. While Novelli also asserts this regarding *r*, his consonant inventory indicates that it is a trill, an assertion affirmed by Dimmendaal (personal communication), taking feature values of the equivalent Turkana consonant into account.

(2)

	Bilabial	Dental	Alveolar	Palato-alveolar	Palatal	Velar	Glottal
Plosive	p b		t d			k g	ʔ
Affricate				tʃ dʒ			
Nasal	m		n		ɲ	ŋ	
Lateral			l				
Trill			r				
Fricative		ð	s z			y	
Approximant	(velar) w				j		

The voiced alveolar fricative [z] appearing in most dialects appears in a small number of others as the voiced dental fricative [ð]. The voiced palatal and velar nasal sounds are widely used in the language, while the

<sup>2</sup> Novelli presents plosives *d* and *t* as having dental places of articulation, yet signaled in the written text that they have ‘English value’. Dimmendaal (1983) describes them in Turkana as having an alveolar place of articulation. Taking into account that Novelli’s linguistic training was conducted in Italian, his native language, in which these plosives are dental, I have classified them as alveolar plosives. This should be subject to verification and further research.

voiced velar fricative is disappearing, replaced by [g] and [w]. The glottal stop appears before plosive consonants syllable initially, as shown in (3).

- (3) a. tɔ.ʔdɔŋ.as - ‘Pinch each other!’      c. ε.ʔde.ʔdeŋ - ‘He is fierce/angry.’  
 b. ε.tʃe.ʔdi - ‘He moves on tiptoe.’      d. ŋa.ʔtapa.ʔta - ‘footprints, tracks’

(Novelli, 1985: 34)

## 2.2 Vowel System

### 2.2.1 Vowel Inventory

Karimojong has twenty-six oral vowel phonemes, thirteen of them voiced, and thirteen voiceless which can be seen in the vowel chart in (4). Each voiced vowel has a voiceless counterpart. In addition to the vowels /i,e,ɛ,a,ɔ,u/, the language contains lax variants of both the high front unrounded and high back rounded vowels, the raised open front vowel /æ/ which is used in some verb endings, the high front rounded vowel /y/ and the close-mid central rounded vowel /ø/.

(4) *Vowels*

	i	y	ɪ	e	ɛ	æ	a	ə	ɑ	ɔ	o	ʊ	u	ĩ	ɨ	ẽ	ɛ̃	æ̃	ɑ̃	ɔ̃	õ	ʊ̃	ũ		
high	+	+	+	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	+	+
low	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-
back	-	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-	+	+	+	+	+
voiced	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-
round	-	+	-	-	-	-	-	+	-	+	+	+	+	-	-	-	-	-	-	+	-	+	+	+	+
ATR	+	+	-	+	-	-	+	-	-	-	+	-	+	+	-	+	-	-	+	-	-	-	+	-	+

### 2.2.2 Voiceless Vowels

The exact nature of what Vine (1980) terms ‘African shadow vowels’ requires additional research. Dimmendaal (personal communication) prefers the term ‘voiceless’ or ‘non-voiced’ vowels. Novelli (1985) describes them as ‘breathed, quite mute’ in word-final position and as possessing ‘a sort of gliding value’ word-medially. The voiced/voiceless vowel distinction is seen in the (quasi-) minimal pairs in (5). Example (5-a) shows the voiceless vowel [ĩ] as the TAM marker of the indicative mood past tense of passive voice. This is contrastive with the voiced vowel [i] in (5-b) which marks the Indicative Mood, Active Voice, Past Progressive

tense. In (5-c), voicelessness and a low tone mark the second root vowel [o] as indication of the Passive Voice Simple Past. In (5-d), the voicing of this vowel is the first person marker in Future Tense of the Reflexive Voice.

(5) *Word-final Voiceless/Voiced Vowel Minimal Pair Contrasts*

- |   |   |
|---|---|
| a. α-dɔŋ̀<br>3s-pinch-IND. PASS.PST.<br>'He was pinched'. | b. à-dòŋ-i<br>3s-pinch-IND. ACT..PST. PROG<br>'He was pinching' |
|---|---|

(Novelli, 1985: 269,270)

- |  |   |
|--|---|
| c. à-mur-ò<br>1s-sacrifice- IND.PASS.PST.<br>'I was sacrificed.' | d. à-muró<br>1s-sacrifice-IND.REFL. FUT<br>'I will sacrifice myself'. |
|--|---|

(Novelli, 1985: 240)

Word-medial examples of voiceless vowels are shown in (6). They are taken from Novelli (1985:29).

(6) *Word-Medial Voiceless Vowels*<sup>3</sup>

- |                   |
|-------------------|
| a. áɛ́ɔŋ 'I'      |
| b. ε̣woi 'acacia' |

Word-final voiceless vowels carry the tone value opposite that of the preceding voiced vowel. When suffixes are added to those occurring at the end of the verb stem, the vowels become voiced and assume the tone value of the preceding voiced vowel. In (7-a) voiceless vowel [ɔ] carries a low tone, unlike the preceding vowels carrying high tones. Examples (7-b,c) demonstrate that, upon affixation of [-éenén-], the voiceless vowel becomes voiced and adopts the high tone of the preceding vowels. In (7-c), the voiceless vowel becomes voiced and assumes the [-ATR] specification of the dominant suffix [-ðr], with the epenthesis of [r].

(7) *Word Final Voiceless Vowels Under Affixation*

- |                         |   |                            |
|-------------------------|---|----------------------------|
| a. ámurò 'to sacrifice' | b. ámuróéenén 'to sacrifice frequently' | c. ámuróðr 'sacrifice' VEN |
| d. ákípúkà 'to rule'    | e. ákípúkáéenén 'to rule frequently'    |                            |
| f. ákíákì 'to send'     | g. ákíákíùn 'to send toward'            | h. ákíákíar 'send' VEN     |

(Novelli, 1985: 214)

<sup>3</sup> Dimmendaal, in personal communication, disagrees with Novelli regarding these vowels, indicating they are semi-vowels with [-ATR] values.

Similarly, in (7-d,f), voiceless vowels carry the low tones differentiating them from the high tones on preceding voiced vowels, and the forms are transformed in affixation processes as in (7-a) through (7-c).

### 2.2.3 Diphthongs

Because of the extensive affixation in the language, diphthongs and multiple vowel combinations are quite frequent. Individual vowels may occur in two types of patterns: they may form separate syllables or form part of a complex nucleus in a single syllable. As shown in (8), they are commonly the result of plural formation. In (6-a,b), plural formative [-e] forms [-ae] diphthongs at the ends of the words. In (8-c,d), [-i] suffixation forms [-ei] diphthongs. Diphthongs [-oi] and [-ui] are formed in (8-e,f) and in (8-g,h) respectively.

#### (8) Plural Suffixation

	Singular	Plural	Gloss
a.	atuba	ηatubae	‘trough’
b.	etokora	ηitokoraē	‘partridge’
c.	akine	ηakinei	‘goat’
d.	aηole	ηaηolei	‘horse, mule’
e.	amuro	ηamuroi	‘thigh’
f.	amedo	ηamedoi	‘nape’
g.	ebuku	ηebukui	‘inhabited place, country’
h.	aluru	ηalurui	‘quail’

(Novelli, 1985:31-32)

Diphthongs are quite prominent in verb suffixes, and frequently include glides., as illustrated in (9). In (9-a,b) the palatal glide forms diphthongs respectively with [-a] and [-o] in the form B Active Voice and Form A Passive Voice in future tense. In (9-c,d) [-ae] diphthongs are formed for a Passive Voice Form A, present or past perfect and a Form A Reflexive present tense, for third person singular respectively.

#### (9) Verb Suffixes Containing Diphthongs

	Suffix Type	Gloss
a.	adoηja	Active Voice, Form B ‘pinch’
b.	ikidónjō	Passive Voice, Form A, FUT. ‘We shall be pinched’
c.	akadōηitae	Passive Voice, Form A PERF. ‘I have/had been pinched’
d.	edōηae	Reflexive, Form A PRES. ‘He pinches himself.’

Vowel combinations resulting from affixation onto verb forms are numerous, but the distinctive formative

elements of the verb constitute separate syllables. Vowel combinations in verb forms subsequently syllabified are presented in (10). In (10-a), each vowel in the combination [-eá] belongs to a separate syllable, and the high tone on the latter vowel marks the breaking of the diphthong into two different tone qualities. In (10-b), verb [ákiɔ́] is in the reduplicated verb position, with an epenthetic vowel [ɪ] forming the first vowel combination with stem-final vowel [a]. The second vowel combination consists of the stem-final [a] of the reduplicant with the initial vowel of suffix [ákin]. The high tones on the [ɪ] and on each of the two low vowels individuates the vowels, a process further illustrated by the separation of the verb into its formative elements and into syllables. In (9-c) the verb form includes the frequentive infix [-eenen], which includes a vowel combination, and future tense marker [-ete], as well as the 3 p. pronominal prefix [ε-]. Epenthetic vowel [-e-] separates the frequentive infix from the tense marker. Syllabification allows for the complex vowel within the frequentive infix to remain in one syllable, but the [-ee-] complex which follows is separated by the distinction between the epenthetic vowel and the initial vowel of the tense marker, which in turn is also syllabified.

(10) *Vowel Combinations and Syllabification in Verb Forms*

<u>Infinitive</u>	<u>Affixed Form</u>	<u>Syllabified Form</u>	<u>Gloss</u>	<u>Reference</u>
a. ákì-dé	áki-dé-ákin	á.kɪ.dɛ.á.kìn	‘to have an isolated spot on the head’	216
b. ákì-dá	áki-da-í-da-ákin	a.kɪ.da.ɪ.dá.a.kìn	‘to push all right in’	217
c. ákì-dóŋ	à-dòŋ-éenen-e-etè	à.dòŋ.éen.en.e.e.tè <sup>4</sup>	‘I will often pinch’	32
d. á-murò	òko-muro-etèi	o.ko.mu.ro.e.tèi	‘and I will be sacrificed’	240

Reduplicated verb forms undergo vowel epenthesis prior to suffixation. These vowels are termed ‘stem-enlarging vowels’ and their interaction with suffix-initial vowels can lead to the formation of diphthongs, to vowel deletion, or even glide insertion to form a larger vowel complex. In (11-a), stem-enlarging vowel [e] is epenthesized to the reduplicated form before the present tense passive voice suffix [-o] is appended. The resulting diphthong takes a low tone marked on the first vowel of the pair. In (11-b), glide epenthesis occurs to transition final vowel [u] to the future active voice suffix, forming a diphthong of the glide and suffix-initial [-e]. In (11-c), glide epenthesis occurs to transition final vowel [i] to the present passive suffix, forming a word-final vowel complex carrying a low tone. Example (10-d) shows deletion of the stem-enlarging vowel [-i] before suffix [-etè].

<sup>4</sup> Novelli does not explain the unusual syllabification of this form. It apparently has to do with historical changes in the affixes, as [eenen] is derived from the reduplication [en-en].

(11) *Diphthongs: Stem-Enlarging Vowels under Suffixation*

	<u>Infinitive</u>	<u>Vowel</u>	<u>Suffix/Gloss</u>	<u>Form</u>	<u>Gloss</u>	<u>Ref.</u>
a.	áki-rem	e	-o / PRES,PASS	akarémérémèo	'I am stabbed repeatedly.'	241
b.	ákí-ŋu	u	-éte/FUT,ACT	ìjuìŋujetè	'You will sniff repeatedly.'	243
c.	ákí-bíl	ɪ	-o/ PRES,PASS	èbilíbilìjò	'He is broken repeatedly'	245
d.	ákì-dóŋ	i	-etè/ PST PROG,ACT	ìdòŋidoŋetè	'You(p.) were castrating repeatedly'	368

Hence, diphthongs and vowel combinations occur widely in the language as a result of epenthesis, suffixation and glide insertion. The study of the rules governing these processes is beyond the scope of this paper, but their presence must be noted to account for surface phenomena in a study of alternations in the vowel system. The following section presents the vowels in the Karimojong harmony set.

**2.2.4 Vowels of the Harmony Set**

Karimojong has cross-height vowel harmony, in which each non-low [+ATR] vowel has a corresponding [-ATR] vowel of the same height. The [+ATR] vowels of alternating affixes appear in [+ATR] environments, and analogously, the [-ATR] vowels appear in [-ATR] environments. Shown in (12) are the two groups of vowel qualities, that of [+ATR] vowels and that of [-ATR] vowels. Each [+ATR] vowel is paired with a corresponding [-ATR] vowel with similar features. Low vowel [a] alternates with [o] within a particular set of suffixes under root-controlled harmony processes. Until recently, this vowel in numerous African languages has been considered to be an unpaired [-ATR] vowel, which is neutral and transparent to harmony (Noske, 2000, *inter alia*). This situation, thought to be the result of vowel mergers (Creider, 1998; Dimmendaal, 2002) creates what is referred to as a nine-vowel harmony system (see §4.1). With the advent of ultrasound imaging, the notion that [a] is unpaired has changed. It has been shown that the low vowel [a] actually shows tongue root advancement in [+ATR] environments (Gick, et al, 2006; Archangeli, 2003). This [+ATR] vowel will be represented as [ɔ̠] and is shown as the tenth vowel of the harmony set in parentheses. This vowel is not distinguished in Novelli (1985) from which my examples have been taken. However, as a consequence of this research in related languages, I will assume that [a] in [+ATR] environments is [ɔ̠].<sup>5</sup>

(12) Harmonic Vowels	[+ATR]		[-ATR]	
	i	u	ɪ	ʊ
	e	o	ɛ	ɔ
		(ɔ̠)		ɑ

<sup>5</sup> Novelli (1985) reported a [+ATR] low vowel that does not participate in harmonic alternation, and which appears in some examples as [a].

## 2.3 Tone

Karimojong is a tonal language with a three tone system shown in (13). The high tone in (13a) is shown with a rising angle diacritic over vowels *a*, *i*, and *o*. The mid tone is normally written without a diacritic, as shown in (13-b). To distinguish a mid tone in a vowel series, a level diacritic will be used as shown in (14-c,d). The diacritic mark with a falling angle is used to indicate a low tone as in (13-c) on vowels *a*, *o*, and *i*. Otherwise, in the case of series of vowels taking one tone, the tone diacritic will be indicated on the first vowel of the series only. In (14-a), vowel series [-ae] which takes a high tone, has the diacritic over the first vowel only. In (14-b), series [-aa] takes a high tone diacritic over the first vowel and a low tone diacritic over the second.

(13) *Basic Tones in Karimojong*

a. High Tone	b. Mid Tone	c. Low Tone
ákínók	kotere	àdòḡitò
‘to light fire’	‘in order that’	‘they have pinched’

(14) *Tones in Vowel Series*

a. mamáe	b. pàpáà	c. nò ò i	d. édzáari
‘maternal uncle’	‘grandfather’	‘very much’	‘I am accepting’

(Novelli, 1985:37)

Combination tones, which consist of an unbroken series of two tones over the same vowel, are rarely heard. There is a tendency in the language to drop the second of two tones in a combination (Novelli, 1985), except where there are semantic requirements for its retention. As shown in (15), the attested combination tones are high-low, mid-low, and low-mid. In (15-a), the high-low combination appears in the word-final [a]. In (15-b) a mid-low combination appears with the word-final [i]. In (15-c) the low-mid combination appears in the word-initial [o].

(15) *Combination Tones*

a. High-low	b. Mid-low	c. Low-mid
àdzàarâ	èdzàarî	kotere ò̃ten
‘I have accepted’	‘He was accepting’	‘that I may make ready’

(Novelli, 1985:37)

Karimojong has grammatical tonal patterns reflecting tense, mood, voice and verb class. Complete

paradigms can be found in Novelli's *Grammar of the Karimojong Language* (1985). It has been noted by Dimmendaal (personal communication) that Novelli differed from most Africanists in his methodology by not making use of downstep, a common phenomenon in African languages.

## 2.4 Verb Morphology

Karimojong, like all Nilotic languages, possesses a rich and complex verb system. There are three factors contributing to this complexity. The first one is the affixation structure. Verb roots are preceded by prefixes marking negation, subject or object, and causatives in that order. Derivational suffixes following the root mark the ventive, itive, dative and frequentive. There are inflectional suffixes marking tense, aspect, number and voice. The second complicating factor is that the verbs themselves are divided into two major classes, creating a considerable degree of allomorphy. Morphophonemic alternations due to vowel harmony, tone rules, and the fusion of vowels constitute the third factor

### 2.4.1 Structure of the Verb Stem

The stem can be mono-or poly-syllabic. Monosyllabic stems may have the configuration CVC, CV, or simply V, examples of which are shown in (16-a-c) with their infinitive forms in parentheses. Polysyllabic stems may have the form CVV, VCV, CVCV, CVCGV and are shown in (17-a-d). A number of verbs, particularly those ending in vowels, come with the extension [-(V)re], which is not considered part of the root. This is shown in example (16-c) and in (18-a-d). Double stemmed verbs in which the stem ending in [-n] applies to singular persons, and the stem ending in [-k] applies to plural persons, are shown in (19). Example (19-e) shows an irregular case of a double-stemmed verb showing vowel and consonant changes for the singular and plural forms. This case provides evidence for the convergence of [a] and [ɔ] in Nilotic, which is discussed in §4.1. All examples are from Novelli (1985: 210-217, 225-226).

#### (16) Monosyllabic Verb Stem Structure

- |         |       |            |          |
|---------|-------|------------|----------|
| a. CVC: | -dóŋ- | 'castrate' | (ákìdɔŋ) |
| b. CV:  | -bú-  | 'return'   | (ákíbú)  |
| c. V:   | -u-   | 'fart'     | (auore)  |

#### (17) Poly-syllabic Verb Stem Structure

- |           |         |             |          |
|-----------|---------|-------------|----------|
| a. CVV:   | -tɪɑ-   | 'work'      | (ákítíɑ) |
| b. VCV:   | -olì-   | 'get lost'  | (áòlì)   |
| c. CVCV:  | -murò   | 'sacrifice' | (amúrò)  |
| d. CVCGV: | -bolja- | 'play'      | (ábóljà) |

(18) *Verb Stems with [-(V)re] Extension*

- a. ábù-òre - ‘to swell, leaven’
- b. ákù-ore- ‘to swell, leaven’
- c. aru-ore - ‘to make sounds (of animals)’
- d. ákìpò-re- ‘to cook’

(19) *Double-Stem Verbs*

- a. átwàn-are / átwàk-are - ‘to die’
- b. akòn-òre / akòk-òre - ‘to mature’
- c. áò-ore / aòk-òre - ‘to dry’
- d. ákìmwòn-òre/ ákìmwòk-òre - ‘to be satisfied’
- e. ábùn-òre / ápòn-are - ‘to come’

**2.4.2 Basic Verb Structure**

The Karimojong verb has two prefix slots before the stem, and three suffix slots following it. The first prefix slot, occupied by either a pronominal prefix or an infinitive prefix, is obligatory. The second slot next to the stem, should it be utilized, is occupied by the causative prefix. The first two suffix slots are occupied by derivational affixes, and the final slot by a suffix representing tense, aspect and mode (TAM). This structure is illustrated in (20). Example (21) shows a glossed example of this verb in its entirety.

(20) *Elements of the Karimojong Verb*

è-	Pronominal Prefix
-zi-	Causative Prefix
-lip -	Stem
-án-	Derivational Suffix
-ákìn-	Derivational Suffix
-etè	TAM marker

(21) *Verb Form*

è - zi - lìp - án - àkìn - etè  
3p- CAUS - pray - FREQ- DAT - FUT  
‘They will cause to pray frequently for’

**2.4.3 Derivation and Inflection: The Order of Meaningful Elements**

Affixes on the verb in Karimojong are ordered in such a way that those generally classified as derivational are closest to the root to its left and right, and those classified as inflectional are found at the left and right edges of the grammatical word. The derivational and inflectional morphological structure of the verb [è-tò-dòŋ-án-

ákin-jò] is shown in (22). The pronominal prefix [ε-] at the left edge and the passive voice present conditional voice marker for third person constitute the set of inflectional affixes in this form. The causative prefix [to-] and the frequentive affix [án-] respectively take the left and right positions proximal to the root and are derivational suffixes. Dative suffix [ákin] is in an intermediate position between inflectional and derivational suffixes.

(22) *Derivational and Inflectional Morphological Structure of the Verb*

**INFL DER ROOT DER DER INFL**  
 ε - to - doŋ - án - akín - jò  
 3s/p CAUS ‘pinch’    FREQ - DAT - PASS.PRS.3s/p  
 ‘he/she/they is/are caused to be frequently pinched for (the purpose of)’

The classification of Karimojong morphemes as inflectional or derivational obeys standard formal criteria, as affirmed by Booij (to appear). Obligatoriness for inflectional morphemes is seen in that all Karimojong verbs have inflectional prefixes, whether they are pronominal, negative, or infinitive markers. TAM markers are not required for citation forms. Inflectional morphemes are those most relevant to syntax, as exemplified by the pronominal prefixes and the TAM markers. Regarding the expression of semantic differences, it is the general case for inflectional affixes to reflect valency, tense, aspect, mood, person, number and gender, while derivational morphemes are used for a broad range of semantic categories, and are considered closer to the expression of lexical meaning than inflectional affixes. In Karimojong, the morpheme [-ákin] changes the valency of the verb, and is understood as having a defined semantic meaning—‘for, for the purpose of’. That the position of this suffix is more to the outside than that of the other derivational suffixes indicates that it shares the characteristics of both derivational and inflectional morphemes.

The Karimojong verb obeys the affix-ordering principle proposed by Greenberg (1963:93), part of an enumerated list said to represent universal characteristics of the world’s languages. This is stated in (23).

(23) *Ordering of Inflectional and Derivational Affixes*

Universal 28. If both the derivation and inflection follow the root, or they both precede the root, the derivation is always between the root and the inflection. (Greenberg, 1963:93).

The validity of Greenberg’s proposal for the Karimojong case can be further illustrated by a listing of possible morphemes by the template slot in which they are found. This is shown in (24). Inflectional markers

marking infinitives, negation, agreement at the left edge are in the position of the first prefix. Other inflectional markers of tense, aspect and mood are at the right edge and their template slot is the third suffix position. The second prefix is the causative, which is a derivational suffix located next to the root. The first suffix position, the frequentive position, is derivational and is likewise next to the root. The second suffix position includes derivational suffixes and those that have both derivational and inflectional characteristics as mentioned above.

(24) *Morphemes by Template Position*

1. First Prefix: [ákI-]—Infinitive marker  
[a-] — Infinitive marker  
[ɲá-]/[pá-]— Negation marker  
Pronominal Prefixes (See Appendix)
2. Second Prefix: [tA-] — Causative  
[zI-] — Causative
3. First Suffix: [-eenen-] — Frequentive  
[-Ún-] — Frequentive  
[-á/ón-] — Frequentive
4. Second Suffix: [-Ûn-] — Ventive  
[-à/or-] — Itive  
[-á/ókìn-]—Dative
5. Third Suffix: TAM Markers (See Appendix for a partial listing)

**2.4.4 Verb Class, Affixation and Position Class**

There are three basic positions of the verb: the fundamental one, which gives the basic meaning of the verb; the frequentive, which indicates that the action is performed frequently, and which is effected through affixation; the iterative, which expresses that the action is done repeatedly, expressed through reduplication of the verb. These three positions are modified by a “directional” connotation, effected through affixation: of movement toward the deictic center—the ventive; away from the deictic center—the itive, and for a certain reason or person—the dative. The three positions and the directional modifications results in 12 basic positions of the verb. An additional connotation, the causative, expressed through a prefix, can be added to each of these 12 positions for a total of 24.

Karimojong verbs come in two major morphological classes, which are denominated Class 1 and Class 2. While both sets of verbs in the citation form of the infinitive employ the alternating prefix [áki-], only the Class 2 verbs retain it in the different positions of the verb. Class 1 verbs will substitute the prefix [á-] when there is no pronominal prefix to replace the infinitive morpheme. Class 1 verb [ákídóŋ] –‘to pinch’ in its 24 positions is shown in (25), while a corresponding paradigm for Class 2 verb [ákìdóŋ]-‘to castrate’ is shown in (26).

(25) *Verb Positions for Class 1 Verb: [ákídóŋ] - ‘pinch’*

Normal Position

- |               |                     |
|---------------|---------------------|
| 1. ákí-dóŋ    | 13. ákí-tó-dóŋ      |
| 2. á-dóŋ-ùn   | 14. ákí-tó-dóŋ-ùn   |
| 3. á-dóŋ-ar   | 15. ákí-tó-dóŋ-àr   |
| 4. á-dóŋ-ákìn | 16. ákí-tó-dóŋ-ákìn |

Frequentive Position

- |                  |                        |
|------------------|------------------------|
| 5. á-dóŋ-éenén   | 17. ákì-tó-dóŋ-éenén   |
| 6. á-dóŋ-ún-ùn   | 18. ákí-tó-dóŋ-ún-ùn   |
| 7. á-dóŋ-án-ar   | 19. ákí-tó-dóŋ-án-àr   |
| 8. á-dóŋ-án-ákìn | 20. ákí-tó-dóŋ-án-ákìn |

Iterative Position

- |                      |                           |
|----------------------|---------------------------|
| 9. á-dóŋ-ɔ́-dóŋ      | 21. ákì-tò-dóŋ-ò-dóŋ      |
| 10. á-dóŋ-ó-dóŋ-ó-ùn | 22. ákí-tò-dóŋ-ó-dóŋ-ó-ùn |
| 11. á-dóŋ-ó-dóŋ-ó-ar | 23. ákí-tó-dóŋ-ó-dóŋ-ó-àr |
| 12. á-dóŋ-ó-dóŋ-ákìn | 24. ákí-tó-dóŋ-ó-dóŋ-ákìn |

(26) *Verb Positions for Class 2 Verb ákìdóŋ-to castrate*

Normal Position

- |                 |                     |
|-----------------|---------------------|
| 1. ákì-dóŋ      | 13. ákì-zí-đóŋ      |
| 2. ákí-dóŋ-ùn   | 14. ákí-zí-dóŋ-ùn   |
| 3. ákí-dóŋ-or   | 15. ákí-zí-dóŋ-òr   |
| 4. ákí-dóŋ-ókìn | 16. ákí-zí-dóŋ-ókìn |

Frequentive Position

- |                    |                        |
|--------------------|------------------------|
| 5. ákí-dóŋ-éenén   | 17. ákí-zí-dóŋ-éenén   |
| 6. ákí-dóŋ-ún-ùn   | 18. ákí-zí-dóŋ-ún-ùn   |
| 7. ákí-dóŋ-ón-or   | 19. ákí-zí-dóŋ-ón-or   |
| 8. ákí-dóŋ-ón-ókìn | 20. ákí-zí-dóŋ-ón-ókìn |

#### Iterative Position

- |                        |                           |
|------------------------|---------------------------|
| 9. akì-don-í-dòṅ       | 21. ákì-zi-don-í-don      |
| 10. áki-don-í-dóṅ-ó-ùṅ | 22. áki-zi-dóṅ-í-dóṅ-ó-ùṅ |
| 11. ákì-don-í-dóṅ-ó-ṛ  | 23. áki-zi-dóṅ-í-dóṅ-ó-ṛ  |
| 12. ákì-don-í-dóṅ-ókìn | 24. áki-zi-dóṅ-í-don-ókìn |

#### 2.4.5 Verb Conjugation

The conjugation of the Karimojong verb includes verb form, voice, mood and tense. Verbs differing only in form will have different suffixes and can differ in their prefixes. Suffixes will vary according to the voice and mood, and tenses exist in three morphological categories: Tenses 1 and 2; Tenses 3 and 4, and Tense 5. Within these categories the individual tenses are distinguished by tone patterns. The semantic value of each tense varies with the mood.

##### 2.4.5.1 Verb Form

The two forms of the Karimojong verb, Form A and Form B, differ in their usage. Form A is used when all parts of speech in the sentence occur in normal word order: verb, subject, direct object and indirect object. Form B is used when other parts of speech are placed in front of the verb. This is termed the *applied form* of the verb. This is used for interrogatives, and for understood determinations of place, time, purpose, manner, cause and accompaniment. A comparison of Form B and Form A usage is shown in (27), from Novelli (1985:502-503).

#### (27) Form B Versus Form A Usage

- | Form B  | Form A  |
|---|---|
| a. tari orí ákádaṅja aeḡḡ íjḡḡ ?<br>until when 1s-tolerate-FUT 1s 2s<br>'Until when will I tolerate you?' | b. àkàdàḡḡ aeḡḡ íjḡḡ tari orí?<br>1s-tolerate-FUT 1s 2s until when<br>'Until when will I tolerate you?' |
| c. ḡai irukorjatà íjḡḡ<br>with whom 2s-go-PRS.PROG 2s<br>'With whom are you going?'                       | d. ìrúkorétè íjḡḡ ka ḡai<br>2s-go-PRS.PROG 2s with whom<br>'With whom are you going?'                   |

(Novelli, 1985: 502-3)

##### 2.4.5.2 Voice and Mood

There are three voices in Karimojong: Active Voice, Passive Voice and Reflexive Voice. Moods are distinguished using Roman numerals I, II and III.

Mood I is the indicative mood, used for simple statements of reality. Expressions of cause, reason, time or imminence are accompanied by particular adverbs. Examples of its use are provided in (28).

(28) *Indicative Mood*

- |  |  |
|--|--|
| <p>a. èḍìkinò    iṅez erámjò<br/>         PRES imminent 3s    beat PASS-PRS<br/>         ‘He is near to being beaten.’</p> | <p>b. erokó ikèz ṅépónà<br/>         yet    3p    NEG-arrive-PRS<br/>         ‘They have not yet arrived.’</p> |
|--|--|

(Novelli, 1985: 507)

Mood II is the subjunctive/conditional mood. It is used for three types of expressions: conditional clauses in which probable, improbable and impossible conditions may be expressed; dubitative sentences, and a third category of expressions which includes indirect interrogative sentences with place determinations, adversative sentences, temporal clauses with conditional meanings, those in the absolute ablative with temporal clause in the past, sentences that exclude the repetition of an action, dependent clauses with temporal meanings, sentences using the adverb “already”, and with exclamations of surprise. Glossed examples of two of its conditional uses are shown in (29). Example (29-a) shows what is translated as a Type I Conditional English sentence. In (29-b), the Karimojong sentence with prefix and suffix inflection for the subjunctive and conditional mood translates as a Type II Modal Conditional English sentence.

(29) *Subjunctive/Conditional Mood*

- |  |
|--|
| <p>a. kʔíłót    ijóṅ lo-ré itʃápi    akon-imàna<br/>         SUBJ-2s go-5<sup>6</sup>    2s    home 2s weed IND.FUT    2s    field<br/>         ‘If you go home you will weed your field.’</p> |
| <p>b. kʔíłót    ijóṅ lo-ré kʔitʃápu<br/>         SUBJ-2s go-SUBJ.5<sup>7</sup>    2s    home SUBJ- 2s weed –SUBJ.5<sup>8</sup><br/>         ‘If you could go home you could weed.’</p>         |

(Novelli, 1985: 513)

Mood III is the narrative/imperative mood. The narrative is normally used in compound sentences and in coordinate constructions, where each sentence or phrase is logically dependent on the other. In the compound

---

<sup>6</sup> Tense 5 is the simple past tense. However, in Mood II, expression in the protasis in coordination with the main clause will change its meaning. As the main clause is in the future, it forms part of what is known in English as a First Conditional construction.

<sup>7</sup> Tense 5 is used to form conditional constructions here.

sentence in example (30), third person plural Narrative Mood suffixes mark each of the verbs: [-a] in the case of [-ATR] roots [-ɲam-]-‘eat’ and [-lɪp]-‘to pray’ of the and [-o] in the case of [+ATR] root [-per-] – ‘sleep’.

(30) *Narrative Mood*

àpòtù ɲìdwè tɔ-ɲam-a ...ki-lɪp-a... to-per-o...  
 first children NARR3p-eat-PST DEM-pray-ACT.NAR.PST.3p 3p go to sleep-ACT.NAR..PST.3p  
 ‘first the children ate...then they prayed...then they went to sleep.’

(Novelli, 1985: 510)

The imperative is used in three ways. The first is to order something done or declare it advisable because something else has happened, will or is expected to happen. This is called the Habitual Imperative, which appears in example (31-a). The second is to order the continuation of an action, especially before something else happens. This is the Precedent-Continuous Imperative, seen in example (31-b). The third is to command that something be done now, and it is called the Actual Imperative. This is shown in example (31-c).

(31) *Imperative Mood*

a. Habitual Imperative

kìlìpèté (èdòli apák ɲma kilipét)  
 2p pray-HAB IMP<sup>9</sup> time of the prayer  
 ‘Do pray! (Since it is prayer time.)’

b. Precedent-Continuous Imperative

tò-nàpìté íkòkú ɛɲɲa ɲɛ-búnò tòto keɲ  
 2s wear-PC ACT.IMP child yet NEG-3s-arrive-ACT.PRS mother 3s-POSS  
 ‘Continue carrying the child on your back until its mother arrives.’

c. Actual Imperative

tɔ-bɔk  
 2s- dig-ØACT.IMP  
 ‘Do dig!’

(Novelli, 1985:511-512)

**2.4.5.3 Tense**

Segmental values of affixes divide the five basic tenses into three groups: that of Tenses 1 and 2, Tenses 3 and 4, and Tense 5. The individual tenses and finer shades of meaning within these groups are distinguished by

<sup>9</sup> Tense 2 in Mood III is Habitual Imperative.

tonal patterns and other inflections. The basic tenses are identified by number from 1 to 5. The tenses show differences in meaning according to the mood. A listing of the tenses by mood is given in (32).

(32) *List of Tenses by Mood*

Indicative Mood:

Tense 1: Future, Habitual Present, and Present Continuous.

Tense 2: Past Continuous.

Tense 3: Present Perfect.

Tense 4: Pluperfect.

Tense 5: Simple Past.

Subjunctive/Conditional Mood:

Tense 1: Protasis of the probable condition.

(If I pinched...; If I (will) pinch...; If I am/will be pinching...)

Tense 2: Present Conditional.

Tense 3: Protasis of Third Conditional.

(If I had pinched...)

Tense 4: Perfect Conditional.

(I should/would/could have pinched)

Tense 5: Present Subjunctive

Narrative Mood:

Tense 2: Present/ Past Continuous.

Tense 4: Present/ Past perfect.

Tense 5: Simple Past.

Imperative Mood:

Tense 2: Habitual Imperative.

Tense 4: Continuous Precedent.

Tense 5: Actual Imperative.

## 2.5 Morphological Classification of Affix Types

What follows is a breakdown of Karimojong affix types classified according to their morphological status and semantic meanings.

### 2.5.1 Inflectional Affixes

There are three types of inflectional affixes: infinitive prefixes discussed in §2.5.1.1, pronominal prefixes in §2.5.1.2, and TAM suffixes presented in 2.5.1.3.

### 2.5.1.1 *Infinitive Prefixes*

The infinitive prefix for the citation form of the verb is usually the same for both verb classes [akI-], with the archiphoneme [I] realized according to the ATR value of the root. This can be seen in (33-a,b,de).

Occasionally, citation forms arise in which the infinitive prefix is merely [a], as shown by the Class 1 citation verb form in (33-c).

#### (33) *Infinitive Inflection for Citation Forms*

Class 1 Verbs	Class 2 Verbs
a. ákí-mókì ‘to handle firmly’	d. ákì-tùle ‘to blow on fire’
b. ákí-sá ‘to go slowly’	e. ákì-bú ‘to knock down’
c. á-òlì ‘to get lost’	

(Novelli, 1985: 218-220)

Nevertheless, Class 1 verbs which have the [akI-] infinitive prefix in the citation form switch to the [a-] prefix for non-causative verb positions. This is evident when one compares examples (25-1) through (25-12) with (25-13) through (25-24). Additional cases are shown in (34).

#### (34) *Class 1 Infinitive Prefixation for Causative and Non-Causative Verb Positions*

Verb: [ákí-ré] – ‘to put in a line’

a. Position 2: a-ré-òn	c. Position 14: ákí-ré-ré
b. Position 3: a-ré-ar	d. Position 15: ákí-ré-re

(Novelli, 1985: 219)

### 2.5.1.2 *Pronominal Prefixes*

Pronominal prefixes code subject agreement in the active, passive and reflexive voices, and object agreement when there is a subject object relationship. They vary according to person and number of the referring pronoun, but also with the verb class, voice, and mood of the verbal expression. Nonetheless, there is a great deal of homophony among the roughly 144 separate meanings represented, and ambiguity is resolved with the presence of other sentence constituents and through context. In (35), Active and Reflexive Voice pronominal subject prefixes are shown in the three moods for Class 1 and Class 2 verbs. Examples of usage are shown in (36). Both are taken from Novelli (1985:201, 274).

(35) *Active and Reflexive Voice Pronominal Subject Prefixes*

	Class 1 Verbs			Class 2 Verbs		
	Indicative I	Subjunctive II	Narr./ Imp III	Indicative I	Subjunctive II	Narr./ Imp III
1s	α-	kʔα-	(at) ɔɔ- <sup>10</sup>	ε-	kʔε-	εε-
2s	i-	kʔi-	tɔ-	i-	kʔi-	ki-
3s	α- <sup>11</sup> ε-	kʔε-	tɔ-	ε- <sup>11</sup> i-	kʔi-	ki-
1p	iki-	kʔiki-	(at) ɔɔ-	iki-	kʔiki-	εε-
2p	i-	kʔi-	tɔ-	i-	kʔi-	ki-
3p	α- ε-	kʔε-	tɔ-	ε- i-	kʔi-	ki-

(36) *Use of Active Voice Pronominal Subject Prefixes*

Class 1

à-lep-ì

IND.1s-milk-IND.FUT  
'I will milk.'

kʔà-lep-ì

SUBJ.1s-milk-SUBJ.PRES  
'If I milked...'

òolep-ì<sup>12</sup>

NARR.1s-milk-NARR.FUT  
'...and I was milking'

Class 2

é-dóŋ-ì

IND.1s-castrate-IND.FUT  
'I will castrate.'

kʔé-dóŋ-ì

SUBJ.1s-castrate-SUBJ.PRES  
'If I castrated'

èε-dóŋ-ì

NARR.1s-castrate-NARR.FUT  
'...and I was castrating.'

When the object of the verb is a pronoun, a special pronominal prefix codes both the subject and the object. Exceptions to this include reflexives and objects in the third person singular or plural. A paradigm for the pronominal prefixes by verb class and mood appears in (37). Some examples of their use appear in (38). The homophony in this paradigm necessitates the use of pronouns in the sentence, in accordance with word order parameters in the language (mainly VSO). Examples and paradigms are from Novelli (1985:108-109).

<sup>10</sup> In certain tenses, [ɔɔ] → [oo-], [tɔ-] → [to-].

<sup>11</sup> Prefix for the past tense only.

(37) *Subject/Object Pronominal Prefixes for Active/Reflexive Voice*

	Class 1	Class 2		Class 1	Class 2
	I, II / III	I, II / III		I, II / III	I, II / III
I slap myself	---	---	We slap (me)	---	---
you	aka, ɔko	eke	you	iki, ito	iki
him	---	---	him	---	---
us	---	---	ourselves	---	---
you	aka, ɔko	eke	you	iki, ito	iki
them	---	---	them	---	---
You slap me	iki, ito	iki	You slap me	iki, ito	iki
yourself	---	---	(you)	---	---
him	---	---	him	---	---
us	iki, ito	iki	us	iki, ito	iki
you	---	---	yourselves	---	---
them	---	---	them	---	---
He slaps me	aka, ɔko	eke	They slap me	aka, ɔko	eke
you	iki, ito	iki	you	iki, ito	iki
himself	---	---	him	---	---
us	iki, ito	iki	us	iki, ito	iki
you	iki, ito	iki	you	iki, ito	iki
them	---	---	themselves	---	---

(38) *Use of Subject/Object Pronominal Prefixes*

Class 1	Class 2
a. àkà-limókìn-ì    aḡóḡ    ij ðḡ 1s.2s-tell-IND.FUT    . 1s    2s 'I will tell you.'	c. eke-lipì    iḡèz aḡóḡ 3s.1s.-beg    3s    1s 'He will beg me.'
b. ìkì- limókìn-ì    ij ðḡ    aḡóḡ 2s.1s--tell-IND.FUT    2s    1s 'You will tell me.'	d. iki-lipì    iḡèz izua 3s.1p.-beg    3s    1p 'He will beg us.'
c. àkà-limókìn-ì    iḡèz aḡóḡ 3s.1s-tell-IND.FUT    3s    1s 'He will tell me'	e. iki-lipì    izua ij ðḡ 1p.2s-beg    1p    2s 'We will beg you.'

Subjects of passive voice sentences are the objects of verbal actions. A paradigm of the pronominal prefixes referring to them is shown in (39). Examples of their use appear in (40).

(39) *Pronominal Prefixes for Passive Voice Verb Object (Sentence Subject)*

Class 1 Verbs				Class 2 Verbs		
	Indicative I	Subjunctive II	Narr./ Imp III	Indicative I	Subjunctive II	Narr./ Imp III
1s	aka-	kʔaka-	ɔko- <sup>13</sup>	εκε-	kʔεκε-	εκε-
2s	iki-	kʔiki-	itɔ-	iki-	kʔiki-	iki-
3s	α- <sup>14</sup> ε-	kʔε-	tɔ-	ε- <sup>14</sup> i-	kʔ i-	ki-
1p	iki-	kʔiki-	itɔ-	iki-	kʔiki-	iki-
2p	iki-	kʔiki-	itɔ-	iki-	kʔiki-	iki-
3p	α- <sup>14</sup> ε-	kʔε-	tɔ-	ε- <sup>14</sup> i-	kʔi-	ki-

(40) *Use of Passive Voice Pronominal Prefixes*

Class 1	Class 2
a. aká-dɔŋ-jò <sup>15</sup> 1s.PASS-pinch-FUT.PASS 'I shall be pinched'	d. εκε-dɔŋ-jò 1s.PASS-castrate-FUT.PASS 'I shall be castrated'
b. kʔaká-dɔŋ-jò 1s.SUBJ.PASS-pinch-T1..PASS 'If I were pinched...'	e. kʔéké-dɔŋ-jò 1s.SUBJ.PASS-castrate-T1..PASS 'If I were castrated...'
c. oko-dɔŋ-etèì 1s.NARR.PASS-pinch-T1..PASS '...and I am pinched'	f. εκε-dɔŋ-etèì 1s.NARR.PASS-pinch-T1..PASS '...and I am castrated'

(Novelli, 1985: 203)

**2.5.1.3 TAM Markers**

As seen in §2.4.3, tense, aspect, mood and verb form are coded through an affix at the right edge of a verb. Additional examples appear in (41), with the affixes and their glosses in marked in bold type. As will be seen in §3.3, inflectional affixes may be dominant, recessive or neutral under vowel harmony rules.

(41) *Verb Forms with TAM Markers*

a. í-tó-dʒók- <b>étè</b> 2p-CAUS-be good- <b>IND.FUT.A.2p</b> 'You will cause to be good'	<b>íèz</b> 2p	b. à-rònj ar- <b>ozì</b> 3p-become worse- <b>REFL.PST PROG.A.3p</b> 'They were becoming worse.'
---	------------------	---

(Novelli, 1985: 87, 89)

<sup>13</sup> Under vowel harmony rules [ɔko-]→[oko-], [itɔ-]→[ito-], [tɔ-]→[to-] in some tenses.

<sup>14</sup> For past tenses only.

<sup>15</sup> Root vowels in Class 1 examples a [+ATR] specification from the TAM marker.

c. ì-ṅuṅu-**itotor**  
 3p-sniff repeatedly-IND. PRE.PRF.A.3p  
 ‘They have sniffed repeatedly’

d. à-mjètèmjèt-**ḡ**  
 3p-wipe off repeatedly-IND.PST.A.3p  
 ‘They repeatedly wiped off’

(Novelli, 1985: 241, 249)

### 2.5.2 Derivational Affixes

Five types of derivational affixes are presented: the causative prefix in 2.5.2.1, frequentive affixes in §2.5.2.2, the ventive in 2.5.2.3, the itive in 2.5.2.4 and the dative in 2.5.2.5.

#### 2.5.2.1 The Causative Prefix

The causative prefix varies with the verb class, and in the case of Class 1 verbs, the vowel of the verb stem. Phonological rules also apply to alter the shape of the Class 2 prefix. The rules affecting causative prefix formation are shown in (42). The underlying form of the prefix is formed with the consonant [t]. In the case of the Class 1 verbs, the vowel is that of the root vowel, while in the case of Class 2 verb the vowel is [i]. A phonological rule  $t \rightarrow z$  before [i, ɪ] makes the surface form of the Class 2 causative prefix [-zi-], and that of Class 1 verbs with stem vowel [ɪ] to be [zɪ]. Verb forms with causative prefixes are shown in (43). Page numbers from Novelli (1985) where the forms are found are listed in the Reference column.

#### (42) Rules of Causative Prefix Formation

Class 1 Verbs: t + Stem vowel

Class 2 Verbs: t + i

Phonological Rule:  $t \rightarrow z / \_\_\_ [i, \text{ɪ}]$

#### (43) Use of the Causative Prefix

Class	Infinitive	Causative	Gloss	Reference
a. Class 1	ákítʃáp	ákí-tá-tʃáp	‘weed’	209
b. Class 1	ákí-dóŋ	ákí-tódóŋ	‘pinch’	225
c. Class 2	ákí-lìp	ákí-zí-lìp	‘pray’	209
d. Class 2	ákì-dóŋ	ákì-zí-dóŋ	‘castrate’	225

#### 2.5.2.2 Frequentive Suffixes

There are three frequentive affixes /-An/, /-Un/, /-eenen/ which may be affixed to any verb. The choice of affix hinges on the other affixes in the verbal expression, due to co-occurrence restrictions. As will be discussed in §3.3.1.2, 3.3.2.1, and 3.3.3, affixes /-An/ and /-Un/ alternate according to vowel harmony rules, while

/-eenen/ remains neutral and in some instances blocks harmony.

In (44-a,b) the frequentive suffix [-An] takes the surface form [-an], matching the [-ATR] specification of the root vowels of the two verbs. In (44-c,d) the suffix is realized as [-on], matching the [+ATR] specifications of the root vowels of the respective verbs.

(44) *Use of Frequentive Suffix /-An/*

	Infinitive	Frequentive	Gloss	Reference
a.	ákí-sá	ásá-án	‘go slowly’	218
b.	ákí-ré	aré-án	‘put in a line	219
c.	á-ólí	áólí-ón	‘get lost’	219
d.	ákì-bú	ákìbú-ón	‘knock down’	220

The frequentive suffix /-Ún/, with a high tone, is not to be confused with its low tone counterpart, the ventive, which is discussed in §2.5.2.3. The frequentive is shown in (45). In (45-a,b), the suffix is realized as [-ún], in accordance with the [-ATR] specification of the root vowels of the respective verbs. In (45-c,d), the suffix is realized as [-ún] in accordance with the [+ATR] specification of the respective verbs.

(45) *Use of Frequentive Suffix /-Ún/*

	Infinitive	Frequentive	Gloss	Reference
a.	ákí-bú	ábú-ún	‘return’	220
b.	ákí-dó	ádó-ún	‘snap one’s fingers’	218
c.	ákì-dó	adó-ún	‘produce, deliver child’	218
d.	ákì-túlé	ákítúle-ún	‘blow on fire’	219

The frequentive suffix [-eenen] remains unchanged by the ATR specification of the root vowel. This can be seen in (46). Examples (46-a,b) show affixation of this suffix to stems with [-ATR] specifications. The [+ATR] specifications of the root vowels in (46-c,d) also do not affect this suffix when affixation takes place.

(46) *Use of Frequentive Suffix /-eenen/*

	Infinitive	Frequentive	Gloss	Reference
a.	ákí-ré	aré-éenen	‘put in a line	219
b.	ákí-dó	ádó-éenen	‘snap one’s fingers’	218

c.	ákì-tùlé	ákìtùlè-éénén	‘blow on fire’	219
d.	ákì-bú	ákìbù-éénén	‘knock down’	220

### 2.5.2.3 The Ventive

The ventive is a grammatical category common in languages of the ancient near East, Northern Africa, the Caucasus and in Oceania. Its meaning can be translated as ‘this way’ or ‘toward the deictic center’. This directionality can be a strict physical description of the direction of action in a motion verb, or it can be metaphorical in nature. The ventive in Karimojong is a suffix, which appears as [ɔn] in the case of [-ATR] verbs and as [un] in the case of [+ATR] verbs. Verb forms featuring this suffix are shown in (47).

#### (47) Use of the Ventive Suffix

	Infinitive	Ventive	Gloss	Reference
a.	ákí-sá	ásá-òn	‘go slowly’	218
b.	ákí-bú	ábú-òn	‘return’	220
c.	á-ólí	áólí-ùn	‘get lost’	219
d.	ákì-dó	adó-ùn	‘produce, deliver child’	218

### 2.5.2.4 The Itive

The directional opposite of the ventive is the itive. Its translation is ‘that way’ or ‘away from the deictic center’. As shown in (24), the itive suffix in Karimojong is [-ar] in the case of [-ATR] verbs and [-or] in the case of [+ATR] verbs. Examples with this suffix are shown in (48).

#### (48) Use of the Itive Suffix

	Infinitive	Itive	Gloss	Reference
a.	ákí-dóŋ	ádóŋ-àr	‘pinch’	225
b.	ákí-ákì	ákìakí-àr	‘send’	214
c.	ákì-bú	ákìbú-or	‘knock down’	220
d.	á-ólí	áólí-or	‘get lost’	219

### 2.5.2.5 The Dative

The suffix [-Akin] is said by Novelli to give a dative connotation, translated roughly as ‘for’, ‘for the benefit of’. The suffix is realized as [-akin] in [-ATR] verbs, and as [-okin] in [+ATR] verbs. Examples of verbs with this suffix are shown in (49).

(49) *Dative Suffixation*

	<u>Infinitive</u>	<u>Dative</u>	<u>Gloss</u>	<u>Reference</u>
a.	ákí-dóḡ	ádóḡ-ákìn	‘pinch’	225
b.	ákí-gjél	ákígjél-ákìn	‘barter’	215
c.	ákí-bú	ákíbú-(ó)kìn	‘knock down’	220
d.	á-ólí	áólí-ókìn	‘get lost’	219

**2.5.2.5.1 Vowel Substitutions and Omissions under Dative Suffixation**

The [a] and [o] vowels of the dative suffix show instability when affixed to stems ending in vowels, being retained, elided or replaced. There are also verbs where both elision and retention occur to produce forms with semantic differences. In (50), verb ákìdè - ‘to leave someone’ under [-Ákìn] affixation has two possible meanings, according to whether the characteristic vowel is retained. Examples in this sub-section are from Novelli (1985:216-219).

(50) *Semantic Distinctions in [-Ákìn] Suffixation*

- ákìdè + [-Ákìn] → ákìdékìn ‘to leave someone for’  
ákìdè + [-Ákìn] → ákìdèákìn ‘to have an isolated spot on the head (of an animal)’

While the fate of the characteristic vowel is determined on a case-by-case basis, there are certain patterns and tendencies which can be noted. In two cases, characteristic vowels tend to be elided. The first case is that of monosyllabic stems, particularly in Class 2 verbs, shown in (51), where the final [e] vowel of the stem replaces the characteristic vowel in the dative suffix. The form retaining the characteristic vowel is unattested.

(51) *[Ákìn] Suffixation in Monosyllabic Stems*

- ákìré + Ákìn → ákìrékìn / \*ákìréókìn

The second case is that of the bisyllabic stem ending in a voiceless vowel, shown in (52-a). The voiceless vowel becomes voiced in the suffixation process, and takes the position of the characteristic vowel in the suffix template. Forms with characteristic vowel [o] with this verb are unknown. In (52-b), the voiceless vowel [ɿ] becomes voiced and substitutes for the characteristic vowel. Example (52-c) presents an exception in which voiceless vowel [ɿ] does not replace the characteristic vowel. Bisyllabic stems ending in oral vowels tend not to

elide the characteristic vowel, as shown by the retention of the initial vowel of the dative suffix juxtaposed with the stem-final vowel [ɔ] in the verb [ákɪtʃótʃɔ̃].

(52) [-Ákìn] Suffixation with Bisyllabic Stems Ending in Voiceless Vowels

- a. ákibéle + Ákìn → ákibelékìn ‘to overturn for’  
\*ákibeleókìn
- b. ákímókí + Ákìn → amókíkìn ‘to handle firmly for’
- c. áòlì + Ákìn → áòlíókìn ‘to get lost for’
- d. ákɪtʃótʃɔ̃ + Ákìn → ákɪtʃótʃɔ̃ákìn ‘to persuade for’

The picture is more complex under reduplication. The epenthetic vowel tends not to appear before the dative suffix after the reduplication process in verbs ending in consonants. In (53) it does not occur for the verb [ákítʃíl] – ‘to tear’ the verb [ákísúb] – ‘to create’.

(53) [Ákìn] Suffixation for Reduplicated Verbs Ending in Consonants

- a. ákí-tʃílítʃíl + Ákìn → átʃílítʃílákìn ‘to tear repeatedly for’
- b. ákísúbúsúb + Ákìn → ásúbúsúbákìn ‘to create repeatedly for’

Reduplicated stems of verbs ending in vowels, particularly those belonging to Class 1, tend to replace the characteristic vowels, although forms retaining them may exist in free variation, as shown in (54-a). Class 1 verbs may also substitute the characteristic vowels with an additional stem-enlarging vowel, as shown in

(54) [Ákìn] Suffixation for Reduplicated Verbs Ending in Vowels

Class 1 Verbs

- a. ákídó + Ákìn → ádóóádókìn / ádóóádókìn- ‘to snap fingers repeatedly for’
- b. ákíbé + Ákìn → ábéébéékìn / ábéébéékìn- ‘to get repeatedly to a certain destination for’
- c. ákítʃí + Ákìn → atʃí í tʃí í kìn / atʃí í tʃí ákìn- ‘to split repeatedly for’

Class 2 Verbs

- d. ákìdò + Ákìn → ákidoíódókìn ‘to produce, deliver a child (repeatedly) for’
- e. ákílo + Ákìn → ákiloílóókìn ‘to shake something for’
- f. ákiro + Ákìn → ákiroíróókìn ‘to rust (for)’
- g. ákídá + Ákìn → ákidaídádókìn ‘to push all right in’

(54-b,c). Verbs belonging to Class 2 tend to keep the characteristic vowels, as shown in examples (54-d) through (54-g).

## **2.6 Conclusions**

Important aspects of Karimojong structure from the phonemic to the word level have been described in this chapter. These include a phoneme inventory, the behavior of vowels and diphthongs, and a sketch of the verbal morphology with preliminary observations regarding the behavior of affixes under ATR harmony rules. To develop an outline of the structure of the morphology-phonology interface, a more detailed analysis of the ATR harmony system must be described. This is the topic of the following chapter.

### 3.0 ATR Harmony Processes and Related Phenomena

A full description of ATR harmony processes in Karimojong verbs requires that four aspects of the phenomenon be examined. The first aspect is that of the privileged positions of the vowels initiating spreading. The second and third aspects are the typologies of the harmony processes and of the affixes. Affix type is a major determinant of the phonological structure of the surface form, and is related to processes of language change, which include vowel mergers and affix incorporation. The fourth aspect encompasses the adjacency effects that alter vowel qualities but preserve contrasts in the speech signal. They are important determinants of the surface form and add a layer of complexity to the analysis of harmony. The sections that follow will present the abovementioned phenomena in the same order.

#### 3.1 Privileged Positions in the Harmony Domain

With the exception of lexically-specified irregular cases, the [ATR] environment is determined throughout the language by vowels in two privileged positions: the root vowel, which is the first vowel in a root, and the TAM marker which is at the right edge of the verb. The irregular cases have the rightmost [a/o] suffix as a position of privilege and will be described in §3.2.2.

The examples in (55) show a case of root-controlled harmony. They are of infinitive forms representing the two [ATR] environments, with the root vowel written in dark type. Each root is preceded by prefix infinitive marker [áki-], in which [i] is an archiphoneme of the vowel that alternates according to the [ATR] value of the root vowel. This vowel is interpreted as underlyingly unspecified for [ATR], and surfaces harmonically with the same specification as that of the root vowel.

(55)	[-ATR]	[+ATR]
a.	áki <b>í</b> dóŋ ‘to pinch’	e. áki <b>ì</b> dóŋ ‘to castrate’
b.	áki <b>í</b> bók ‘to swing south’	f. áki <b>í</b> júk ‘to smear’
c.	áki <b>í</b> nók ‘to light fire’	g. áki <b>í</b> nók ‘to go near’
d.	áki <b>í</b> bé ‘to agree’	h. áki <b>í</b> élè ‘to change’

(Novelli, 1985: 227)

Root controlled spreading can also occur in a rightward direction. In (56), ventive suffix [-Un], which has the meaning of motion toward the deictic center, receives its ATR specification from the root. In (56-a) through

(56-d), where the root vowels shown in bold have [-ATR] values, the vowel of the suffix is [u]. In (56-e) through (56-h), the suffix vowel is realized as [u], assuming the [+ATR] value of the corresponding root vowels. As the ventive examples in (56-a) through (56-h) show the adoption of the root vowel ATR specification by both the suffix vowel and the infinitive prefix vowel, they indicate that root-controlled ATR harmony is bi-directional. A closer examination of the data in Karimojong indicates that this is the unmarked case for ATR harmony in the language, and it will be discussed in §3.2.1.

(56)	<u>Infinitive</u>	<u>Ventive</u>	<u>Gloss</u>	<u>Infinitive</u>	<u>Ventive</u>	<u>Gloss</u>
a.	ákí- <b>bó</b>	ábó-ùn	‘return’	e. ákí- <b>doŋ</b>	ákidóŋ-ùn	‘castrate’
b.	ákí- <b>ré</b>	áré-ùn	‘put in a line’	f. ákí- <b>bú</b>	ákibú-ùn	‘knock down’
c.	ákí- <b>mókì</b>	ámókì-ùn	‘handle firmly’	g. ákí- <b>tulé</b>	ákítulé-ùn	‘blow on fire’
d.	ákí- <b>sá</b>	ásá-ùn	‘go slowly’	h. ákí- <b>dó</b>	ákidó-ùn	‘produce, deliver child’

(Novelli, 1985: 218-226)

Harmonic spreading from the second privileged position, the rightmost TAM marker, is confined to the [+ATR] case, and usually involves active and passive voice markers. Two examples of this type of spreading are shown in (57). In (57-a), the causative form with derivational suffixes shows bidirectional spreading of the [-ATR] specification from the root vowel [ɔ] of [dóŋ], while the leftward spreading from the root changes only the high front vowel of the infinitive marker of the infinitive form. The TAM suffixed form, to which the present tense active voice marker has been added shows suffix-controlled spreading leftward of a [+ATR] specification, changing the specification of the root vowel to a positive ATR value. Likewise in (57-b), the vowel of the infinitive prefix closest to the root in both forms assumes a [-ATR] value while the CAUS+

(57)	<u>Infinitive</u>	<u>CAUS + Derivational</u>	<u>TAM Marker</u>
a.	ákí--dóŋ INF pinch ‘to pinch’	ákí- <b>tó</b> -dóŋ- <b>án-úr</b> INF CAUS pinch FREQ-IT ‘frequently cause to pinch (away)’	à-dóŋ- <b>ì</b> 1s-pinch- <b>ACT.PRS.1s</b> ‘I pinch’
b.	ákí-mókì INF-handle firmly ‘to handle firmly’	ákí- <b>tó</b> -mókí- <b>án- ákìn</b> INF- CAUS-handle firmly-FREQ-DAT ‘frequently cause to handle firmly (for)’	á-mókí - <b>jò</b> INF-handle firmly - <b>PASS</b> ‘to be handled firmly’

(Novelli, 1985:223,269)

(Novelli, 1985:219,245)

Derivational form shows bidirectional [-ATR] spreading. The affixation of the passive voice marker [-jo] induces [+ATR] spreading leftward from this privileged position.

Of the two privileged positions identified as occurring throughout the language, that of the suffix, where it occurs, is dominant over that of the root, the unmarked case. Dominance is an important property to take into account for theoretical proposals regarding ATR harmony, particularly those based on a ranking hierarchy of constraints.

## 3.2 Types of Harmony Processes

Karimojong has a multi-directional vowel harmony system in that it can extend from the root to prefixes and suffixes, or from suffixes to stems and prefixes. Information on the morphological status of the suffixes and of the lexical entry of the individual verb is required to explain vowel harmony processes as they are not phonetically-conditioned assimilation rules. Three distinct harmony processes have been identified: bidirectional root-controlled harmony, lexically-specified suffix-controlled harmony, and [+ATR] suffix-controlled harmony.

### 3.2.1 Bi-directional Root-Controlled Harmony

As discussed in §3.1, bidirectional root-controlled harmony occurs when the ATR specification of the root vowel spreads to the right and to the left. Additional examples of this are shown in (58-a) through (58-d). In (58-a), the [-ATR] specification of the root [-mækI-] spreads to the vowel of the causative prefix [-tə-] and to that of the infinitive prefix [akI-], neutral [α-] notwithstanding, both of which are to the left of the root vowel. To the right, the [a/o] alternating suffixes [-an] and [-akin] carry the [-ATR] specification. Example (58-b) shows the [-ATR] specification of the root [-tʃúm-] ‘pierce’ spread bi-directionally, giving the archiphoneme /I/ of the infinitive prefix a [-ATR] value. The [-ATR] specification spreads through the reduplicated root and to the suffix [-Un], triggering its realization as [-on]. Examples (58-c) and (58-d) show the bi-directional spreading of a [+ATR] specification. In (58-c), the vowel of the causative prefix is realized as [-i-], triggering the alternation of the syllable onset t > z.

#### (58) Bidirectional Root-Controlled Harmony

- |   |   |
|---|---|
| <p>a. ákI - tɔ - mɔ́kí - an - akin<br/>         INF- CAUS - handle firmly - FREQ – DAT<br/>         ‘to frequently cause to handle firmly (for)</p> | <p>b. ákI - tʃumótʃúmó - òn<br/>         INF - pierce repeatedly - VEN<br/>         ‘to pierce repeatedly (this way)’</p> |
|---|---|

c. áki - zi - dóη - ón - ókin  
 INF- CAUS - castrate - *FREQ* – DAT  
 ‘to cause to castrate (for)’

d. áki - rimírímí - ùn  
 INF - go around repeatedly - VEN  
 ‘to go around repeatedly (this way)’

(Novelli, 1985: 219-225)

### 3.2.2 [-ATR] Suffix-Controlled Harmony

The second type of harmony is [-ATR] suffix-controlled harmony, shown in (59). It is an irregular case of [a/o] alternation involving the frequentive suffix [-An] and the itive [-Ar]. A [+ATR] verb affixes an [a/o] suffix in which [o] should appear as the suffix vowel to harmonize with the root vowel specification. Instead the vowel [ɔ] appears as the suffix vowel, and it drives [-ATR] harmony leftward, within a domain that is lexically specified. In (59-a), that domain extends only to the root vowel, which changes to [ɔ] while the front close vowel [i] of the infinitive prefix remains unchanged. In (59-b), spreading of the [-ATR] specification includes this vowel of the infinitive prefix, changing it to the [ɪ]. In (59-c), suffixation changes the voiceless vowel to a voiced vowel, and the spreading of the [-ATR] feature changes [ɔ] to [ɔ̄]. As noted in §2.22, the tonal value of the voiceless vowel changes from low to high.

#### (59) [-ATR] Suffix-Controlled Harmony

	<u>Infinitive</u>	<u>ITIVE</u>	<u>FREQ + IT</u>	<u>DATIVE</u>	<u>Gloss</u>	<u>Reference</u>
a.	ákì-dóη	ákìdóη-ðr <sup>16</sup>	ákìdóηónɔr	ákìdóη-ókìn	‘castrate’	225
b.	ákì-dó	ákìdɔ-ɔr	ákìdóónɔr	ákìdo-(ó)kìn <sup>17</sup>	‘produce child’	218
c.	ámurò	ámúrɔ-ɔr	ámuróónðr	ámurókìn <sup>18</sup>	‘sacrifice’	214

This type of harmony is also bi-directional, as verbs originally with [+ATR] roots but with this type of [-ATR] spreading will select [-ATR] recessive TAM markers in conjugations of Form B, Tenses 1 and 2. Three examples from Form B, Tense 1 are shown in (60).

#### (60) Bi-directionality of [-ATR] Suffix-Controlled Spreading (Form B Conjugations)

- a. é-dóηódóη-ð-ðr-jà - ‘...I (will) repeatedly castrate.’
- b. kʔí-dóηódóη-ð-ɔr-jà - ‘...that he repeatedly castrate(s)/will repeatedly castrate’
- c. ì-donɔnɔn-ɔ-ɔr-jatà - ‘...they (will) repeatedly castrate’

<sup>16</sup> There are conflicts in the paradigms shown in the Novelli grammar as regarding the leftward extension of the domain of this type of harmony. Where adjacency effects do not interfere, the domain is two syllables to the left of the head vowel.

<sup>17</sup> See Section 2.5.2.1.1 regarding vowel substitutions for the dative suffix.

<sup>18</sup> Vowel elision occurs in this form.

A grounded explanation for this phenomenon is the phonologization of a V + [r] co-articulation effect, as pronunciation of a trill, cross-linguistically, is associated with tongue retraction (Recasens & Espinosa, 2002; Recasens, personal communication). It is also simultaneous with a diachronic vowel merging process in which Karimojong evolved from a ten-vowel to a nine-vowel harmony system, as will be discussed in §4.1. According to Dimmendaal (2002), the diachronic development of this type of harmony appears to have occurred in a two-step process. The [+ATR] low vowel [ɔ] first merged with [ɔ̄], and the [-ATR] spreading process resulted from a reinterpretation by the speech community. This issue will be further examined in §4.1.

### 3.2.3 [+ATR] Suffix-Controlled Harmony

As shown above in §3.1 example (57), the affixation of a [+ATR] TAM marker in most cases changes the ATR specification of the [-ATR] vowels to its left. Example (61) shows four cases of [+ATR] TAM marker suffixation on the [-ATR] Class 1 verb [ákitɔdʒók]- ‘to cause to be good’. In (61-a), the affixation of TAM suffix [-i] marking the indicative mood, Active Voice, Form A past progressive form causes changes in the ATR specification of the vowel [ɔ] to a positive one, giving it the value [o]. Similar changes occur in the other examples: affix [-ete] in (61-b), [-jo] in (61-c) and [-etei] in (61-d). The changes in ATR specification of both the root vowels, as well as the vowels in the causative prefixes which had received their ATR specification from them, we can deduce that [+ATR] suffix-controlled harmony is dominant over bidirectional root controlled harmony.

#### (61) [+ATR] Suffix-Controlled Harmony

Infinitive: ákì-tɔ̄-dʒók (2) – ‘to cause to be good’<sup>19</sup>

- |  |  |
|--|--|
| <p>a. è-tò-dʒók-í<br/>1s-CAUS-be good-IND.ACT.PST.PROG.A.1s<br/>‘I was causing to be good.’</p>          | <p>b. ì-tò-dʒók-ètè<br/>2p-CAUS-be good-IND.ACT.PST.PROG.A.2p<br/>‘You were causing to be good.’</p>               |
| <p>c. ɛkɛ-to-dʒók-jó<br/>1s-CAUS-be good-IND.PASS.PST.PROG.A.1s<br/>‘I was being caused to be good.’</p> | <p>d. ɛkɛ-to-dʒók-etei<br/>1s-CAUS-be good-NARR.PASS.PST.PROG.A.1s<br/>‘...and I was being caused to be good.’</p> |

(Novelli, 1985:89)

(Novelli, 1985:91)

<sup>19</sup> [ɛdʒók] – ‘be good’ is a Class 1 verb. With the addition of the causative, the verb changes to Class 2.

The [+ATR] suffix-controlled harmony process is dominant over lexically-specified [-ATR] spreading, since subsequent [+ATR] spreading from [+ATR] TAM suffixation overrides it, as shown in (62). In (62-a), TAM marker [i̇] of Tense 1, first person, Indicative Mood spreads the [+ATR] feature to the stem-enlarging vowel and the vowel of the Itive suffix, which in (59-a) and in (60) have the value [ɔ]. In (62-b), the TAM marker corresponds to Tense 2, second person. In (62-c), the TAM marker [ete] for Tense 2, Indicative Mood, third person plural likewise spreads its [+ATR] specification.

(62) *Dominance of [+ATR] Suffix Control*

a. é-dóηódóη-ó-ori̇ - ‘I (will) repeatedly castrate’ (Form A)

b. ì -doηdoη-ó-ori - ‘you (s.) are/were repeatedly castrating.’

c. ε- doηdoη-ó-orete - ‘They are/were repeatedly castrating.’

### 3.3 Affix Types and Harmony

Affixes are classified into four types according to their behavior under phonological vowel harmony rules. They are: the neutral affixes, discussed in §3.3.1; the [a/o] alternating affixes, presented in §3.3.2; harmony set alternating affixes in §3.3.3 and the [+ATR] TAM Markers, in §3.3.4. This last type consists of dominant, harmony driving affixes from which a [+ATR] specification spreads leftward. .

#### 3.3.1 Neutral Affixes

An affix is defined as neutral when it contains vowels of the harmony set, none of which participate in harmony. There are four types of neutral affixes: pronominal prefixes, discussed in section 3.2.1.1; the frequentive suffix [-eene] presented in §3.2.1.2, the reduplicated frequentive [-itit] in §3.2.1.3, and a small subset of TAM markers. The case of one TAM marker showing neutrality only in certain environments is discussed in §3.2.4.1.

##### 3.3.1.1 Pronominal Prefixes

The great majority of the pronominal prefixes are neutral and non-alternating, although a small group used for utterances in the narrative mood constitutes an exception to the rule. Examples of neutral pronominal prefixes are shown in (63). In (63-a-d), the first person singular and third person plural Class 2 passive voice pronominal prefixes remain neutral and non-alternating as the verb ακιακι -‘send’, shown in examples (a,c) as having a [-ATR] specification, undergoes [+ATR] spreading from the suffix in examples (b,d). In examples (e-

f), the first person singular and third person plural Class 1 Active Indicative pronominal prefixes remain neutral as TAM markers [-i] and [-jetè] respectively initiate leftward [+ATR] harmony.

(63) *Neutral Pronominal Prefixes*

Infinitive: ákɪ-ákɪ̯ - ‘to send’ (Class 2)

- |   |   |
|---|---|
| <p>a. <b>ɛkɛ</b>-akɪ-tàè      áɛɔ̯ɔ̯ɔ̯</p> <p>1s-send PASS.IND.PRS PRF 1s</p> <p>‘I have been sent’</p> | <p>b. <b>ɛkɛ</b>-aki-tetèì      áɛɔ̯ɔ̯</p> <p>1s -send-PASS.NAR.PRS PRF 1s</p> <p>‘...and I have been sent’</p> |
| <p>c. <b>ì</b>-akɪ-tàè      íkèz</p> <p>3p-send PASS.IND.PRS PRF 3p</p> <p>‘They have been sent’</p>    | <p>d. <b>ì</b>-ákító      íkèz</p> <p>3p-send-PASS-NAR.PRS PRF 3p</p> <p>‘...and they have been sent’</p>       |

(Novelli, 1985: 246)

Infinitive: ákíbil - ‘to break’ (Class 1)

- |  |   |
|--|---|
| <p>e. <b>á</b>- bílibíl-à</p> <p>1s-send repeatedly-ACT.REFL.FUT</p> <p>‘I will send myself repeatedly’</p>    | <p>f. <b>á</b>- bílibìl-ì</p> <p>1s-send repeatedly-ACT.IND.FUT</p> <p>‘I will send repeatedly’</p>       |
| <p>g. <b>è</b>- bílibílazì</p> <p>3p-send repeatedly-ACT.REFL.FUT</p> <p>‘They sent themselves repeatedly’</p> | <p>h. <b>è</b>- bílibilijetè</p> <p>3p-send repeatedly-ACT.IND.FUT</p> <p>‘They will send repeatedly’</p> |

(Novelli, 1985: 245)

**3.3.1.1.1 Exceptional Cases of Alternating Pronominal Prefixes**

The alternating pronominal prefixes are listed in (64). They are all confined to Class 1 verbs in the Narrative/Imperative Mood, and are seen as being at the vanguard of a diachronic change in Karimojong,<sup>20</sup> a process discussed in §4.2. Their mid-back vowels are shown underspecified for ATR; they surface as [ɔ] or [o] depending upon the ATR specification of the vowel segments that follow.

(64) *List of Alternating Narrative/Imperative Mood Pronominal Prefixes*

- a. [(at)OO-]<sup>21</sup> – Class 1, Active Voice, Narrative/Imperative Mood, 1s, 1p
- b. [tO-] – Class 1, Active Voice, Narrative/Imperative Mood, 2s, 3s, 2p, 3p
- c. [OkO-] – Class 1, Passive Voice, Narrative/Imperative Mood, 1s
- d. [itO-] – Class 1, Passive Voice, Narrative/Imperative Mood, 2s, 1p, 2p
- e. [tO-] – Class 1, Passive Voice, Narrative/Imperative Mood, 3s, 3p

<sup>20</sup> Assertion by Gerrit Dimmendaal, in personal communication.

<sup>21</sup> The [-at] portion of this suffix may be dropped.

Contextual examples are provided in (65). In (65-a-c), verb *ákírútf* - ‘to tie’, which has a [+ATR] specification, induces no alternation in the first person singular passive voice pronominal prefix [ókɔ-] in (65-b), where the TAM marker is neutral, but alternates in example (65-c), in which there is a dominant [+ATR] suffix spreading its specification leftward. Examples (65-d-f) show another [+ATR] verb [àmúíò] – ‘sacrifice’ and the alternation of both the first person singular and the third person plural passive voice prefixes under harmony processes initiated by dominant TAM markers. Examples (65-g-i) show [-ATR] verb [ákíré] – ‘to overpower’ taking [-ATR] TAM markers with [a/o] in example (65-h), and the same verb root, under dominant [+ATR] suffixation, showing an alternating first person singular prefix [oko-]. Examples (65-j-l) show the case of the alternation of the second person singular prefix [ító-]. In example (65-k), it does not alternate under the suffixation of neutral past tense marker [-ì ], but under the dominant marker [-tetèì] of the Narrative Passive Present Perfect tense, it assumes a [+ATR] specification.

(65) *Contextual Examples of Alternating Narrative/Imperative Mood Pronominal Prefixes*

- |  |  |  |
|--|--|--|
| a. <i>ákírútf</i><br>INF tie<br>‘to tie’ | b. <i>ókɔ-rutʃurutʃ-ùì áḙóŋ</i><br>1s-tie repeatedly, NAR.PST 1s<br>‘...and I was repeatedly tied’ | c. <i>ókorutʃ-itetèì áḙóŋ</i><br>1s-tie-PASS.NAR.PRS PRF 1s<br>‘...and I have been tied’ |
|--|--|--|

(Novelli, 1985: 244)

- |   |   |  |
|---|---|--|
| d. <i>à-murò</i><br>INF sacrifice<br>‘to sacrifice’ | e. <i>to-muro-etèì íkèz</i><br>3p-sacrifice-PASS.NAR.FUT 3P<br>‘...and they will be sacrificed’ | f. <i>ò ko-muro-etèì áḙóŋ</i><br>1s-sacrifice-PASS.NAR.FUT 1s<br>‘...and I will be sacrificed’ |
|---|---|--|

(Novelli, 1985: 240)

- |   |  |  |
|---|--|--|
| g. <i>ákí-ré</i><br>INF-overpower<br>‘to overpower’ | h. <i>aka-ré-tàè áḙóŋ</i><br>1s-overpower-PASS.IND.PRS PRF 1s<br>‘I have been overpowered’ | i. <i>ókore-tetèì áḙóŋ</i><br>1s-overpower-PASS.NAR.PRS PRF 1s<br>‘...and I have been overpowered’ |
|---|--|--|

(Novelli, 1985: 242)

- |  |   |  |
|--|---|--|
| j. <i>ákí-dóŋ</i><br>INF-pinch<br>‘to pinch’ | k. <i>ító-dòŋ-ì ijóŋ</i><br>2s-pinch-PASS.NAR.PST 2s<br>‘...and you were pinched’ | l. <i>ító-dòŋ-tetèì ijóŋ</i><br>2s-pinch-PASS.NAR.PRS PRF 2s<br>‘...and you have been pinched’ |
|--|---|--|

(Novelli, 1985: 271-2)

**3.3.1.2 Frequentive Suffix [-eenen]**

The neutrality of frequentive suffix [-eenen] is demonstrated quite simply in (66). In examples (a,b,c) it maintains its [+ATR] specification under [-ATR] spreading processes from the root vowels of all of the [-ATR]



suffixes and which demonstrate their neutral behavior are shown in (67). Throughout the paradigm, the root vowel of the [-ATR] verb [ákídóŋ] remains unchanged despite the affixation of a [+ATR] TAM marker, which is indication that this suffix does not spread its positive ATR specification. Examples are from Novelli (1985: 270,272).

The second neutral TAM marker is [-it], which marks Tenses 3 and 4—the present and past perfect- in the active voice and in both the indicative and subjunctive moods. It occurs only in the three singular persons and in the first person plural. Tense 3, the present perfect is shown in (68).<sup>22</sup> In all four cases in both the indicative and subjunctive moods, the root vowel of the [-ATR] verb [ákídóŋ] remains unchanged, despite the affixation of this TAM marker, the vowels of which bear a [+ATR] specification.

(67) *Neutral TAM Markers: Tense 5 TAM Markers*

Infinitive: ákídóŋ- ‘to pinch’

a. Passive Voice, Tense 5, Simple Past

	Mood I Indicative	Mood II Subjunctive/Conditional	Mood III Narrative/Imperative
1s	aka-dóŋ-ì	kʔaka-dóŋ-ì	ókɔ- dɔŋì
2s	iki-dóŋ-ì	kʔiki-dóŋ-ì	ítɔ-dɔŋì
3s	a-dóŋ-ì	kʔe-dóŋ-ì	tɔ-dɔŋì
1p	iki-dóŋ-ì	kʔiki-dóŋ-ì	ítɔ-dɔŋì
2p	iki-dóŋ-ì	kʔiki-dóŋ-ì	ítɔ-dɔŋì
3p	a-dóŋ-ì	kʔe-dóŋ-ì	tɔ-dɔŋì

b. Active Voice, Tense 5- Simple Past (Optional form)

3s	adɔŋí	kʔé-dɔŋí
----	-------	----------

(68) *Neutral TAM Markers: [-it]*

Active Voice, Tense - Present Perfect

	Mood I Indicative	Mood II Subjunctive/Conditional
1s	à-dóŋ-ít	kʔá-dɔŋ-it
2s	ì-dóŋ-ít	kʔì-dɔŋ-it
3s	è-dóŋ-it <sup>23</sup>	kʔé-dɔŋ-ìt
1p	ìkì-dóŋ-ít	kʔíki-dóŋ-it

<sup>22</sup> Tense 4, the past perfect, differs only in tonal pattern.

<sup>23</sup> There is an additional optional form in the third person singular ε-dóŋ-ítàè, which mirrors the Passive Voice form.

A special case of a neutral frequentive suffix arises from the reduplication of the [-it] suffix. Only in Tenses 3 and 4 is it employed, and it may have additional TAM markers attached to it. In examples (69-a,b) the neutrality of this reduplicated form is shown by the fact that the [-ATR] root vowel of [-dɔŋ] goes unchanged. However, the affixation of additional dominant [+ATR] TAM markers in examples (c-f) show both the alternation of the root vowel to a [+ATR] value, and the alternation of narrative mood pronominal prefixes in examples (c) and (f). These alternations are due to the other dominant TAM markers, not the neutral [-itit] suffix.

(69) *Frequentive Suffix [-itit]*

Infinitive: ákídɔŋ- ‘to pinch’ Tense 4

a. ì-dɔŋitit íjɔŋ  
2s-pinch-ACT.IND.FREQ.PST PRF 2s  
‘You had frequently pinched’

b. kʔì-dɔŋitit íjɔŋ  
SUBJ2s-pinch-ACT.FREQ.PST PRF 2s  
‘that you had frequently pinched’

c. òo-dɔŋ-itit-è áɛɔŋ  
NAR.1s-pinch-ACT.IND.PST PRF1s 1s  
‘...and I had frequently pinched’

d. ì-dòŋitito íɛz  
2p-pinch-ACT.IND.FREQ.PST PRF 2p  
‘You had frequently pinched’

e. kʔì-dɔŋitit-o íɛz  
SUBJ.2p-pinch-ACT.FREQ.PST PRF 2p  
‘that you had frequently pinched’

f. oo-dɔŋitit-o íwɔŋ  
NAR.1p-pinch-ACT.IND.PST PRF-1 1p.incl  
‘...and we had frequently pinched’

(Novelli, 1985:214-215)

### 3.3.2 The [a/o] Alternating Suffixes

The [a/o] alternating affixes can be divided into two categories: those that are derivational morphemes and those that are inflectional. The derivational morphemes express the ventive, the frequentive, and the dative. The inflectional morphemes are TAM markers expressing voice, tense, mood and at times distinguish person and number. The [a] and the [o] are what Novelli terms ‘characteristic vowels’, in that the presence of each one signals the original ATR specification of the verb that it is affixed to. The [a] appears in suffixes attached to a [-ATR] verb, although the specification of the root and other vowels be changed by subsequent derivation processes. The [o] appears in suffixes affixed to [+ATR] verbs. The characteristic vowels also define the specification of the suffixes in which they appear. While these suffixes contain other vowels, these vowels are neutral; they are unaffected by the presence of the characteristic vowels or any other vowel harmony process taking place and are not harmony drivers.

### 3.3.2.1 [a/o] Derivational Morphemes

The [a/o] alternating affixes appear with [a] in the case of affixation to a verb with a [-ATR] root vowel, and with [o] where the root vowel of the verb has a [+ATR] value. There are also irregular cases in which the [-ATR] vowel [ɔ] surfaces. Individual verbs containing root vowels with specified values of the [ATR] harmony set can be joined with any of three [a/o] affixes. In (70) and (71), these affixes are shown initially with the archiphoneme as the suffix vowel: [-Ar-] - ITIVE, [-An-] - ‘frequently, habitually’, and [-Akin] – dative case, ‘for’. The archiphoneme represents the underlyingly underspecified vowel which is replaced by the vowel bearing an ATR specification. Data is taken from Novelli (1985: 214-234)

Example (70) shows the [-ATR] case. Suffix vowels deemed to be underlyingly unspecified surface as [a] in suffixes [-án], [-àɪ], and [-ákìn].

#### (70) [a/o] Derivational Morphology: [-ATR] Case

<u>Infinitive</u>	<u>FREQUENTIVE</u>	<u>ITIVE</u>	<u>DATIVE</u>	<u>Gloss</u>	<u>Reference</u>
a. ákí-dóŋ	ádóŋ-án	ádóŋ-ar	ádóŋ-ákìn	‘pinch’	225
b. ákí-bú	ábú-án	ábú-ar	ábú-ákìn	‘return’	220
c. ákí-ré	áré-án	áré-ar	áré-ákìn	‘put in a line’	219
d. ákí-mókì	ámókí-án	ámókí-ar	ámókíkìn <sup>24</sup>	‘handle firmly’	219
e. ákí-sá	asá-án	asá-ar	ásá-ákìn	‘go slowly’	218

In (71), verbs with [+ATR] root vowels that alternate regularly with this group of suffixes is shown. In each case, the archiphoneme surfaces with the vowel [o], yielding suffixes [-ón], [-oɪ], and [-ókìn]. As discussed in §3.2.2 and shown in (59), there are also irregular cases in this type of affixation, in which a subclass of [+ATR] verbs with root vowel [o] have the frequentive and itive suffixes surfacing with the [-ATR] vowel [ɔ]. The result is localized, leftward spreading of the [-ATR] feature the domain of which is lexically defined.

#### (71) [a/o] Derivational Morphology: [+ATR] Case

<u>Infinitive</u>	<u>FREQUENTIVE</u>	<u>ITIVE</u>	<u>DATIVE</u>	<u>Gloss</u>	<u>Reference</u>
a. ákí-bú	ákíbú-ón	ákíbú-or	ákíbú-(ó)kìn <sup>24</sup>	‘knock down’	220
b. ákí-tùle	ákìtùle-ón	ákìtùle-or	ákìtùle-ókìn	‘blow on fire’	219
c. ákí-lík	ákìlík-ón	ákìlík-or	ákìlík-ókìn	‘swallow’	227
d. ákí-dzúk	ádzúk-ón	ádzúk-or	ádzúk-ókìn	‘smear’	227
e. ákí-nók	ánók-ón	ánók-òr	ánók-ókìn	‘go near’	227

<sup>24</sup> See § 2.5.2.5.1 regarding vowel substitutions for the dative suffix.

An important aspect of [a/o] derivational suffixes is their behavior under the subsequent suffixation of TAM markers that establish new harmony domains. TAM markers with [+ATR] specifications that trigger leftward spreading have different rules for suffixes containing the [-ATR] characteristic vowel. As shown in (72), upon establishment of the [+ATR] harmony domain, the vowel [a] contained within it is cited by Novelli to be transparent and remain [a]. Recent ultrasound research (Archangeli, 2003; Gick, Pulleyblank, Mutaka & Campbell, 2006, Benus & Gafos, 2007) on vowel harmony systems has indicated that such vowels undergo phonetic advancement; in this case the value of the vowel would become [q]. The vowel does not revert to a [o] value in a [+ATR] harmony domain. This fact is used in §4.1.3 to justify separate levels of affixation, and to propose the lexical phonology model in §4.3.

(72) *Behavior of [-ATR] Characteristic Vowel under [+ATR] Suffixation*

/tA-/ + /-dɔŋ-/ + /-Ar-/ → tɔdɔŋar  
 CAUS pinch IT

tɔdɔŋar + /-jo/ → tɔdɔŋarjo “causing to be pinched”  
 PASS.CONT.

3.3.2.2 *[a/o] Inflectional Morphemes*

The TAM markers that include characteristic vowels occur in a restricted set of forms within the verbal paradigm. The format for the paradigm is in (73). Forms in Active Voice, Form B and Form A, Tense 5,

(73) *Paradigm of TAM Markers Employing Characteristic Vowels (ChV)*

Active	Affix Format	Passive	Affix Format	Reflexive	Affix Format
Form A, T5 Pos. 9, 2,3 p.p Stem ends in consonant	-(j) ChV (t + ChV) or ChV̥	Form A, T3,4 1,2,3 p.s., 1 p.p.	- t + ChV + e (i/e+t+CV+i/e)	Form A, T1,2 1,2,3 p.s., 1 p.p	-ChV
Stem vowel i,i 2,3 pp	-(j) ChV (t + ChV)	Form A, T 5, Pos.1-8, 10- 12 2,3 p.p. (verbs ending in a consonant)	- ChV + e	Form A, T1,2 2,3 p.p.	-ChV+ z + i
Stem vowel ε,e,υ,u 2,3 pp	- ChV (t + ChV)				
Stem vowel a,ɔ, o 2,3 pp	- (t + ChV)				
Form B, T1,2; 1,2,3 p.s., 1 p.p.	-(j)ChV			Form B, T1,2 1,2,3 p.s., 1 p.p	-ChV + ɹ
Form B, T1,2; 2,3 p.p.	-(j)ChV + t + ChV			Form B, T1,2 2,3 p.p.	-ChV + t + ChV + r

Position 9 for verbs ending in a consonant include the glide [j]. Form A Passive Voice Tenses 3 and 4 will have a vowel [i] epenthesized when the verb ends in a consonant.

From this paradigm, examples in the Active, Passive and Reflexive Voice can be derived given the infinitive forms. Examples appear respectively in (74) through (76). The characteristic vowel of the derivation is defined by the ATR specification of the root vowel of the infinitive. The Active Voice forms are shown all in Form A. In (74-a), infinitive *ánínḡ* - ‘to wipe off’ with a [-ATR] specification, is conjugated into Form A, Tense 5, third person plural. There are two forms for this conjugation, both of which are [a/o] alternating. One, has the format ChV-t-ChV, and the other has a voiceless variant of the characteristic vowel which in this case is [a]. Example (74-b) shows the [+ATR] case of this same conjugation with the verb [áíbélè] - ‘to change’. In this case the characteristic vowel employed is [o]. Example (74-c) shows a [-ATR] verb in Active Voice, Indicative Mood, first person singular, Form A. The format for this conjugation is that of a Characteristic vowel carrying a low tone.

(74) *Active Voice Forms with Characteristic Vowels*

a. <i>ánínḡ</i> - ‘to wipe off’ <i>ā-nìn-ata / ānínḡ íkèz</i> 3p-wipe off-IND.PST 3p ‘They wiped off’ (Form A)	b. <i>áíbélè</i> - ‘to change’ <i>è-bel-otò / è-bel-ò íkèz</i> 3p-change-IND. PST 3p ‘They changed’ (Form A)	c. <i>ákírè</i> - ‘to overpower’ <i>ā-ré-ā áḡḡḡ</i> 1s-overpower- REFL.FUT 1s ‘I will overpower’ (Form A)
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(Novelli, 1985: 242, 251)

Passive voice forms are shown in (75-a-c). Example (75-a), shows a Position 9 reduplicated form of [*ákírém*] - ‘to stab’ in the present perfect tense. The format for this tense is an ending of –ChV-e, and it appears here with the [+ATR] characteristic vowel [o]. The [-ATR] characteristic vowel appears in a suffix with the format [-t-ChV-e] in example (75-b), with the verb [*ákíákì*] - ‘to send’, which has a [-ATR]

(75) *Passive Voice Forms with Characteristic Vowels*

a. <i>ákírém</i> - ‘to stab’ <i>aka-rémérémétòe</i> 1s-stab rpt.-IND. PASS.PRS PRF ‘I have been stabbed repeatedly’	b. <i>ákíákì</i> - ‘to send’ <i>eke-aki-tàè</i> 1s-send- IND. PASS.PRS PRF ‘I have been sent’	c. <i>ákímjét</i> - ‘wipe off’ <i>ā-mjét-āè</i> 3p-wipe off- IND. PASS..PST ‘They were wiped off’
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(Novelli, 1985: 241-249)

specification on its root vowel. In (75-c), where the [-ATR] verb ends in a consonant, obviating the need for an epenthetic [t] in the previous example, characteristic vowel [a] appears under the –ChV-e format.

Two examples of reflexive voice forms with characteristic vowels appear in (76). Example (76-a), following the format –ChV-zi is the conjugation of the [-ATR] verb [alɔre]- ‘to dry in the sun’ in the Active Voice, indicative Mood, future tense. Characteristic vowel [a] appears in this form which bears the pronominal prefix of the third person plural. Example (76-b) is that of a [+ATR] verb in the Reflexive Voice, Indicative Mood, Future Tense. The conjugation follows the formula of –ChV-t-ChV-r, and has [o] as its characteristic vowel, as the verb [ámúrò] - ‘to sacrifice’ has a [+ATR] specification.

(76) *Reflexive Forms with Characteristic Vowels*

a. alɔre<sup>25</sup> - ‘to dry in the sun’

è-lò-āzì      íkèz  
 3p-dry in the sun-      3p  
 REFL.IND.FUT  
 ‘They will dry themselves in the sun’

b. ámurò - ‘to sacrifice’

è-mùr-otor<sup>26</sup>      íkèz  
 3p-sacrifice- REFL.IND.FUT      3p  
 (Form B)  
 ‘They will sacrifice themselves.’

(Novelli, 1985: 239-240)

**3.3.3 Harmony Set Alternating Affixes**

This type of affix harmonically employs [±ATR] allophones for the vowel in each suffix. Suffix [-Ún], marked with a high tone, has a frequentive meaning. In (77-a), verb root [-bú] has a [-ATR] specification which spreads to suffix [-Ún], giving a lax value to the suffix-initial vowel. In (77-b), áòlì- ‘to get lost’ has a [+ATR] specification, and the vowel of the suffix likewise has the [+ATR] value. The ventive suffix [-Ûn], marked with a low tone, is realized as [ùn] in [-ATR] environments, seen in (78-a) for [ákí-sá-ùn] – ‘to go slowly toward.’ As shown in (78-b), it is realized as [-ùn] in [+ATR] environments.

(77) *Alternation of the Frequentive Suffix*

a. á - bú - **ún**  
 INF - return - **FREQ**  
 ‘to return frequently’

b. á - òlì - **ún**  
 INF - get lost – **FREQ**  
 ‘to get lost frequently’

<sup>25</sup> The [-re] is suffix not considered to be part of the verb root.

<sup>26</sup> The final vowel is the same as the initial vowel of the suffix; one of the two has been elided.

(78) *Alternation of the Ventive Suffix*

- |  |  |
|--|--|
| <p>a. <b>ákí- sá - ùn</b><br/>         INF go slowly VEN<br/>         ‘to go slowly (toward the deictic center)’</p> | <p>b. <b>ákí - bú - ùn</b><br/>         INF - knock down- VEN<br/>         ‘to knock down (toward the deictic center)’</p> |
|--|--|

(Novelli, 1985: 218-220)

There is redundant overlap in the meanings of Karimojong affixes, and morphological processes group affixes of the same type together. For example, transparent affix [-eenen], [a/o] affix [a/on] and harmony set affix [-Ún] all have frequentive meanings, and their use determines the affixes that follow them. Occurring with a limited set of verbs is an additional frequentive affix [-itit], , which is non-alternating and does not participate in harmony, suggesting a borrowing and grammaticalization process or another type of innovation. Affixes of each type group together. The [a/o] suffixes follow one another as in [an-akin-]; the harmonic frequentive affix [-Ún] is often followed by the ventive [-Ùn] ‘toward’, and transparent affix [-eenen] co-occurs with only TAM markers to its right and does not pair with affixes of other types.

**3.3.4 [+ATR] TAM Markers**

The fourth type of affix, seen in (21) of §2.4.2, (22) of §2.4.3 and (60) of 3.2.3, is the [+ATR] TAM marker which drives [+ATR] harmony leftward. The examples in (79) show each suffix is affixed to a [-ATR]

(79) *Harmony-Driving [+ATR] TAM Markers*

<u>Suffix</u>	<u>Meaning</u>	<u>Infinitive</u>	<u>Form</u>	<u>Gloss</u>	<u>Reference</u>
a. -i	ACT, T1; 1 p.p. (consonant)	ákí-dóŋ	ìkìdóŋì	‘We shall pinch.’	231
b. -e	ACT, T1; 1p.s. (vowel e)	alɔre	àlóé	‘I (shall) dry in the sun.’	239
c. -ete	ACT, T1; 2,3 p.p. (vowel e)	alɔre	èlòètè	‘They (shall) dry in the sun.’	239
d. -to	ACT, T 3,4	alɔre	èlòto	‘They have dried in the sun.’	239
e. -o/-jo	PASS, T1,2;	ákíákì	ekèakíakíjò	‘I shall be sent repeatedly’	244
f. -etei	PASS, Narr. T 1,2;	ákíbil	tobilibilijetèi	‘...and he is repeatedly broken’	245
g. -tetei	PASS, Narr, T 3,4;	ákíbil	ókobilibilitetèi <sup>27</sup>	‘...and I have been repeatedly broken’	245

<sup>27</sup> In this case, the pronominal prefix [OkO-] → [oko-] due to the [+ATR] specification of the TAM marker.

verb, shown with a pronominal prefix. The root vowels in the resulting conjugations change their specifications to [+ATR]. This constitutes only a partial list of these suffixes.

There are cases in which only a [+ATR] feature and a dominant leftward spreading processes serve as markers of tense, aspect and mode. These cases are attributed to diachronic change in which segmental content of the morpheme has been lost, but the feature specification and harmony process remains. The cases found are in the first and second and one form of the third person singular, and the first person plural of Tenses 1 and 2 of Reflexive Voice, Form A constructions. They are shown in (80).

In (80-a), the form [ε-δῶη-ῶη-ῶη] is derived from the [+ATR] verb [ákidóη]-‘castrate’ in which there is a suffix-controlled [-ATR] spreading process that effected a feature change to the root and suffixes. Pronominal prefix [ε-] is neutral. When the form is inflected for Reflexive Voice, a [+ATR] harmony process occurs without the addition of any segments on the timing tier. In (80-b), the form is derived from the [-ATR] verb [ákidóη] in which the frequentive and ventive suffixes show [+ATR] values due to the consonant voicing adjacency effect. Inflection of this form in the reflexive voice for the first person singular changes the ATR value of the root vowel to [+ATR]. As this occurs in commonly used person, number, and tense inflections, and that alternate forms exist for the third person, it is proposed that this is the result of frequency-based language change in progress.

(80) *[+ATR] Feature as Reflexive Voice Marker*

- a. ε-δῶη-ῶη-ῶη + Reflexive Voice → ε-δῶη-ῶη-ῶη  
 1s-castrate-FREQ-IT-REFL.  
 ‘I castrate (self) frequently away’
- b. ἄ-δῶη-ῶη-ῶη + Reflexive Voice → ἄ-δῶη-ῶη-ῶη  
 1s-pinch-FREQ-VEN  
 ‘I pinch myself frequently this way’

(Novelli, 1985: 331, 349)

**3.3.4.1 TAM Markers Both Dominant and Neutral**

There is an exceptional case of a TAM marker that is dominant in some conjugations and neutral in others, and which is considered to be representative of an intermediate state of diachronic change discussed in §3.3. That suffix is [-ere], a Form B marker of Tenses 1 and 2. In both Active and Passive Voice, Indicative Mood, the marker spreads a [+ATR] specification leftward when affixed directly to the root. However, in Active

Voice the spreading is frequently blocked when derivational suffixes intervene. Example (81-a-c) show the Active Voice cases of dominant [+ATR] spreading, especially notable by the alternation of Narrative Mood pronominal prefix [-oko] in (c), an exceptional case that only receives a [+ATR] value from a dominant TAM marker. Examples (81-d-f) show this spreading to be blocked by the frequentive derivational suffix [-ar], hence the non-alternation of the root vowels and of the Narrative Mood pronominal prefix in (81-f). Likewise, in examples (81-g,h), dominant spreading is blocked. In (g), the dative affix [-ákìn] blocks spreading in Active Voice, Tense 2 (past progressive). In (h), the frequentive suffix [-eenen] blocks spreading in the Active Voice, Tense 1(Future).

Nonetheless, the blocking by the frequentive suffix is also not consistent, and the lack of spreading may not be considered a property of the intervening morpheme, but of the relative strength of [-ere] and the degree of its incorporation. In Active Voice, Tense 2, there is an alternative third person singular form with [-eenen] in which spreading is permitted, which is presented in (81-j). In Passive Voice, spreading from the TAM across the frequentive suffix [-eenen] occurs across the board. Example (81-i) shows a third person singular example of spreading across the frequentive suffix in the Passive Voice Future Tense; (81-k) shows the same phenomenon in the first person singular. Example (81-l) shows that spreading is also permitted in the Passive Voice, Past Progressive Tense.

(81) *Dominance and Neutrality of [-erè] Suffix*

Infinitive: ákí-dóη - ‘to pinch’

a. aka-dóη-eré 1s-pinch-B.ACT.IND.PST PROG ‘I was pinching’	b. kʔáka-dóη-eré SUBJ.1s-pinch-B.ACT.SUBJ.PST.PROG ‘if I were pinching...’	c. óko-dóη-eré NAR.1s-pinch-B.ACT.NARR. PST PROG ‘...and I was pinching’
d. aka-dóη-ar-eré 1s-pinch-IT-B.ACT.IND. PST PROG ‘I was pinching (away)’	e. kʔáka-dóη-ar-eré SUBJ.1s-pinch-IT-B.ACT.SUBJ. PST PROG ‘if I were pinching (away)...’	f. ókɔ-dóη-ar-eré NAR.1s-pinch-IT-B. ACT.NARR. PST PROG ‘...and I was pinching (away)’
g. aka-dóη-akin-eré 1s-pinch-DAT-B.ACT.IND. PST PROG ‘I was pinching (for)’	h. ε-dóη-éenén-é-éré 3s-pinch-FREQ-B.ACT.IND. FUT ‘He will frequently pinch’	i. ε-dóη-éenén-é-érè 3s-pinch-FREQ-B.PASS.IND. FUT ‘He will be frequently pinched’
j. a-dóηeenen-e-eré 3s-pinch- FREQ-B.ACT.IND PST PROG ‘He was frequently pinching	k. aka-dóη-éenén-é-ere 1s-pinch- FREQ-B.PASS.IND. FUT ‘I will frequently be pinched’	l. aka-dóη-eeenen-e-erè 1s-pinch- FREQ-B.PASS.IND. PST PROG ‘I was frequently being pinched’

(Novelli, 1985: 269-424)

### 3.4 Adjacency Effects

There are two types of adjacency effects affecting segmental values of verb endings and suffixes in Karimojong. The first is between verb root obstruents and high vowels initiating alternating suffixes. The verb roots with consonant codas, even of [-ATR] verbs, force [+ATR] values on the high vowels of alternating suffixes. This is attributed to the enlargement of the pharyngeal cavity by tongue root advancement in the effort to maintain voicing.<sup>28</sup> In cases where a stem-enlarging vowel is added after reduplication in positions 9-12, and 21-24, this effect is erased. Three cases are shown in (82).

In (82-a), the [-ATR] verb [ákídóŋ] – ‘pinch’ in Position 5, the frequentive/ventive, has the high back vowels of the suffix assuming a [+ATR] value. Nonetheless, in Position 10, the reduplicated form to which the [-ATR] stem-enlarging vowel [ɔ] is epenthesized, shows the alternating suffix adopting a [-ATR] specification, changing the suffix vowel to [ʊ]. This pattern is repeated in (82-b,c) with the stem-enlarging vowel [ʊ].

(82) *Adjacency Effects for Verbs with Consonant Endings*

	<u>Infinitive</u>	<u>Pos. 5</u>	<u>Pos. 10</u>	<u>Gloss</u>
a.	ákídóŋ	ádóŋúnùn	ádóŋódóŋóðn	‘pinch’
b.	ákísúb	ákísúbúnùn	ákísúbósúbóðn	‘create’
c.	ákítʃóm	ákítʃómúnùn	ákítʃómóʃómóðn	‘pierce’

(Novelli, 1985:222-223)

The relative strength of the voiced obstruent effect on the following high vowels is greater than the dominant suffix-controlled harmony processes that normally override root ATR specifications. The examples in (83) show three cases of the verb [ákiŋú] – ‘to sniff’. The itive suffix [-Ar] in the case of this verb has the irregular form with a dominant [-ATR] vowel, shown in (83-a) which would otherwise spread its ATR specification to the root vowel. Nonetheless, the [+ATR] specification induced by the obstruent consonant [b] on the adjacent high vowel [u] counteracts the dominant harmony process, allowing the root vowel to maintain its [+ATR] specification. In (83-b), the itive suffix spreads its [-ATR] specification to the vowel of the frequentive suffix [-An], but the root vowel maintains its [+ATR] specification. Example (83-c) shows that the [+ATR] specification of the obstruent maintains its effect and that the positive specification on the epenthetic

<sup>28</sup> J.R. Westbury, (1979, 1983) and in personal communication. Further explanation is provided in §5.3.

vowel [u] also resists spreading from the suffix. This implies that the [+ATR] specification generated by the continued consonant voicing also spreads to maintain the ATR specification of an epenthetic vowel.

(83) *Dominance of Consonant Voicing/[+ATR,hi] Adjacency Effect*

- |   |   |   |
|---|---|---|
| a. $\acute{\alpha}k\acute{i}\text{-}\eta\acute{u}\text{-}\sigma r$<br>INF-sniff-IT<br>'to sniff away' | b. $\acute{\alpha}k\acute{i}\text{-}\eta u\text{-}\acute{\omicron}n\text{-}\sigma r$<br>INF-sniff-FREQ-IT<br>'to sniff away frequently' | c. $\acute{\alpha}k\acute{i}\text{-}\eta u\acute{\iota}\eta\acute{u}\text{-}\acute{u}\text{-}\sigma r$<br>INF-sniff repeatedly-IT<br>'to sniff away repeatedly' |
|---|---|---|

(Novelli, 1985: 234)

The second adjacency effect involves dissimilation, an alternation in vowel quality that aids in perception by the speaker. When [-ATR] vowels [ɔ] and [ʊ] occur in stem-final position before suffixes beginning with [a]<sup>29</sup>, followed by consonants that are [+cor], their values change to those of the corresponding tense vowels [o] and [u].<sup>30</sup> This process is shown in (84). In (84-a), vowel [ɔ] of the infinitive [ákídɔ́] –‘to snap one’s fingers’, becomes [o], with the suffixation of the frequentive and itive suffixes beginning with [a]. Likewise, in (84-b), vowel [ʊ] of the infinitive [ákíbú] –‘to return’ becomes [u] under the same suffixation condition.

(84) *ATR Dissimilation Process Under [a] – Suffix Affixation*

- a.  $\acute{\alpha}k\acute{i}d\acute{\omicron} + \acute{\alpha}n + ar \rightarrow \acute{\alpha}d\acute{o}\text{-}\acute{\alpha}n\text{-}ar$   
INF-snap one’s fingers-FREQ-IT  
'to frequently snap one’s fingers (away)'
- b.  $\acute{\alpha}k\acute{i}b\acute{u} + \acute{\alpha}n + ar \rightarrow \acute{\alpha}b\acute{u}\text{-}\acute{\alpha}n\text{-}ar$   
INF-return-FREQ-IT  
'to return frequently (away)'

(Novelli, 1985: 218, 220)

This alternation also occurs in stem-enlarging vowels under reduplication, shown in (85). Example (85-a) shows the case where the epenthetic stem enlarging vowel after reduplication of the verb alternates to a [+ATR] specification. This alternation does not apply to the dative [-ákìn], and other vowel changes occur during dative affixation, such as the free variant elision case in (85-c). In the case of (85-b), the alternation extends not only to the epenthetic vowel [ɔ], but as well to the preceding root-final vowel with the same set of feature values. Example (85-d) shows an additional case of [ʊ] → [u] alternation for the verb [ákíbú] –‘to return’.

<sup>29</sup> This excludes the dative suffix [-akín].

<sup>30</sup> This process appears not to apply when an [-an] suffix is followed by the dative [-ákìn].

(85) *Examples of ATR Dissimilation under [a] – Suffix Affixation*

- |   |   |
|---|---|
| a. ákɪ-tɔ-dóŋdóŋó-àr<br>INF-CAUS-pinch repeatedly-IT<br>'to pinch (away) repeatedly'            | b. á-dóóóóó-àr<br>INF-snap one's fingers-IT<br>'to snap one's fingers (away)' |
| c. ákɪ-tɔ-dó(á)kìn<br>INF-CAUS-snap one's fingers-DAT<br>'to cause to snap one's fingers (for)' | d. á-bú-ar<br>INF-return-IT<br>'to return (away)'                             |

(Novelli, 1985: 218-223)

Adjacency effects are generally assumed to occur under the principle of facilitating production or perception. As every theory has its own description or explanation for phonological phenomena, the analysis of these effects will depend upon the assumptions of the theoretical framework employed. In §5.4 and §6.3.5 analyses of this phenomena will be carried out in Feature Geometry (FG) and Optimality Theory (OT) respectively.

### 3.5 Conclusions

There are three ATR harmony processes in Karimojong. Bidirectional harmony spreads the positive or negative ATR specification of the root in a rightward and leftward direction from the root vowel. Suffix-controlled leftward [+ATR] spreading originates in the first vowels of TAM markers with positive ATR specifications. The third type of harmony process is an irregularly occurring suffix-controlled [-ATR] spreading process originating in suffixes of a specific type.

The first conclusion that can be drawn from the data is that suffix-control, where it occurs, is dominant over root control. The second conclusion is that the types of spreading phenomena that occur are highly dependent on affix type. In addition to affixes with vowels that are dominant or recessive under harmony processes, there are also neutral affixes, and ones that show variable behavior indicative of diachronic incorporation processes. The nature of other affixes and of spreading processes affecting them has been shaped by vowel mergers common to African languages. Analysis of these diachronic changes will be the subject of the following chapter.

Two adjacency effects independent of harmony processes affect the feature values of the vowels in surface forms. One is a phonetic effect of tongue root advancement generated by the speaker's efforts at maintaining voicing. The other is dissimilation aimed at preserving distinctions in vowel height in positions adjacent to low

vowels. These processes appear in the surface forms and are unaffected by harmony processes, and are either dominant or apply at a later stage in the derivation.

A theory of phonological analysis must provide a coherent account of the application of phonological processes at every level to explain the data. As the next step in our analysis, a demonstration of the historical processes affecting the language and an explanation of their consequences for a theoretical analysis will be carried out in the next chapter. The argumentation will bear upon the principal theme of this work: whether a parallel or serial model best accounts for Karimojong data.

## 4.0 Historical Change and Lexical Levels

Historical changes in the Karimojong language have generated surface phenomena that define the lexical levels in its morphology-phonology interface. The historical changes are of three types: vowel mergers, cyclical grammaticalization and incorporation of pronominal reference and verbal agreement morphology, and the re-analysis of phonologically eroded affixes that generate new derivational morphology and a parallel cycle of grammaticalization, incorporation and attrition.

The vowel mergers yield a vowel [a] with a dual behavior that has implications for the definition of rule domains. Affixes in Nilotic undergo an incorporation process in which they are at first neutral to harmony, then active, and subsequently eroded. Data from ATR harmony patterns and the behavior of the vowel [a] sustain a proposal for the three morpho-phonological levels.

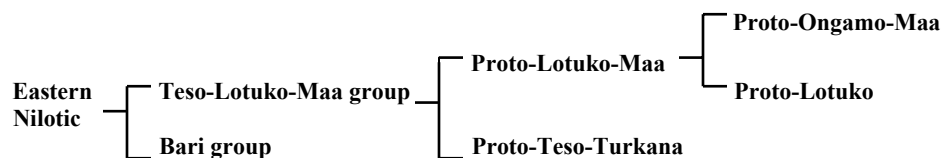
Discussion of the historical aspects of [a] and the implications of its synchronic behavior are carried out in §4.1. Grammaticalization and affix incorporation are discussed in §4.2. A brief explanation of the lexical phonology model is carried out in §4.3. A listing of affixes and the lexical level they correspond to is presented in §4.4.

### 4.1 The Case of [a]

#### 4.1.1 *Vowel Mergers and the Evolution of [a] in Nilotic*

An understanding of the vowel mergers in Karimojong, a language of the Teso-Turkana cluster, can be derived from the report of Dimmendaal (2002), whose argument I am outlining here in conjunction with other sources. His conclusions were an expansion of the historical-comparative studies by Vossen (1982) and other scholars. Vossen (1982:291) proposed the following grouping for the Eastern Nilotic branch:

(86) *Eastern Nilotic Subgrouping*



According to Dimmendaal (2002), all Eastern Nilotic language have fully functioning vowel harmony systems. The languages that originated in the Teso-Lotuko-Maa group currently have nine-vowel systems,

whereas those in the Bari group have ten-vowel systems. The tenth vowel, which is the [+ATR] variant of [a], is an unrounded centralized vowel raised from the lower position, varying between [a̠] and [ʌ]. In this discussion I will refer to it as [ɔ̠]. Both Vossen (1982) and Dimmendaal (2002) propose that the nine vowels that originally existed in the proto-language are \*i, \*ɪ, \*e, \*ɛ, \*a, \*ɔ̠, \*u, \*u, and that the tenth vowel had been lost. Comparative reconstructions by both Vossen (1982) and Dimmendaal (2002) indicate that part of the story of [ɔ̠] is that in some cases it merged with its [-ATR] counterpart [a] as shown in (87).

In (87-a), the Bari word [lɔ̠m]-‘curse’ is shown with its respective cognates in Turkana, Masai and Lotuko, all of which use the [-ATR] vowel [a]. This same situation is repeated in (87-b), with the Bari word [nɔ̠k]-‘suck’. In examples (87-c-f), other Bari words with the [+ATR] vowel [ɔ̠] are compared with translations from Turkana in which the corresponding vowel is [a]; in the case of (87-g), Bari word [gɔ̠m] –‘surround’ is compared with the Masai word [-gam] –‘grip, clamp’. These examples indicate a correspondence between the [ɔ̠] vowel in Bari and the [a] vowel in the Teso-Lotuko-Maa cluster. These examples indicate fairly clearly the retention of the [+ATR] vowel in Bari and its loss in languages of the Teso-Lotuko-Maa cluster of which Karimojong is a part.

(87) *Comparison of Bari with Teso-Lotuko-Maa*

<u>Bari</u>	<u>Teso-Lotuko-Maa</u>
a. lɔ̠m ‘curse’	-ɪlam ‘curse’ (Turkana) -lam ‘avoid, keep away from’ (Masai) -lam ‘avoid’ (Lotuko)
b. nɔ̠k ‘suck’	-nak ‘suck’ (Turkana) -nak ‘suck’ (Masai) -nak ‘suck’ (Lotuko)

(Vossen, 1982:291)

c. dɔ̠p ‘fence in’	-par-par ‘ambush, stalk’ (Turkana)
d. kɔ̠n ‘favor, prefer a child’	-ɪkan-a-kan ‘cradle a child’ (Turkana)
e. pɔ̠r ‘glittering’	-par-par ‘glitter’ (Turkana)
f. bɔ̠ŋ ‘silly, stupid’	-baŋ- ‘stupid’ (Turkana)
g. gɔ̠m ‘surround’	-gam ‘grip, clamp’ (Masai)

(Dimmendaal, 2002:157)

However, further evidence of the merger of the two vowels comes with those cases where the vowel [q] in Bari has been retained in Lotuko. The cognates in (88) are cited by Dimmendaal (2002:158).

(88) *Cognates with [q] in Bari and Lotuko*

<u>Bari</u>		<u>Lotuko</u>	
bwqt	‘skin (v.)’	-bwqt	‘skin (v.)’
lwqk	‘rescue’	-lwqk	‘rescue (v.)’

There is also correspondence between the [-ATR] [a] vowel in Bari with that of in Teso-Lotuko-Maa as shown by the cognates ‘cross’ and ‘calf’ in (89-a,b). Examples are from Dimmendaal (2002:157).

(89) *Correspondence of [a] in Bari and Teso-Lotuko-Maa*

<u>Bari</u>		<u>Teso-Lotuko-Maa</u>	
a. laŋ	‘cross’	-laŋ	‘cross’ (Masai)
		-laŋ-an	‘cross (a river)’ (Lotuko)
b. taqw-ɔk	‘calf’	en-tawwo-	‘calf, heifer’ (Masai)
		ɑ-ðawwo	‘calf, heifer’ (Lotuko)
		ɪ-tak(ɔ)	‘calf’ (Turkana)

Further support for the proposal of a merger between [q] and [a] in the Teso-Lotuko-Maa cluster is found in the findings by Muratori (1938:4) cited by Dimmendaal, who reports cases of dialectal variation between [q] and [a] in Lotuko, in phonetic environments following a glide, a position in which the [q] has been retained the longest. The presence of [q] or [a] varies “from village to village”, an indication of a merger in progress.

The evidence cited above allows us to conclude that the nine-vowel system in the Teso-Lotuko-Maa cluster, of which Karimojong is a part, evolved from a ten-vowel system in the proto-language which has been retained in Bari. The merger between [q] and [a] is only part of the story, as it does not fully explain the behavior of pairings within the Karimojong vowel harmony system. As reported in §2.2.4 and 2.5.2, the [-ATR] vowel [a] pairs with [q] under some circumstances, and in others it pairs with [o] as its [+ATR] counterpart. In addition, as reported in §3.2.2, there is an irregular pairing in which a suffix vowel expected to surface as the [+ATR] vowel [o] in an [a/o] alternating suffix, surface as [ɔ], and initiate an [-ATR] harmony process leftward. These facts can only be fully accounted for through the proposal of additional vowel mergers.

A clue to the trajectory of the additional vowel mergers can be found in the description of [+ATR] [ɔ] in Bari, another Eastern Nilotic language as described by Eluzai Moga Yokwe (1978)<sup>31</sup>. It “...is pronounced with the tongue body at approximately the height of cardinal [ɔ], but ...is unrounded and pronounced with spread lips. It is not as far back as [ɔ].” The merger between [ɔ] and [ɔ̄], one of the common trajectories of the evolution of [ɔ] in ATR harmony systems in African languages reported by Stewart (1971), was shown by Hall and Creider (1998) to occur in Nilotic. In (90), I compare examples from Karimojong from §2.6.2 with those from Teso (Rottland and Otaala, 1983) and Toposa (Schroeder and Schroeder, 1987) as reported by Dimmendaal (2002). From this data array we can conclude that in these three Nilotic languages, a merger between [ɔ] and [ɔ̄] has occurred for some forms.

(90) *Itive Suffix with [ɔ] in Karimojong, Teso and Toposa*

	<u>Infinitive</u>	<u>Itive</u>	<u>Gloss</u>	<u>Language</u>
a.	-dóŋ	-dóŋ-òr	‘castrate’	Karimojong
	-dó	-dó-òr	‘produce child’	Karimojong
	-múrò	-múrò-òr	‘sacrifice’	Karimojong
b.	-lep	-lep-òr	‘milk’	Teso
	-por	-por-òr	‘jump’	Teso
c.	-lep	-lep-òr	‘milk’	Toposa
	-buk	-buk-òr	‘pour’	Toposa

However, in Karimojong, as in Teso, subsequent [+ATR] suffixation will override this harmony process. Dimmendaal (2002:161) cites one Teso form shown (91); Karimojong examples from Novelli (1985:297) are also included.

(91) *[+ATR] Dominance in Teso and Karimojong*

	<u>Itive</u>	<u>Present Tense</u>
a. Teso	-lep-òr	α-lep-or-i 1s-milk-IT-PRS.1s ‘I milk (away)’
b. Karimojong	-dóŋ-òr	è-dóŋ-òr-ì 1s-castrate-IT-PRS.1s ‘I castrate (away)’
c. Karimojong	-ŋú-òr	è-ŋú-òr-ì 1s-sniff-IT-PRS.1s ‘I sniff (away)’

<sup>31</sup> Cited by Hall and Creider (1998).

In addition, as in Karimojong, other Eastern Nilotic languages show [a/o] suffixation patterns, which suggests a merger between [q] and [o]. In (92-a), the Turkana [+ATR] root [-buk-] – ‘pour’ takes the Itive suffix [-orɨ], which includes the vowel [o], while the [-ATR] root [-gjeɛl-] – ‘buy’ takes the Itive [-arɨ], with the vowel [a]. Both Itive forms use the infinitive prefix [a-]. Example (92-b) shows Masai verb roots: [-ibuk-], the [+ATR] root meaning ‘pour’ takes Itive suffix [-or], while [-nuk-], the [-ATR] root, takes Itive suffix [-ar]. In example (92-c) Karimojong root [-òlɨ̀-] – ‘get lost’ carries a [+ATR] specification and takes the [-or] Itive

(92) *[a/o] Suffixation in Eastern Nilotic*

	<u>Infinitive</u>	<u>Itive</u>
a. Turkana	-buk- pour	a-buk-orɨ INF-pour-IT ‘to pour (away)’
	-gjeɛl- buy	a-gjeɛl-arɨ INF-buy-IT ‘to sell’
b. Masai	-ibuk- pour	-ibuk-or pour-IT ‘pour (away)’
	-nuk- bury, cover	-nuk-ar bury, cover-IT ‘bury, cover (away)’
c. Karimojong	-òlɨ̀- get lost	á-òlɨ̀-òr INF-get lost-IT ‘to get lost (away)’
	-mókɨ̀- handle firmly	á-mókɨ̀-àr INF-handle firmly-IT ‘to handle firmly (away)’

(Dimmendaal, 1983:23)

(Dimmendaal, 2002:160)

(Novelli, 1985:219)

suffix in the form [á-òlɨ̀-òr] – ‘get lost (away from the deictic center) and [-ATR] root [-mókɨ̀-]– ‘handle firmly’ takes the itive suffix with vowel [a] in the form [á-mókɨ̀-àr] – ‘to handle firmly (away from)’. These examples establish the occurrence of a merger between [q] and [o] in Eastern Nilotic, in that the vowel [o] takes the place of the [+ATR] counterpart of [a] in the alternation in an entire set of suffixes which should have originally occupied by the vowel [q]. This vowel may well be the same as the vowel [a] signaled by Novelli to

be the [+ATR] variant of [ɑ] found in a reduced number of forms in Karimojong, and which Vossen (1982) had claimed had disappeared from the language.

Hence, the presence of [ɑ/o] alternating affixes and irregular cases of [ɔ] appearing in them to initiate irregular [-ATR] suffix-controlled harmony processes in [+ATR] verbs can be explained by the mergers of [q] with vowels [ɑ], [ɔ] and [o] and a natural process of reinterpretation by the speech community. As this vowel substitution is only initiated in the environment of the consonant [r], the extent of the influence of this consonant on the vowel should be the subject of further research.

#### ***4.1.2 Phonetic Tongue Root Advancement in [+ATR] Environments***

The data in Novelli imply that the dual behavior of [ɑ] is one of [ɑ/o] alternation with transparency in [+ATR] environments. The data were not gathered with detailed information regarding the acoustic properties or articulation. Two techniques have recently been employed to study the behavior of vowels considered to be transparent in vowel harmony languages. One is Electromagnetic Articulometry (EMA), which uses electrodes to track the movements of the tip and blade of the tongue. The other is ultrasound, which allows researcher to study movements of the whole tongue, and the timing and magnitude of tongue gestures in context with others made when producing a speech signal. Results from Wolof, Hungarian and Kinande (Archangeli, 2003; Gick, Pulleyblank, Campbell & Mutaka, 2006; Benus & Gafos, 2007) indicate that that there is advancement and retraction of the tongue in the pronunciation of these vowels in accordance with their ATR environment.

It will be considered that [ɑ] within a [+ATR] environment assumes the value of [q]. This will be in those cases where a [+ATR] vowel both precedes and follows [ɑ] in the speech signal, as will be shown in (93) of §4.1.3. No position will be taken in this thesis regarding the initial vowel of the infinitive prefix [aki-] before [+ATR] roots, as no study of anticipatory co-articulation with the ATR feature has ever been carried out. Analysis of agreement of the ATR feature will exclude this vowel until further research has been carried out regarding its status.

#### ***4.1.3 Synchronic Behavior of [ɑ] and the Distinction of Lexical Levels***

Affixes with [ɑ/o] alternations appear with low vowel [ɑ] in the [-ATR] case under a bidirectional root-controlled harmony. When a [-ATR] verb with this type of affixation subsequently undergoes affixation with a [+ATR] TAM marker and a suffix-controlled leftward spreading of the [+ATR] feature, the [ɑ] is transparent to

harmony, even though all other vowels, including the root vowel, change their [ATR] values from negative to positive. This fact distinguishes two separate levels of phonological rule application. On the first level, characteristic vowel [a] surfaces to match the [-ATR] value of an original root vowel under bidirectional root-controlled harmony. On the second level, [a] remains neutral under suffix-driven [+ATR] spreading, originated by the affixation of the [+ATR] TAM marker. This derivational process is shown in (93). On Level 1, affixation of the dative suffix [-Akin] occurs. The archiphoneme of [-A] of the suffix assumes the [-ATR] value of [a]. On Level 2, Passive Voice TAM marker [-jo] is affixed, and it initiates a leftward spreading process of the [+ATR] specification. Under this process, the root vowel assumes a [+ATR] value, while characteristic vowel [a] does not change to [o]. Neutral affixes such as the pronominal prefix [ɛ-] do not undergo harmony rules and are proposed to be affixed on Level 3, where no harmony rules apply.

(93) ɛdoŋakinjo- he is being pinched (for the purpose of..)’

Level 1     doŋ-Akin → doŋakin  
 Level 2     doŋakin-jo → doŋqkinjo  
 Level 3     ɛ- doŋqkinjo → ɛdoŋqkinjo<sup>32</sup>

In cases where the root vowel has a [+ATR] specification, under bidirectional root-controlled spreading the characteristic vowel in [a/o] derivational suffixes surfaces as [o]. The suffixation of a [+ATR] TAM marker changes no ATR specifications in the vowels of the word, as they already possess [+ATR] specifications. The derivation of [ɛ-doŋokinjo]- ‘he is being castrated for’ derived from the [+ATR] verb [ákidoŋ]-‘to castrate’ is shown in (94). The dative suffix is affixed on Level 1, and under bidirectional root-controlled harmony the dative suffix becomes [-okin]. Affixation of the Passive Voice marker and the subsequent application of leftward [+ATR] spreading does not change the specification of any vowels in the prosodic word, and the pronominal prefix [ɛ-] remains neutral as it does not undergo vowel harmony rules.

(94) ɛdoŋokinjo- he is being castrated (for the purpose of...)’

Level 1     doŋ-Akin → doŋokin  
 Level 2     doŋokin-jo → doŋokinjo  
 Level 3     ɛ-doŋokinjo → ɛdoŋokinjo

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<sup>32</sup> Novelli reports [q] as [a]. The [q] is assumed due to the results of recent ultrasound research and the realities of coarticulation. This does not change the argument for morphophonological levels, as a value of [q] or [a] as opposed to [o] makes the case for a separate morphophonological level.

The surface forms of the verbs in (93) and (94) thus differ in the [q] and [o] values of the characteristic vowel of the dative suffix, which reflect the ATR specifications of the root vowels. It can be concluded that the [q] vowel in the surface form of the originally [-ATR] verb serves to avoid lexical ambiguities that arise from leftward [+ATR] harmony processes. In this case, it distinguishes a form of [-dóŋ]- ‘pinch’ from a form of [-dóŋ] – ‘castrate.’

## 4.2 Grammaticalization and Affix Incorporation

Participation of affixes in harmony is related to their historical development, as affixes evolve from neutrality to participation and harmony to attrition and loss. There also appear to be processes of reanalysis and reduplication to create derivational affixes from inflectional affixes impacted by phonological erosion, and new incorporation processes among segments that have suffered from phonological erosion. The situation of verbal agreement markers is discussed in §4.2.1, and that of the reduplicated frequentive in 4.2.2.

### 4.2.1 Verbal Agreement: Pronominal Prefixes, TAM Markers

Three important phenomena in the historical development of verbal agreement morphology are evident in Karimojong structure, and are key to understanding the behavior of ATR harmony processes in the language. They are the cyclical universal grammaticalization path, the suffixal preference, and the difference in behavior of first and second person forms, which are the vanguard of grammaticalization processes.

Verbal agreement markers, such as the pronominal prefixes and TAM markers in Karimojong, are generally considered to evolve from free pronouns along a universal path of grammaticalization (Fuss, 2004, Lehmann, 1995, Hopper & Traugott, 2003) which is shown in (95).

#### (95) *Universal Grammaticalization Path*

independent pronoun → weak pronoun → clitic pronoun → agglutinative (affixal) agreement marker → fused agreement marker → ∅

The path is cyclical in nature (Jespersen, 1922, Katz, 1996). What begins as a referential pronoun with the status of a grammatical and phonological word weakens due to phonological erosion which requires a lexical host, in this case the verb. As it continues to be phonologically reduced, it loses its power as a referent, and becomes an obligatory part of the verb’s inflection. It becomes redundant with the verbal argument and marks

featural content. Further erosion occurs, and it becomes fused with other inflectional markers such as tense and aspect, before it disappears altogether.

Cross-linguistically, there is a preference for suffixal agreement morphology. Of the verb-initial languages surveyed by Bybee et al (1990), 61 percent of the agreement markers were agglutinated verbal agreement suffixes, 20 percent free-standing post-verbal markers, 19 percent agglutinated agreement prefixes, and 0 percent free-standing pre-verbal agreement markers. Among verb-final languages the figures agglutinated agreement suffixes stood at 65 percent, with 0 percent free-standing post-verbal markers; 31 percent agglutinated prefixes, and 4 percent free-standing pre-verbal markers. Among SVO languages, 49 percent of the agreement morphology consisted of agglutinated suffixes, 4 percent free-standing post-verbal markers, 37 percent were agglutinated prefixes, and 10 percent free-standing pre-verbal markers.

Both the grammaticalization cycle and the suffixal preference are evident in the Karimojong case through the behavior of pronouns and TAM markers. Historically, the pronominal prefixes in Nilotic languages have evolved from pro-clitics.<sup>33</sup> They are no longer free-standing forms, as the verbal complex loses its status as a grammatical word without a filling the prefix slot. Throughout most of the language, they show a degree of phonological independence by not participating in ATR harmony processes, yet are part of the phonological word. As seen in §3.3.1.1.1, they have begun a process of phonological integration and loss of independence as high-frequency Narrative Mood forms alternate under dominant [+ATR] harmony processes. At the time Novelli gathered his data, they held the status of agglutinated affixal agreement markers in incipient stages of further phonological integration. Following the universal principles presented above, pronominal prefixes have reached the stage where they exist alongside free-standing pronouns.

As they are a fusion of person and number agreement with tense, aspect and mood inflection, TAM markers show a later stage of integration. When phonologically active, they participate in ATR harmony, either in the historically earlier root-controlled processes, or the subsequent dominant [+ATR] spreading. As shown in §3.3.4.1 with the behavior of [-ere] and in §3.3.1.3 with [-i], TAM markers also pass through stages of integration. When first agglutinated, they are neutral to ATR harmony processes. Then, most probably dependent on frequency of use and discourse function, more frequent constructions begin to incorporate through their participation in ATR harmony processes, followed by less frequent ones. This continues to include stages

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<sup>33</sup> Gerrit Dimmendaal, personal communication.

in which the phonological substance is lost, almost completely as shown by first and second person Reflexive Voice constructions in §3.3.4, or perhaps partially as in the case of neutral CV constructions.

This brings us to the third characteristic of historical change, that of the vanguard role played by first and second person conjugations (Fuss, 2004; Bybee, 1985). Bybee noted that of the languages surveyed with full agreement paradigms, grammaticalization of first and second person forms pre-dated that of the third person forms. This has been confirmed by Mithun's (1991) work on Native American languages, in which the third person pronouns have been affixed to the outside of the verbal complex, with respect to the position of first and second person subjects. The third person pronouns also show a lower degree of fusion than first and second person markers.

Further evidence is supplied by the fact that 54% of those languages marking verbal agreement in the Bybee (1985) sample did not have agreement markers on the third person forms at all, possibly indicating a lack of pronouns to supply them at an earlier stage of the language's history.

The patterning of first with second person forms versus third person forms is borne out in Karimojong, although not in an ironclad manner. An examination of TAM markers across tense, aspect, mood and position class shows that Karimojong is undergoing dynamic change in its TAM marker paradigms. While these paradigms show a great deal of diversity, they are following an apparent continuum of stages from differentiation by person and number, through patterns of uniformity to patterns of loss, and in Position 4, subsequent loss of affixal material beyond that of the TAM marker. This is shown in the paradigm patterns in (96) through (99). While certain patterns are more common than others, the diversity of patterns is an indication that the geometry of paradigms should not be considered fixed. It is also apparent that there are two parameters of differentiation and uniformity: that which concerns itself with the segmental values of the TAM marker, and that which involves the tonal pattern of the verbal complex. Each is undergoing an independent process from maximum differentiation through uniformity. In the examples that follow, tonal differentiation will be highlighted through the presence of shaded background, groupings of which will share the same shaded background. Segmental groupings will be indicated through rectangular enclosure and underlining.

The examples in (96) of the verb [ákiǎǎ] – 'to pinch' exhibit paradigms with three of the most common patterns. Example (96-a) shows agreement among TAM markers of Tense 1 Indicative Mood of the main singular forms with the first person plural, with an alternative ending for the third person singular. The second

and third person plural also share the same TAM marker. As is commonly seen with this type of paradigm, the alternative TAM ending is one commonly used in another voice—in this case, Tense 1 of the Passive Voice. This paradigm is considered not to vary in tone. The endings of the second and third person plural, as it retains an additional vowel, has the first vowel matching the tone of the root, and the second vowel equivalent to that of the single vowels of the other TAM markers in the paradigm. Example (96-b) shows the variation in the Tense 4 paradigm in which one segmental and tonal paradigm corresponds to the singular forms, and another corresponding to plural forms. The other tonal variation that exists is that which corresponds to distinguish inflection of the pronominal prefix; the pronominal prefix of the first person singular is distinguished from that of the first person plural through low tone marks. The second person prefixes are undistinguishable between singular and plural; both each bear a single low tone. Third person singular and plural are identical mid-tones.

(96) *Patterns of Differentiation*

**Verb: *úkídóŋ* Form A Position 1**

	a. <i>Active Voice</i>	b. <i>Active Voice</i>	c. <i>Passive Voice</i>
	<i>Mood I</i>	<i>Mood III</i>	<i>Mood III</i>
	<u>Tense 1</u>	<u>Tense 4</u>	<u>Tense 4</u>
Singular 1 <sup>st</sup>	à-dóŋ -ì	(àt)òo-dóŋ -itè	ókò-dóŋ -ì
2 <sup>nd</sup>	ì-dóŋ -ì	tò-dóŋ -itè	ító-dóŋ -ì
3 <sup>rd</sup>	è-dóŋ -ì	to-dóŋ -itè	tò-dóŋ-àè
	è-dóŋ-jò <sup>34</sup>	to-dóŋ-itetèi <sup>35</sup>	
Plural 1 <sup>st</sup>	ìkì-dóŋ -ì	(at)oo-dóŋ-ito	ító-dóŋ -ì
2 <sup>nd</sup>	ì-dóŋ-étè	tò-dóŋ-ito	ító-dóŋ -ì
3 <sup>rd</sup>	è-dóŋ-étè	to-dóŋ-ito	tò-dóŋ-àè

The segmental value of the alternative third person form corresponds to the Tense 4 Passive Voice. The paradigm in (96-c) shows the grouping of first and second person singular and plural forms with like TAM endings and tonal patterns and the third person singular and plural representing another.

The tendency toward uniformity is shown by the examples in (97), reflecting the Indicative Mood of the Passive Voice. Example (97-a), of the habitual aspect, known as Tense 1, shows all TAM inflections and tonal patterns to be equivalent. Person and number are distinguished only through the pronominal prefix on each

<sup>34</sup> This alternative TAM marker for the 3<sup>rd</sup> person singular in Active Voice corresponds to the ending for the Passive voice.

<sup>35</sup> This alternative forms corresponds to the Tense 4 Passive Voice.

form. Example (97-b), in Tense 4 (Past Perfect) shows equivalence in the segmental values of the TAM markers, but differentiation by tonal pattern. The first and third person singular and the third person plural share one tonal pattern, and the second person singular and the first and second person plural share another.

(97) *Patterns of Uniformity*

**Verb:  $\acute{\alpha}\kappa\acute{\iota}\delta\acute{\omicron}\eta$  Form A, Position 1, Passive Voice, Mood I**

	a. Tense 1	b. Tense 4
Singular 1 <sup>st</sup>	$\acute{\alpha}\kappa\alpha\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\acute{\alpha}\kappa\alpha\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\acute{\alpha}\acute{\epsilon}$
2 <sup>nd</sup>	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\grave{\alpha}\grave{\epsilon}$
3 <sup>rd</sup>	$\epsilon\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\alpha\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\acute{\alpha}\acute{\epsilon}$
Plural 1 <sup>st</sup>	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\grave{\alpha}\grave{\epsilon}$
2 <sup>nd</sup>	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\acute{\iota}\kappa\acute{\iota}\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\grave{\alpha}\grave{\epsilon}$
3 <sup>rd</sup>	$\epsilon\text{-}\delta\acute{\omicron}\eta\text{-j}\grave{\omicron}$	$\alpha\text{-}\delta\acute{\omicron}\eta\text{-}\acute{\iota}\acute{\tau}\acute{\alpha}\acute{\epsilon}$

Patterns of loss mirror both the patterns of differentiation and the patterns of uniformity. From the data in (98-a-c), it can be postulated that an initial stage of loss consists of the loss of all segmental material excepting the TAM marker's ATR specification, which continues to drive harmony. Example (98-a) shows the paradigmatic pattern of all singular forms and the first person plural constituting one group of forms—in this case, forms which retain only the [+ATR] feature of the TAM marker and the concomitant dominant spreading, while the second and third person plural forms, with [+ATR] vowels continue to drive [+ATR] harmony leftward. Example (98-b), in Narrative Mood, Tense 2 (Past Progressive), has the only the singular forms expressing tense, aspect and mode through a [+ATR] feature. Plural forms are of two alternatives: either the [+ATR] feature devoid of segmental material, identical to the singular forms, or with TAM marker [-os] for all plural forms. The pattern in (98-c) shows more advanced loss, in spite of the less uniform paradigm; singular forms and the first person plural show total loss, and no [+ATR] feature driving harmony. These forms show bidirectional root-controlled harmony with the spread of a [-ATR] feature. However, the TAM markers of this paradigm seem to have first become neutral or the paradigm has always been characterized as such; vowels of the TAM markers of both third person singular forms and the second and third person plural have [+ATR] values but do not drive dominant harmony processes leftward.

Alternative patterns of loss are shown in (98-d,e), both of which are first position paradigms in the Aorist

Past Tense in the Indicative and Narrative Moods (I and III). Both paradigms show loss in all singular forms. The Indicative Mood shows loss in the first person plural as well, thereby agreeing with the paradigmatic patterns in (96-a) and (98-a). The second and third person plural forms show devoicing of the vowel that serves as the TAM marker. The alternative third person singular form shows carries the TAM marker of the Tense 1 and Tense 2 Active Voice. The paradigm in (98-e), shows an opposing pattern in singular and plural. The singular forms have experienced loss, while the plural forms contain voiced versions of the voiceless vowel of the indicative. The alternative form of the third person singular carries the ending of Tense3/4 Passive Voice.

(98) *Patterns of Loss*

**Verb: ἀκίδῶν -‘to pinch’ Form A, Reflexive Voice**

		<b>Position 6</b>		<b>Position 3</b>
		<b>a. Mood I</b>	<b>b. Mood III</b>	<b>c. Mood I</b>
		<u>Tense 2</u>	<u>Tense 2</u>	<u>Tense 2</u>
Singular	1 <sup>st</sup>	ἄ-δὲν-únún [+ATR]	(àt)òo-δὲν-unun [+ATR]	ἄ-δὲν-ár
	2 <sup>nd</sup>	ἰ-δὲν-únún	tò-δὲν-unun	ἰ-δὲν-ár
	3 <sup>rd</sup>	ἄ-δὲν-ùnun ἄδὲνùnùn-oi	to-δὲν-unun to-δὲν-unun-etèi <sup>36</sup>	ἔ-δὲν-ar ἔ-δὲν-ar-òì
Plural	1 <sup>st</sup>	ἰkì-δὲν-ùnun [+ATR]	(at)oo-δὲν-unun- (os)	ἰkì-δὲν-ár
	2 <sup>nd</sup>	ἰ-δὲν-unun-ozì	tò-δὲν-unun- (os)	ἰ-δὲν-ár-ozì
	3 <sup>rd</sup>	ἄ-δὲν-ùnùn-ozì	to-δὲν-unun- (os)	ἔ-δὲν-ar-ozì

**Verb: ἀκίδῶν Form A, Position 1, Active Voice**

		<b>d. Mood I</b>	<b>e. Mood III</b>
		<u>Tense 5</u>	<u>Tense 5</u>
Singular	1 <sup>st</sup>	α-δὲν	(àt)òo-δὲν
	2 <sup>nd</sup>	ἰ-δὲν	tò-δὲν
	3 <sup>rd</sup>	ἄ-δὲν α-δὲν-ἰ	tò-δὲν tò-δὲν-ἄè
Plural	1 <sup>st</sup>	ἰk ἰ-δὲν	(at)oo-δὲν-à
	2 <sup>nd</sup>	ἰ-δὲν-α	tò-δὲν-α
	3 <sup>rd</sup>	ἄ-δὲν-α	tò-δὲν-α

<sup>36</sup> This ending also corresponds to Tense 4, Mood III, Passive Voice.

**Verb: *ákídóŋ* Form A, Position 3, Passive Voice**

	f. <i>Mood I</i>		g. <i>Mood III</i>	
	<u>Tense 5</u>		<u>Tense 5</u>	
Singular 1 <sup>st</sup>	aka-dɔŋ-ár		ókɔ-dɔŋ-àr	
2 <sup>nd</sup>	iki-dóŋ-àr		ítɔ-dɔŋ-àr	
3 <sup>rd</sup>	a-dɔŋ-ár		tɔ-dɔŋ-ar-àè	
Plural 1 <sup>st</sup>	iki-dóŋ-àr		ítɔ-dɔŋ-àr	
2 <sup>nd</sup>	iki-dóŋ-àr		ítɔ-dɔŋ-àr	
3 <sup>rd</sup>	a-dɔŋ-ár		tɔ-dɔŋ-ar-àè	

A third pattern of loss is shown in (98-f,g) which presents the Position 3, Passive Voice, Aorist Past, in the Indicative and Narrative Moods. The Indicative Mood in (98-f) shows total loss of segmental material without the retention of the [+ATR] feature, as the tonal paradigms of the second person singular and the first and second person plural form one group. Likewise, the tonal patterns of the first and third person singular and the third person plural are also identical. In the Narrative Mood, the first and second person singular and plural show loss, and agreement in tonal pattern, while the third person singular and person show agreement in segmental values and tonal patterns.

Loss of segmental material can extend beyond the TAM marker. Example (99) shows the Aorist Past in Position 4, in which portions of the dative suffix [-akin] are also lost. In the Mood I (Indicative) singular and first person plural forms, the final consonant of the dative suffix is lost, and the preceding vowel is made voiceless. The alternative form of the third person singular shows only loss of the TAM marker, and not of the dative ending. The second and third person plural forms show either the denasalization and spirantization of the final [-n], or its total loss, with the word-final [-z] stemming from a portion of eroded TAM marker [-ozi]. The Narrative Mood (III) forms show total loss of the TAM marker and of the [-in] portion of the dative suffix, demonstrating that voiceless vowels in Karimojong endings stem from erosion processes. The alternative third person singular form retains its TAM marker [-àè]. The first person plural shows erosion of the [n] of the dative suffix and of the initial vowel of the TAM marker, which can be concluded from evidence from other paradigms to be either [o] or [i]. The second and third person plural either merely retains the [z] from a missing TAM marker, or n>z due to denasalization and spirantization.

(99) *Patterns of Extended Loss*

Verb: **ákídóŋ Form A, Position 4: ákídóŋákín**

*Active Voice*

	a. <i>Mood I</i>		b. <i>Mood III</i>
	<u>Tense 5</u>		<u>Tense 5</u>
Singular 1 <sup>st</sup>	à-dòŋ-ákì__		(àt)òò-dòŋ-àk__
2 <sup>nd</sup>	ì-dòŋ-ákì__		tò-dòŋ-àk__
3 <sup>rd</sup>	à-dòŋ-ákì__		tò-dòŋ-ak__
	α-dòŋ-ákín		tò-dòŋ-akin-àè <sup>37</sup>
Plural 1 <sup>st</sup>	ìki`-dòŋ-ákì__		(at)òò-dòŋ-akizì
2 <sup>nd</sup>	ì-dòŋ-ákìz		tò-dòŋ-akiz
3 <sup>rd</sup>	à-dòŋ-àkiz		tò-dòŋ-akiz

There is thus ample evidence for the positing that the suffixal agreement paradigm is older than the prefixal agreement paradigm, and has undergone fusion to form part of the TAM system, which is presently undergoing erosion and loss. The pronominal prefix represents the newer form of agreement marking, but is itself undergoing pressure toward uniformity, requiring post-verbal free pronouns to clarify ambiguities. This is consistent with the incipient process of incorporation of heretofore neutral Class 1 Narrative Mood pronominal prefixes into the harmony system— a process of fusion. The expectation is that with the passage of time, the incorporation of the prefixes of other Moods and of Class 2 verbal prefixes will take place.

Paradigm uniformity, erosion and loss are not the only processes in the evolution of suffixal agreement markers. Processes leading to the creation of the frequentive derivational suffixes are part of the evolution of suffixal agreement morphemes, which are explained in the following section.

**4.2.2 Frequentive Suffixes**

The existence of four frequentive forms in Karimojong, all of which have co-occurrence restrictions and which appear to follow similar developmental changes and incorporation processes, leads to this proposal for a separate, five-phase grammaticalization and incorporation process for frequentive forms. Each of the four frequentive forms is at a different stage in the process, though evidence exists for it having passed through previous stages. The five phases are described below with examples.

<sup>37</sup> This TAM ending is otherwise used in the Tense 3 Passive Voice.

Phase 1: The affix is a TAM marker, neutral under harmony rules. This is proposed to be the case as a result of one or more of the following processes. Phonologically active segmental material is eroded and lost, leaving behind an epenthetic vowel and consonant, which are re-analyzed as neutral markers. Or, the phonologically active material remains, and the meaning of the inactive portion is reanalyzed.

The perfect aspect markers, [-it], [-ito] are used in the present perfect and the past perfect, are non-alternating TAM markers. Examples in the first person singular and third person plural are shown in (100-a,b).

(100) *Non-Alternating Perfect Aspect TAM marker*

- |                              |                              |
|------------------------------|------------------------------|
| a. à-dóη-ít                  | b. è-dóη-ito                 |
| 1s-pinch-ACT. A. PRS.PERF.1s | 3p-pinch-ACT. A. PRS.PERF.3p |
| ‘I have pinched’             | ‘They have pinched.’         |

(Novelli, 1985:269)

Phase 2: The affix, or a portion of it, is reduplicated, assumes a frequentive meaning and is at first neutral under harmony. It remains at the right edge of the verbal complex.

(101) *Affix Reduplication*

- |                             |                             |                     |
|-----------------------------|-----------------------------|---------------------|
| a. ì-dòη-ítít íjòη          | b. ì-dòη-ítito íèz          | c. è-tìjα-ítít      |
| 2s-pinch-ACT.A.PST.PERF. 2s | 2p-pinch-ACT.A.PST.PERF. 2p | 1s-do-FREQ-PST.PERF |
| ‘You (s) had pinched.’      | ‘You (p.) had pinched.’     | ‘..I used to do’    |

(Novelli, 1985:214-215)

The [-itit] suffix appears to be new. Novelli (1985:215) has noted just a limited number of verbs using this reduplicated ending: ákíduk- ‘to build’, akímalq̄- ‘to greet’, akítìq̄- ‘to work’.

Phase 3. The affix assumes status of derivational suffix with a frequentive meaning. Other TAM markers take the rightmost slot reserved for suffixal inflectional markers, or the phonological material, active or not, of the old marker remains.

(102) *The Frequentive Becomes a Derivational Affix*

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| a. ì-dòη-éenèn-èt íjòη            | b. ì-dòη-eenen-eto íèz             |
| 2-pinch-FREQ-PRS.PERF. 2s         | 2-pinch-FREQ-PRS.PERF. 2p          |
| ‘You (s) have frequently pinched’ | ‘You (p) have frequently pinched.’ |

(Novelli, 1985:214)

Phase 4: The reduplicated affix participates in harmony processes.

(103) *Incorporation of Reduplicated Affix into Harmony Processes*

- |  |  |
|--|--|
| a. ábú-ún-ún -òn<br>INF-return-FREQ-VEN<br>'to frequently return this way' | b. ábú-án-án-àr<br>INF-return-FREQ-IT<br>'to frequently return that way' |
|--|--|

(Novelli, 1985:213)

Phase 5: *The reduplicated affix loses the reduplicant. Co-occurrence restrictions remain on the morphemes.*

(104) *Loss of Reduplicant*

- |   |   |
|---|---|
| a. ábú-ún -òn<br>INF-restrain-FREQ-VEN<br>'to frequently return this way' | b. ábú-án-àr<br>INF-restrain-FREQ-IT<br>'to frequently return that way' |
|---|---|

(Novelli, 1985:213)

### 4.3 Lexical Phonology Model

Lexical phonology, first proposed by Kiparsky (1982) is a framework for models of the phonology-morphology interface across the world's languages. A number of models have been proposed, all of which vary according to the structures of the languages under consideration. The model for Karimojong is similar to the proposal made by Odden (1993) for Kimatuumbi, and differs from standard models in that the syntax is seen as an initial process that organizes the lexical entry, rather than a separate module that merely receives the output from the lexicon.

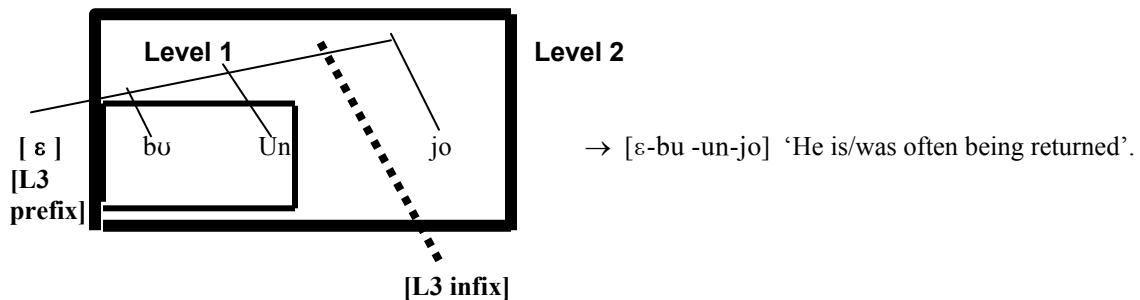
#### 4.3.1 Model Presentation

The lexical phonology model proposed for Karimojong consists of an initial syntax module which plans the overall word structure, followed by morphological and phonological processes encoded to apply on particular levels. M-structure results from morphological processes, includes the morpheme/phoneme string, a meaning, headmarking, and an encoding of the levels of application for the affixes and the phonological processes that accompany them. After passing through up to three levels of morphological affixation and the application of phonological rules, the word then proceeds to a post-lexical syntax level for sentence formation.

An illustration of this word formation procedure is shown in (105). The morphology is built step-by-step, with each step marked according to its corresponding constituent. Then, starting with the lowest unprocessed constituent, phonology applies up the hierarchy. The L1 processes encompassed by the small rectangle show a

[-ATR] spread rightward, as the previously underspecified affix [-Un] -‘often’ adopts the [-ATR] feature to create an intermediate form /bu-un/. The L2 phonological process inside the larger rectangle consists of a [+ATR] harmonic spread leftward. The vowel of the TAM marker –jo spreads its [+ATR] feature to all vowels leftward, forming a second intermediate form /bu -un-jo/. Bracketed in boldface type are actual and potential L3 processes. The pronominal prefix /ε-/‘he’, and the grammaticalizing frequentive affix, whose position should it be employed are shown in the hierarchy as unaffected by L1 or L2 harmony processes, and are proposed to be affixed on Level 3.

(105) *Lexical Phonology Model*



Affixes on Level 1 are assumed to be historically older forms, and all participate in harmony. Level 2 affixes are relatively newer, but have been incorporated to the extent that they participate in harmony. Affixes have been classified as Level 3 based on their non-participation in harmony processes. It is quite possible that these are from a variety of historical process; some are new affixes not yet incorporated; others may have become neutral through phonological erosion but provide no evidence for classification as a Level 1 or 2 affix.

Affixes transition from one level to another in the grammaticalization and incorporation process. Pronominal prefixes, which are in the early stages of incorporation into the harmony rules of the language, are Level 3 affixes when neutral under harmony. Narrative Mood forms of the pronominal prefix, which alternate under [+ATR] suffix-controlled harmony, are classified as Level 2 affixes, but as they do not alternate under bi-directional root controlled harmony, cannot be classified as Level 1 affixes.

#### 4.4 Morphophonological Levels in Karimojong Verb Suffixation

Alternative patterns of loss are shown in (98-d,e), both of which are first position paradigms in the Aorist the proposed morphophonological (hereafter MP) levels of affixation and glossed examples. Affixation levels

and their corresponding morphological and phonological processes are listed in (106).

(106) *Karimojong Affixes by Morphophonological Level*

**MP Level 1:**

Morphology: Alternating Infinitive Prefixes  
Causative Prefixes [tA-] and [zi-]  
Alternating harmonic suffixes [-Un], [-UnUn]  
Alternating derivational [a/o] suffixes  
Alternating inflectional [a/o] suffixes

Phonology: Bidirectional root-controlled harmony  
Suffix-controlled [-ATR] harmony

**MP Level 2:**

Morphology: Voice/Mood/Tense markers  
Alternating Narrative Mood Pronominal Prefixes [ɔkɔ-], [tɔ-], [ɔɔ-]

Phonology: Suffix-controlled [+ATR] harmony

**MP Level 3:**

Morphology: Non-alternating Pronominal Prefixes  
Non-alternating inflectional suffix [-it], [-i̇]  
Non-alternating frequentive suffixes [-eenen], [-itit]  
Non-alternating cases of TAM marker [-ere]

Phonology: No ATR harmony processes

## 4.5 Conclusions

It was shown that in this chapter that ATR harmony processes have a reciprocal relationship with diachronic change in Karimojong, and that three morphophonological levels are necessary to account for surface forms. On the one hand, vowel mergers and reinterpretations by the speech community have generated greater variety in the affix types and harmony processes in the language. On the other hand, affix behavior under harmony processes brings to light transitional phases of affix incorporation.

Three types of affixes in Karimojong demonstrate attested diachronic processes of incorporation. Pronominal prefixes, descended historically from proclitics, are largely neutral to processes of harmony. Indicative of historical change are the Narrative Mood pronominal prefixes that alternate under dominant suffix-controlled harmony processes. TAM markers also show both neutral and phonologically active behaviors indicative of their transition. Both the pronominal prefixes and the TAM markers show evidence of participation of universally attested cyclical grammaticalization processes for pronominal reference and verbal agreement morphology. An interesting case of a parallel grammaticalization process is that involving

frequentive affixes. Karimojong has four of them, at different stages of historical development. As they appear to be derived from eroded pronominal agreement morphology, their evolution provides important material for further research into the diversity of paths of grammaticalization processes.

The lexical phonology model proposed here provides a framework for synchronic and diachronic explanation. Its compatibility with Rule-Based Theory (RBT) and Optimality Theory will be explored in the following chapters.

## **5.0 Karimojong ATR Harmony and Rule-Based Autosegmental Theory**

Discussion of the validity of a theoretical proposal includes examining other analyses of the data, so this chapter is dedicated to rule-based Auto-segmental Theory (AT). As the version of Optimality Theory to be analyzed relies on some principles first established by AT, it is necessary to determine how the facts of the language fit within them. This begins with a presentation of the basic principles of AT in §5.1. The phonological structure (P-structure) of the Karimojong word, based on theoretical proposals for head-dependent asymmetries (Van der Hulst & van de Weijer, 1995; Van der Hulst & Dresher, 1998) and which forces important modifications to AT, is presented in §5.2. In §5.3, the three types of harmony found in the language are analyzed successively within this modified rule-based AT framework along with the adjacency effects described in §3.4, one of which requires feature geometry (FG) to be described adequately under a rule-based generative model.

Serial derivation under rule-based theory, which by tradition is seen as the prototypical case, has important differences with a constraint-based model. The three morphophonological levels described in §4.0 to §4.4 are organized differently under the two frameworks, a fact that is discussed in §5.5 and §6.6.

### **5.1 Principles of Autosegmental Theory**

Autosegmental theory (AT) is based on the notion that distinctive features of a segment are hierarchically organized. A feature or a group of features constitutes its own separate tier and acts independently to produce phonological alternations. The skeletal tier provides an abstract representation of the timing properties of segments. In a fully autosegmentalized model, each feature has its own tier, and the melody feature contains merely root nodes. Features cannot be phonetically realized unless they are associated with timing slots on the skeletal tier. Spreading is described as the association of features to segments adjacent on a tier. Six principles govern association processes used to describe autosegmental spreading under ATR harmony. The first four are general to AT (Lieber, 1987, Goldsmith, 1990, Kenstowicz, 1994); the remaining two are specific to ATR harmony. They are:

1. Tier association begins at one margin of a word or morpheme and lines associate the features of one tier to the feature slots on another, in a one-to-one fashion.

2. Autosegmental analyses permit a mapping of one-to-many, in which a segmental feature on one tier maps with several segments on another tier, in a process generally referred to the “spreading” of association lines.
3. Association lines may not cross (No Crossing Constraint).
4. One-to-many mappings are held to be motivated feature-filling processes, although one-to-many feature changing rules may also be formulated. Opaque segments block further spreading and are postulated to resist feature-filling processes by having the relevant features already stipulated. Harmony processes are postulated not to continue past opaque segments due to the No-Crossing Constraint.

AT proposes that vowel harmony occurs on a separate tier. The harmonizing vowel feature on its tier ceases to function solely as the property of a single segment and is available for association with other segments subject to the following principles:

5. The surface form of each vowel is associated with at least one feature. In the case of ATR harmony, it must be  $\pm$ ATR.
6. In ATR harmony, each ATR feature is associated with a controlling vowel in a privileged position, vowel, from which autosegmental spreading mapping one to many occurs. Features independent of any segment, termed floating features, can be postulated in exceptional cases.

The principles and constraints within AT crucially determine the need for a stratal analysis of ATR harmony in Karimojong. Morphemes containing vowels normally part of the harmony domain, but which do not alternate, present a problem for the No Crossing Constraint as harmony processes appear to pass through them. An explanation of the surface forms of the language can be made without violating this constraint by proposing that that these morphemes are affixed on a separate level.

Nonetheless the presence of Head Dependent Asymmetries (HDA) (Dresher & van der Hulst, 1998) in the structure of vowel harmony in Karimojong presents a far more complex picture than canonical AT is able to account for. There are second vowels in two-syllable morphemes and morpheme-initial epenthetic vowels that do not participate in harmony processes though they form part of morphemes containing vowels that do. Yet these vowel segments have the same feature profiles as vowels that are included in the ATR harmony system in other contexts.

An example is shown in (107) with [iki -dóŋ-ar-ítàè]-. The underlined segments in (107-a) indicate a [-ATR] spreading process initiated with the root vowel [ɔ], and gives a [-ATR] value to the itive suffix [-Ar] and selects a [-ATR] TAM marker with characteristic vowel [a] in [-tae]. Yet, epenthetic vowel [-i-] and second vowel [-e-] have [+ATR] feature values, which translated into the AT theoretical framework means that they possess connections to a [+ATR] autosegment on the harmony tier. As shown in (107-b), one of these connections would violate the No-Crossing Constraint, as the association line from the [i] segment to the [+ATR] autosegment cross the association line from the [a] segment in the TAM marker to the [-ATR] autosegment. In addition, in many TAM markers, a [+ATR] segment would drive a [+ATR] harmony process leftward, which does not occur in this case.

- (107) a. iki-dóŋ-ar-ítàè  
 2p- pinch-IT- A.IND.PASS.PRS.PRF.2p  
 ‘You have been pinched (away)’
- b. \* [-ATR] [+ATR]

The [-ATR] spreading process in this example can only be explained through the existence of a special structure that selects the vowels in the morphemes that participate in spreading processes. A theoretical proposal based on the existence of phonological heads within morphemes, which delineates a phonological structure within the Karimojong verb constitutes an explanation of the data and is a significant modification of AT. This is developed in the next section.

## 5.2 Karimojong P-Structure

As discussed in §4.3 and following from the findings of Booij (1984, 1988, 1991), the lexical entry is proposed to be constructed within the lexicon in such circumstances that its morphosyntactic structure is created simultaneously with the application of prosodification algorithms, and both the morphosyntactic and prosodic structure are available for phonological rules to apply to. The morphological structure (hereafter M-structure) consists of the morpheme/phoneme string, a meaning, headmarking and encoding of morphophonological level.

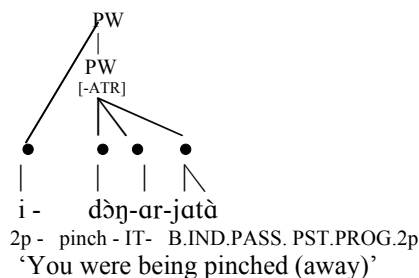
Headmarking is a determinant of the P-structure. Each morpheme contains a phonological head, which is connected to a Prosodic Word (PW) node that can be part of a recursive PW word structure. In the verb root, the phonological head is the leftmost vowel. In each affix, it is the vowel closest to the root vowel. For suffixes, the phonological head is the vowel furthest to the left, while for prefixes it is the vowel furthest to the

right. When more than one vowel in a morpheme participates in harmony, a branching from the phonological head of the morpheme to the remaining vowels in the morpheme occurs. ATR harmony processes occur when an ATR feature percolates from the head vowel in a privileged position to the PW node, and then is subsequently applied to the phonological head in each morpheme connected to the PW node. Transparent prefixes and outer suffixes that do not participate in harmony, though part of the same prosodic word, link to separate PW nodes. No feature percolation occurs in conjunction with their affixation as they are MP Level 3 processes, postulated as Level 2 under rule-based theory (RBT). The non-alternating suffix [-eenen], also infixed on MP Level 3 (RBT Level 2), links to the PW node of the root, after Level 1 and Level 2 feature percolation and spreading processes have applied.

An example with two instances of branching from the phonological head shows the case of TAM marker [atɑ], marking Tenses 1 and 2 of Form B, Passive Voice, shown in (108). The word [i-dɔŋ-an-ar-jatɑ] has two prosodic word nodes, one for the pronominal prefix [i-], which is affixed on MP Level 3 (RBT Level 2) and does not undergo vowel harmony processes, and the other for the verb stem, which does. In the latter case, the [-ATR] feature percolates from the root vowel to the PW node, which is linked to the phonological heads of the affixes to the right, which are underspecified for ATR. The phonological head of [-atɑ] has a branched connection leading to both the head vowel and the second and final vowel of the suffix, both of which have the value [ɑ].

(108) *P-Structure with Branching from the Phonological Head*

/i-/ + /-dɔŋ-/ + /Ar/ + /jAtɑ/ →



(Novelli, 1985:293)

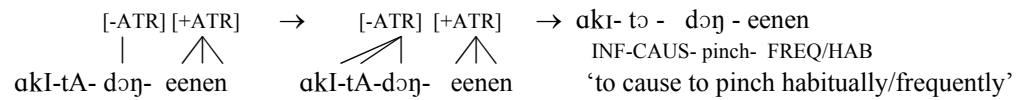
When affixes contain one alternating vowel and other vowels which are transparent, no branching occurs, and transparent vowels have no connection to the PW node. A case of this type is shown in (109), with the word [iki- dɔŋ-ar-(í)tàè] –‘You have been pinched (away)’. Suffix [-tAe] has the first suffix vowel [-A-] as the





already underlyingly specified and associated to a [+ATR] autosegment. The [-ATR] specification of the root vowel spreads to both the infinitive prefix [akI-] and the Class 1 causative prefix [-tA].

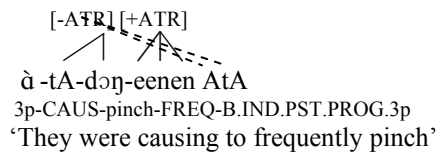
(112) *Neutral Suffix Affixation under Canonical AT*



(Novelli, 1985, p. 315)

This model runs into difficulties when attempting to explain [-ATR] suffixation beyond this frequentive suffix. In (113), the vowels of suffix [-AtA], the Form B TAM marker for the present/past progressive, would receive [-ATR] spreading from the root, but the No Crossing Constraint prohibits the association lines linking the suffix vowels to the [-ATR] autosegment from crossing those linking the vowels of [-eenen] with the [+ATR] autosegment.

(113) *The No-Crossing Constraint and Neutral Suffixes*



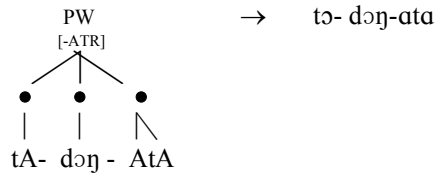
(Novelli, 1985:316)

The alternative is a stratal model of affixation with P-structure shown in (114). Affixes that assume the [-ATR] value of the root vowel under bi-directional root control are proposed to be affixed on a first level and to undergo the corresponding harmony rule. They do so through the percolation of the [-ATR] feature from the node of the root vowel to the prosodic word node, which is then spread to the intermediate nodes of each affix with an underspecified vowel. The [-ATR] specification is then spread to the vowel segments according to their connections to the intermediate node of each affix. The frequentive affix [-eenen] and the third person plural pronominal prefix [a-] are proposed to be infixes on a second level, where ATR harmony processes do not apply (referred to as RBT Level 2). The [-eenen(e)] suffix is affixed between phonological heads and has a separate PW node within the recursive structure. No feature percolation or spreading is associated with its affixation, as it is affixed in an MP Level 3 process. The pronominal prefix [i-] is connected to a separate

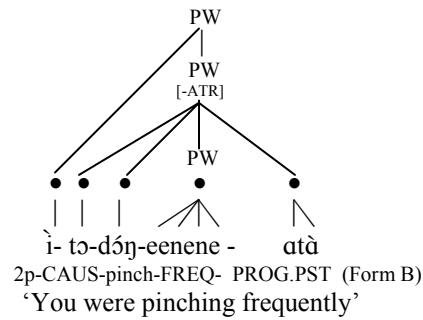
prosodic word node in the recursive structure, as described in §5.1, and it retains its underlying [+ATR] specification without spreading it to other segments.

(114) *Rule-Based Stratal Analysis of [-eenen] Suffixation*

**Level 1 (Output):**



**Level 2:** <ɪ->tɔ- dɔŋ <eenen(e)> atà →



(Novelli, 1985, p. 316)

**5.3.2 [+ATR] Suffix-Controlled Spreading**

Word formation in AT under suffix-controlled leftward spreading requires a stratal analysis to account for neutral affixes. In a serial rule-based framework, root-controlled and suffix-controlled harmony processes are postulated to occur as separate rule applications on the same first level. Neutral pronominal prefixes and TAM markers are affixed on RBT Level 2 and are linked to separate PW nodes in a recursive structure. As shown in previous sections, the frequentive suffix [-eenen(e)] is infix and attached to the PW node of the stem. Initial stages of word formation have affix-level nodes link with the PW node of the stem, and percolation of the ATR specification of the root occurs, resulting in root-controlled spreading. The dominant TAM marker linked to a separate PW node is affixed. Feature percolation to the PW node at the top of the prosodic word hierarchy occurs, and the [+ATR] specification is spread to all of the heads of all of the morphemes affixed up to that point. MP Level 3 morphemes, affixed on Level 2 under RBT, are then incorporated without further spreading.

The first case of such a process is presented in (115) with the derivation of [ɛ-dɔŋ-akin-jo]-‘he/she is being pinched for (the purpose of...)’. The underlying representation of the stem is connected to the affix node which is linked to the PW node. Affixation of [-Akin] on Level 1 creates a linkage between the PW node and the

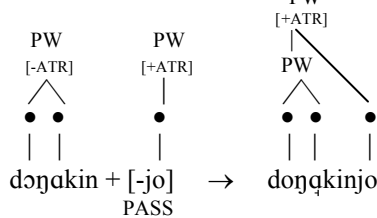
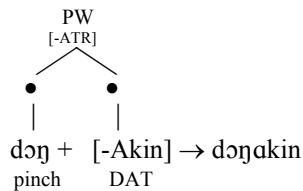
phonological head of the suffix [-Akin]. The [-ATR] specification of the head vowel of the root percolates to the PW node, and to the suffix head. The underlyingly unspecified archiphoneme that receives the [-ATR] specification of the root vowel, and surfaces as [ɑ]. The second Level 1 process is the affixation of passive voice marker [-jo], a dominant suffix with a [+ATR] specification. The affix nodes delink the [ATR] specification from their original PrW node and link with that of the dominant suffix. The [+ATR] feature percolates to the nodes of the other affixes, spreading a [+ATR] specification leftward, a feature changing

(115) *PW Structure under [+ATR] Suffix-Controlled Spreading*

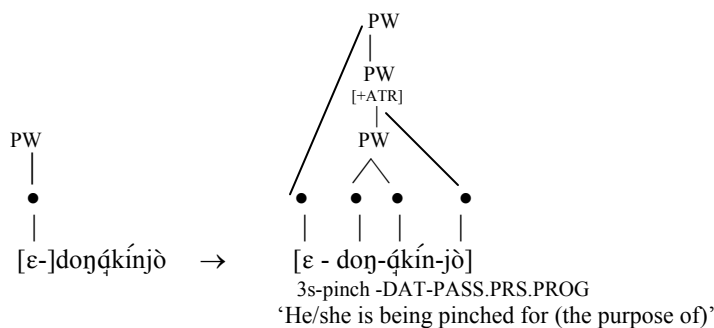
**UR:**



**Level 1:**



**Level 2:**



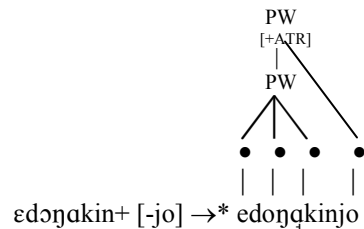
(Novelli, 1985, p. 305)

operation. The [ATR] specification of the root changes from negative to positive. As explained above, the [ɑ] does not alternate with [o] but adopts a more advanced position of the low vowel, changing to [q]. Neutral pronominal [ɛ-] is affixed on RBT Level 2, and undergoing no harmony rules, it retains its underlying [-ATR] feature specification and is linked to a separate PW node within the hierarchy.

That [+ATR] suffix-controlled harmony is a feature-changing rather than a feature-filling process partly explains why a stratal analysis is necessary to derive the correct surface form. In (116), it is shown what would happen were it not so. The pronominal prefix [ε-] would be affixed on Level 1 with alternating suffix [-Akin]. The second process on the same level affixes the passive voice marker [-jo], which would induce a [+ATR] harmony spread leftward. The pronominal prefix would be part of the same prosodic word included in this harmony process, changing the ATR specification of the pronominal prefix to a positive value. This form is unattested, demonstrating in this instance that a horizontal model of affixation and spreading is not a viable one for predicting the surface forms of Karimojong verbs.

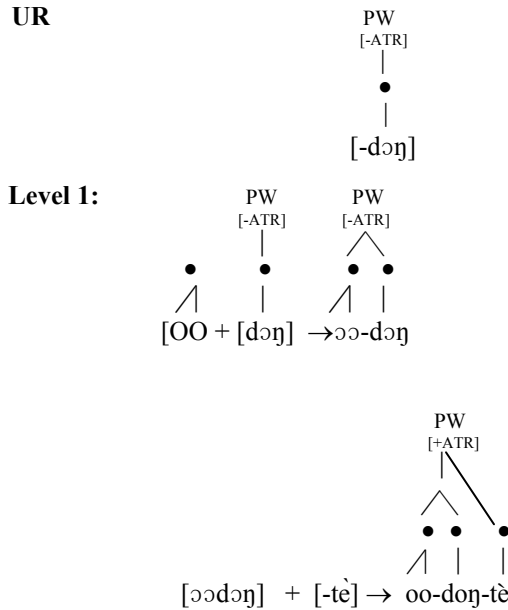
(116) *Non-Stratal Analysis with Pronominal Prefixation*

[ε-] + dɔŋ + [-Akin] → εdɔŋakin



Those cases in which the pronominal prefixes do alternate, such as the Narrative Mood constructions discussed in 3.3.1.1.1 and 4.2.1, affix the pronominal prefix on RBT Level 1, subjecting it to ATR harmony processes. An example is shown in (117), with [oo-dɔŋ-eenen-tè] - ‘...and I/we have/had frequently pinched’ which also includes a neutral frequentive suffix. Alternating pronominal prefix [ɔɔ-] is never pre-linked to a separate PW, but possesses an underlying [-ATR] value. It links to the PW node of the root. Affixation of the perfect tense marker [-tè], a [+ATR] dominant suffix that links to the same PW node, allows percolation of the [+ATR] feature, which spreads leftward, changing the specifications of the phonological heads linked to the PW node of the stem to positive values. The neutral frequentive suffix is affixed on RBT Level 2, and though it shares the same [+ATR] specification, as in (114), it is also linked to the PW of the root, with vacuous phonological effects.

(117) *Suffix-Controlled Harmony: Alternating Pronominal Prefix and Neutral Frequentive Suffix*



**Level 2** [oo-dɔŋ-te] + [-eenen-] → oo-dɔŋ-eenen-tè  
 1s/p.NAR-pinch-A.IND.NAR.PRF.PST  
 ‘...and I had frequently/habitually pinched.’

(Novelli, 1985, p. 315)

**5.3.3 [-ATR] Suffix-Controlled spreading**

The theory must be able to explain those cases exceptional to the regular affixation and spreading processes of Karimojong verb paradigms. Regular cases of [+ATR] bidirectional spreading from the root are shown in (118-a,b). The [+ATR] values of the root vowels in [ákì-bú] - ‘to knock down’ and [ákì-tùle] - ‘to blow on fire’ spread leftward to the archiphoneme [-I] of the infinitive prefixes, giving them positive values in both cases. The rightward spread of the same ATR specification gives the archiphoneme of suffix [-Ar]- ‘away

(118)	<u>Infinitive</u>	<u>[-Ar] ‘away from’</u>	<u>[-Un] ‘toward’</u>	<u>Gloss</u>
a.	ákì-bú	ákì-bú-or	ákì-bú-ùn	‘to knock down’
b.	ákì-tùle	ákì-tùle-or	ákì-tùle-ùn	‘to blow on fire’
c.	ákí-dóŋ	ákí-dóŋ-ɔr	ákí-dóŋ-ùn	‘to castrate’
d.	ákì-dó	ákì-dó-ðr	ákì-dó-ùn	‘to produce, deliver a child’
e.	ákĩ-ŋú	ákĩ-ŋú-ðr	ákĩ-ŋu-ùn	‘to sniff’
	f. ákĩ-ŋú-ón-ðr		g. ákĩ-ŋú-ón	

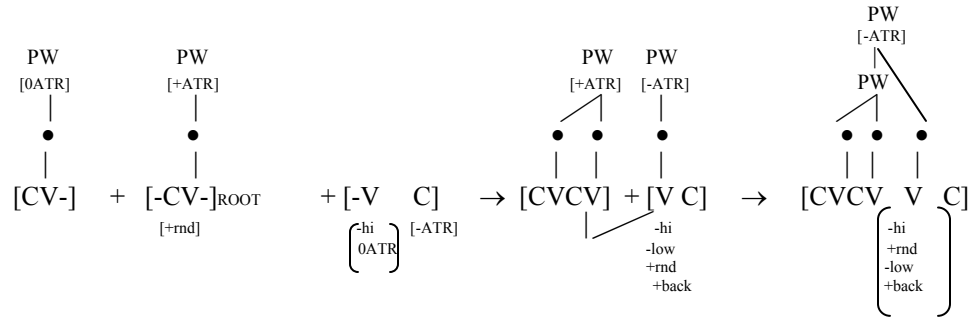
(Novelli, 1985: 218-220)

from' the positive value for both verbs. Likewise, for suffix [-Un] 'toward', the archiphoneme is converted to [u], indicating the rightward spread of the [+ATR] specification of the root.

Nonetheless, examples (118-c,d) show a different pattern for the suffixation of [-Ar], which differs not only from the regular pattern of the previous two verbs, but from the regularity shown in their own suffixation of [-Un]. Suffix [-Ar] assumes a [-ATR] value, the vowel [ɔ], an irregular variant for this suffix which normally displays the vowel [ɑ] as its [-ATR] value. In addition, the [-ATR] value spreads leftward, changing the ATR specifications of the root vowels and of the infinitive prefixes from positive to negative values for both verbs. Hence, 'to castrate away from' becomes [ákí-dóŋ-ɔr], and 'to deliver a child away from' [ákì-dó-ɔr], with all vowels bearing a [-ATR] specification. In example (118-e), the [-ATR] feature influences the vowel of the suffix, but the leftward [-ATR] harmony process is blocked by the [+ATR] adjacency effect on [u] from the preceding voiced consonant [ŋ]. This is seen by the form in (118-f), in which spreading extends to the frequentive suffix [-on], but stops at the root vowel. Yet, no [-ATR] feature appears the specification of the suffix [-Un], nor does it affect affixation of [-on] in the absence of suffix [-Ar] as seen in (118-g), indicating that the rhotic is the source of the alternation. As suggested in §4.1, the causes for this phenomenon are proposed to be a vowel merger and V + [r] interaction (which may influence one another). Tongue retraction occurs in the pronunciation of rhotic consonants (Recasens & Espinosa, 2002; Recasens, personal communication), and this can be proposed to generate a [-ATR] feature. The [-ATR] feature participates in a localized spreading process, which is bidirectional and dominant over root vowel specifications, but as shown in §3.2.2, is in turn dominated by [+ATR] spreading from dominant TAM markers.

When licensed, the [-ATR] feature generated by tongue retraction is parsed by the vowel of the suffix [-Ar], which has also received the remaining feature values of [o] from the [+ATR] spreading from the root, converting the suffix archiphoneme into the [-ATR] vowel [ɔ]. This process is shown in rule formalism, in (119). The CV- prefix with its underspecified vowel is affixed to the root which has a [+ATR] dominant vowel and a [-ATR] feature. Affixation of a suffix with feature values generated by the root controlled process (for [o]) occurs. The dominant root vowel also spreads the [+ATR] feature to the prefix vowel. This suffix has a [-ATR] specification and is dominant, and therefore aggressively spreads its [-ATR] specification leftward, changing the specifications of the root and the prefix vowels to negative ATR values.

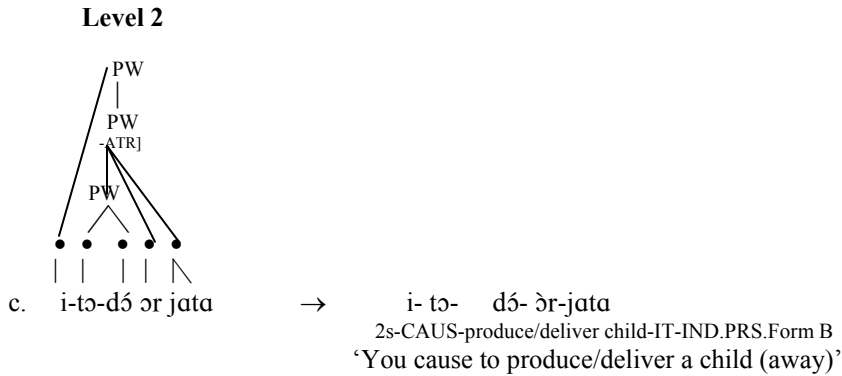
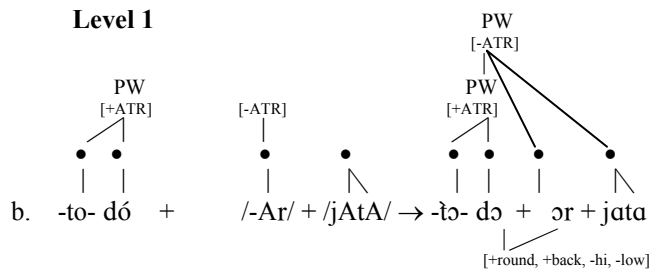
(119) *Affixation Process with [-ATR] Spreading*



An attested example is shown in (120) with the word [i-tə-dó-ðr-jata]. The underlying representation appears in (120-a). Example (120-b) shows Level 1 affixation and spreading process. The verb [áki-dó] -‘to

(120) *[-ATR] Suffix-Controlled Spreading*

a. UR /i/ + /-tA-/ + /do/ + [-ATR] + /Ar/ + /jAtA/

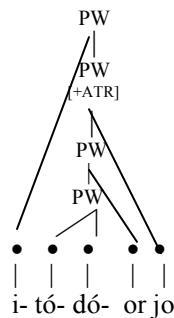


(Novelli, 1985: 218,411)

produce/deliver a child’ spreads its [+ATR] specification to the causative prefix [tA-] in a root-controlled leftward spreading process, which in the canonical case, would be bidirectional. The feature round is also spread to the itive affix to the right, but does not spread to the TAM marker, which is already specified for the feature [-round]. Additionally, the [-ATR] feature is licensed by the root to be parsed by the [-Ar] suffix. The [-ATR] feature percolates to a new dominant PW node and spreads leftward to heads of the root vowel and the

causative prefix, effecting a feature change, and rightward to the vowels of the TAM marker unspecified for ATR. Example (120-c) shows the Level 2 affixation of the neutral pronominal prefix [i-], which creates another PW node with vacuous phonological results. In cases where a [+ATR] TAM marker is affixed after [-ATR] harmony has applied, the phonological head of the TAM marker creates a hierarchically higher node, spreading its [+ATR] feature and overriding the [-ATR] spreading from the [-ɔr] suffix. Such a case with [i-tó-dó-or-jo], shown in (121).

(121) [+ATR] Suffix Control Supersedes [-ATR] Suffix Control



That the prosodic structure is utilized by phonological processes rather than a generating factor is shown in those cases in which the domain restrictions on [-ATR] spreading are evident. The form [akidəŋəɔr]-‘to castrate frequently (away)’ is derived from the [+ATR] verb [akidoŋ]. The vowel [i] of the infinitive prefix bears a [+ATR] specification derived from an initial root-controlled harmony process. This was not overridden by [-ATR] spreading, which altered the specification of the root vowel, because the spreading domain has a maximum of two syllables. Hence, in rule-based theory, the [-ATR] spreading process is governed by the rule in (122). The feature [-ATR] of the rightmost vowel preceding consonant [r] will spread for two vowel position slots to the left of the head vowel.

(122) Domain Restriction on [-ATR] Suffix-Controlled Spreading

$$V \rightarrow [-ATR] / \text{ \_\_\_ } C_0 \text{ \_\_\_ } C_0 V r_{[-ATR]}$$

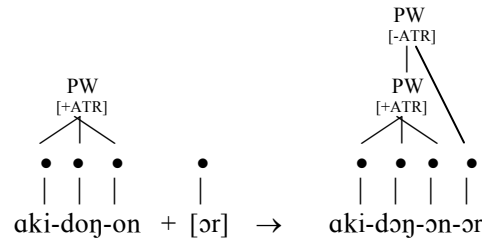
The derivation of [akidəŋəɔr] proceeds as in (123). In RBT it is carried out entirely on Level 1. Before the suffixation of [-ɔr], bidirectional root-controlled harmony spreads the [+ATR] feature specification to the

archiphonemes of infinitive prefix [aki-] and frequentive suffix [-ɔr]. The dominant PW node bears a [+ATR] feature specification. The affixation of [-ɔr] with the dominant [-ATR] feature generates a new dominant node

(123) *Prosodic Structure in [-ATR] Spreading with Domain Restriction*

**UR** /aki/ + /doŋ/ + /An/ + /ɔr/

**Level 1**



with a [-ATR] feature, which spreads only as far as the limits of the domain specified in (119). Hence the vowel [-i] in the infinitive prefix [aki-] retains its [+ATR] specification, while the root vowel and the frequentive suffix vowel receive the [-ATR] specification of the dominant suffix.

Thus, irregular forms resulting from vowel mergers and V + [r] interactions can be adequately described in terms of the interaction of autosegmental principles with prosodic structure. They are explained theoretically as the result of a [-ATR] feature generated by a V + r coarticulation process licensed by the lexical entry. The feature values of [o] that were supplied by the default [+ATR] spreading from the root combine with the [-ATR] feature to provide featural content to the archiphoneme of the [-Ar] suffix, changing its value to [ɔ], and creating a dominant suffix which spreads its [-ATR] specification bi-directionally. This is effected within the P-structure by creating a dominant PW node. The [-ATR] suffix-controlled process supersedes root-controlled harmony, but is itself superseded by suffix-controlled [+ATR] harmony in cases where a [+ATR] TAM marker is subsequently affixed.

## 5.4 Adjacency Effects

### 5.4.1 *The Consonant/ [+ATR] Adjacency Effect*

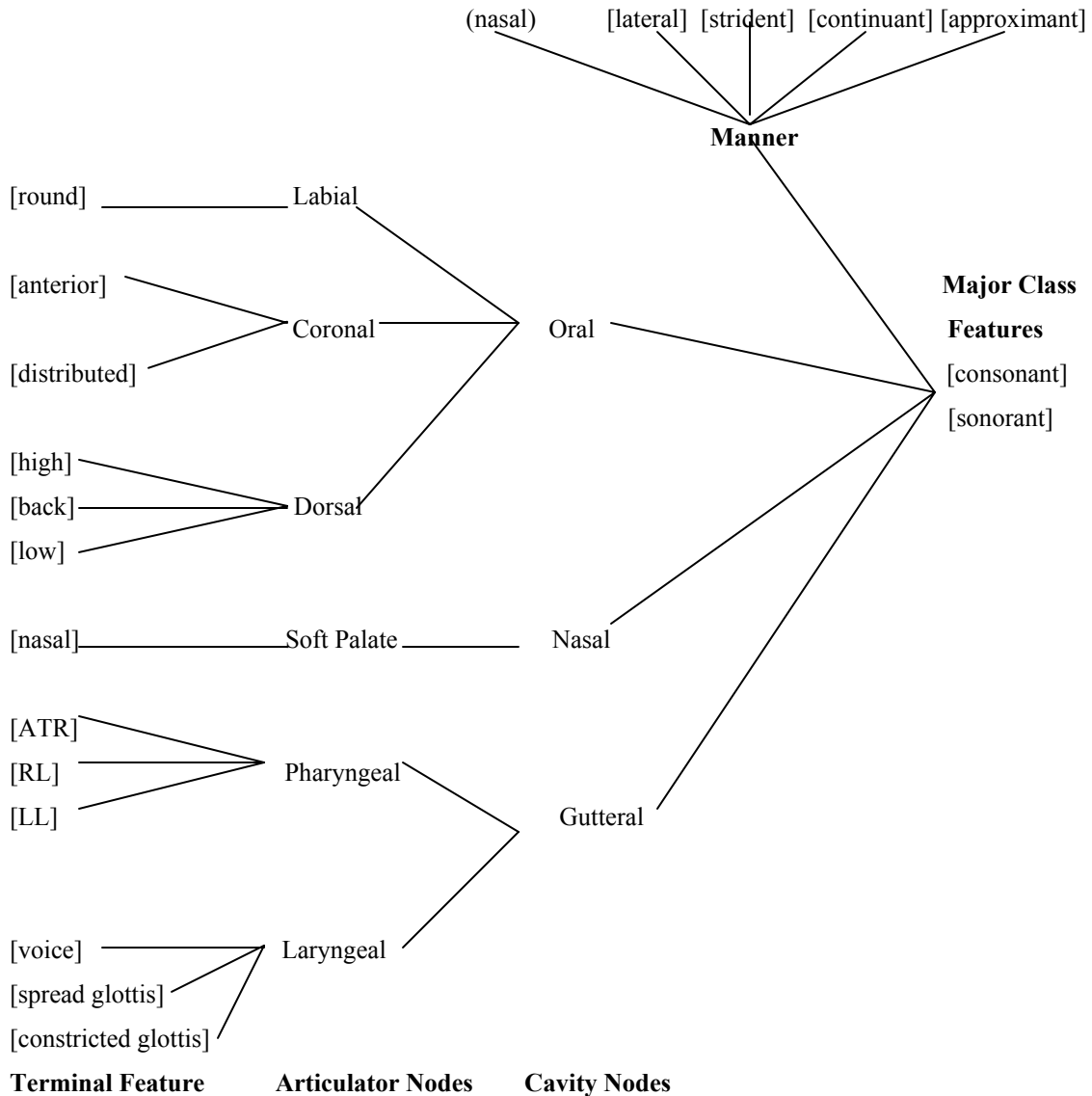
The first adjacency effect described in §2.7 involves an apparent spread of a [+ATR] feature from the consonant coda of rightmost syllable of the root to the initial high vowel of an alternating suffix which is unspecified for ATR. Voiced obstruent stops are phonetically [+ATR], evident from J.R. Westbury's (1979) X-

ray tracings of voiced obstruent stops in English, and if they affect the specification of following vowels they may be considered phonologically [+ATR] (Trigo, 1991). Though across the world's languages such stops may devoice upon closure, there are several strategies that speakers use to maintain voicing, which occur in the articulation of consonant clusters and VCV sequences. The continuation of vocal fold vibration occurs through a drop in pressure of the supraglottal cavity. This relative drop in pressure is produced by enlarging the cavity, which can be accomplished by the advancing the tongue root or opening the velopharyngeal port (Westbury, 1983). The proposal here is that this is accomplished through tongue root advancement as a coarticulation strategy which is 'cognitive and acquired' (Bermudez-Otero, 2007: 499; Keating, 1988: 287-288; Pierrehumbert, *et al* 2000: 285-286). In cases where the consonant coda is nasal, the opening of the velopharyngeal port that is concomitant to producing the nasal sound is apparently a supplementary effect that heightens the continuation of voicing, as in Karimojong, a [+ATR] specification spreads from the voiced velar nasal to the adjacent high vowel unspecified for ATR.

Nonetheless, there are articulatory grounds for why this occurs only when the following vowel is [+high], and for proposing that it constitutes a secondary articulation for the consonant coda. When the vowels following the voiced consonant are low or mid, the degree of closure is reduced, as the position of the tongue is lower and mouth opens wider. Therefore the size of the supraglottal cavity increases with the pronunciation of these vowels, allowing for the continuation of voicing. The pronunciation of high vowels causes the tongue to raise and to reduce the size of the cavity. The tongue root is advanced to compensate for this and to allow voicing to continue, and this can be interpreted as a secondary articulation of the consonant.

Under rule-based theory, a framework must be defined to provide both an explanation for an ATR specification on a consonant, and the latitude for consonant-vowel interactions. This can only be done under a proposal that defines feature combinations and restrictions on them beyond the consonant-vowel dichotomy suggested by AT in its simplest form. Feature geometry (Clements, 1985, 1987, 1991; Sagey, 1986; Halle, 1992, McCarthy 1988, 1991, 1994; Dinnsion, 1998), hereafter known as FG, proposes the organization of features in a hierarchical tree structure, with the intention of allowing groupings that reflect any and all natural classes, to account for spreading phenomena. The tree has nodes representing the primary places of articulation—called articulator nodes (Sagey, 1986) and what are termed manner and stricture features —lateral, strident, continuant, approximant and nasal. This hierarchy has at the top the major class features—[±consonantal],

(124) *General Feature Geometry Model*<sup>38</sup>



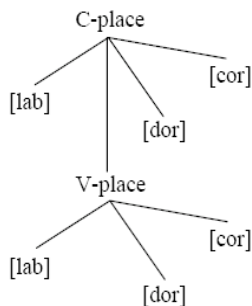
which distinguishes consonants from vowels and glides, and  $[\pm\text{sonorant}]$  to distinguish vowels and sonorant consonants from obstruents. Nasals and liquids would be both  $[\text{+sonorant}]$  and  $[\text{+consonantal}]$ . The feature  $[\pm\text{approximant}]$  (Clements, 1987) is used to distinguish nasals and liquids—liquids have positive values for this feature while nasals are negative—and to allow liquids and glides to pattern together as a natural class. The inclusion of the  $[\text{approximant}]$  feature and of grouping it with other features in a special Manner node has been confirmed by language acquisition work by Dinnsion (1998). Some proposals (Clements, 1987; Sagey, 1986)

<sup>38</sup> Based on research in Dinnsion (1998), Halle (1992), McCarthy (1994), Trigo (1991).

group the major class features and the manner and stricture features together. Other models, such as Halle (1992) include nasal as one of the cavities under which the soft palate figures as the articulator node. A general schema of a feature geometry model based on the research cited above is shown in (124), with the feature [nasal] appearing as a terminal feature under the soft palate articulator node and in the constituent grouping of Manner Features.

There are numerous proposals within this framework to account for spreading phenomena in the world's languages. Useful in accounting for the C/[+ATR] adjacency effect in Karimojong is that of Clements (1991a). It proposes a single set of features characterizing the places of articulation for both consonants and vowels, thereby accounting for spreading relationships between them and providing a clear explanation for primary and secondary articulations. Every segment, consonant or vowel, has a C-place and a V-place under which cavity and articulator nodes and their terminal features are grouped. The V-place node is placed under the C-place node in both types of segments. This is illustrated in example (125), which shows a diagram of Clement's conception of C-place and V-place for Oral Cavity features taken from Moren (2003).

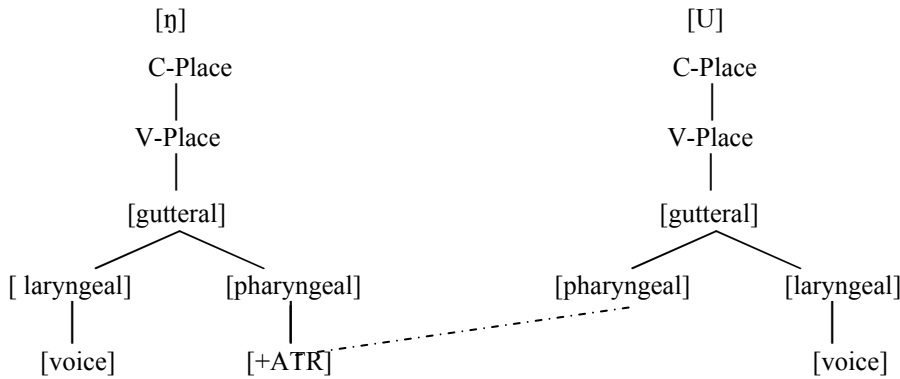
(125) *Clements' FG Model for Consonantal and Vocalic Place with Oral Cavity Features*



The voiced consonant / [+ATR] adjacency effect is explained by the spreading of a [+ATR] terminal feature from the pharyngeal node under the V-place of the voiced consonant coda to the V-place pharyngeal node of the vowel underspecified for ATR. This is schematically presented in example (126).

The attachment of the V-Place node as a subtree under C-place predicts that the spreading a V-place feature from one vowel to another across a consonant will be blocked when the consonant is specified for the feature or feature set as a secondary articulation, but not as a primary one. (Kenstowicz, 1994). This is exactly what happens in Karimojong. The guttural node—voicing and tongue root specification—regularly spread across voiced consonant codas in the [-ATR] case. It is only when the guttural node features are expressed as a

(126) *[+ATR] Feature Spread from Voiced Consonant to Underspecified Vowel*



secondary articulation that this spreading is blocked. As noted by Kenstowicz (1994), this prediction regarding primary and secondary articulations remains to be systematically studied. A study of the relationship between consonant voicing continuance and ATR feature could shed light on this theoretical issue and the validity of the C-Place/V-Place proposal within the FG framework.

**5.4.2 [ATR] Dissimilation**

The second adjacency effect described in §2.7 is where a [-ATR] vowel before suffixes beginning with [a] and followed by a coronal consonant become [+ATR]. It is proposed that this occurs due to adjustments by the speaker for the ease of perception by the listener, and is not a “blind” phonetic effect. In rule-based theory, it can only be represented as the descriptive rewrite rule in (127).

(127) *ATR Dissimilation Rule*

$$V \rightarrow [+ATR] / \text{---} \left( \begin{array}{c} \text{V} \\ +\text{low} \\ +\text{back} \\ -\text{ATR} \end{array} \right) \text{C}_{[+\text{cor}]}$$

**5.4.3 Adjacency Effects and Rule Ordering**

Within a serial rule framework, the rules executing the adjacency effects are ordered as occurring on RBT Level 1 after harmony processes have applied. A derivation with the Voiced Consonant / [+ATR] adjacency effect appears in example (128). The verb [ɛ -tɔ-dóŋ-ùŋ] - ‘he causes to pinch frequently’ is derived on two levels due to the neutrality of the pronominal prefix [ɛ-] under ATR harmony rules. The first step of the derivation is the affixation of the causative prefix [-tA-] and the frequentive suffix [-ùŋ]. Bidirectional root-

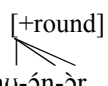
controlled harmony causes the underspecified archiphonemes in each suffix to assume [-ATR] specifications. Then, the Voiced Consonant/ [+ATR,hi] adjacency rule applies, changing the [ʊ] of the frequentive suffix to [u]. On Level 2, pronominal prefix [è-] is affixed, and does not undergo any change in its ATR specification as harmony rules do not apply on the second level.

(128) *Derivation with Voiced Consonant/[+ATR] Adjacency Effect*

[è - <b>ṭṭ</b> - <b>ḍḍ</b> ḡ- <b>ùn</b> ] - ‘He causes to pinch frequently.’	
<b>UR :</b> [- <b>ḍḍ</b> ḡ]	
<b>Level 1:</b> [tA] + [- <b>ḍḍ</b> ḡ] + [-Un] →	Derivational affixation
<b>-ṭṭ-ḍḍḡ-<u>un</u></b>	Bidirectional Root-Controlled Harmony
<b>-ṭṭ-ḍḍḡ-<u>ùn</u></b>	Consonant / [+ATR] Adjacency Effect
<b>Level 2:</b> [è-] + [- <b>ṭṭ-ḍḍḡ-ùn</b> ] →	Pronominal Prefix Affixation
[è - <b>ṭṭ-ḍḍḡ-ùn</b> ]	
3s-CAUS-pinch-FREQ	
‘He causes to pinch frequently’.	

A derivation with the [ATR] Dissimilation Effect is carried out in (129). The verb [áki-ḡu-ḍn-ḍr] -‘to frequently sniff (away)’ shows dominant [-ATR] lexically-specified suffix-controlled harmony (see §5.3.3), which would otherwise cause the surface form of the root vowel to assume a [-ATR] specification. On Level 1,

(129) *Derivation with [+back]/[ATR] Dissimilation Effect*

áki-ḡu-ḍn-ḍr - ‘to frequently sniff (away)’	
<b>UR :</b> [-ḡu-]	
<b>Level 1:</b> [áki-] + [-ḡu-] + [-An] + [-Ar] + [-ATR] →	Derivational affixation
<div style="display: inline-block; vertical-align: middle;">             [+round]   </div> áki-ḡ <u>u</u> -ḍn-ḍr	Lexically specified suffix-controlled harmony, Roundness Harmony
áki-ḡ <u>u</u> -ḍn-ḍr	[ATR] Dissimilation Rule
<b>Level 2:</b> ∅	
[áki-ḡu-ḍn-ḍr]	
INF-sniff-FREQ-IT	
‘to sniff frequently away’	

(Novelli, 1985: 234)

infinitive prefix [ɔ́kɪ-], the frequentive suffix [-An], and the itive suffix [-Ar] are affixed to the root [-ŋu-], and the lexically-licensed [-ATR] feature is parsed by the vowel in the itive suffix. The [-ATR] specification spreads leftward as far as the root vowel, changing it to [u], which is shown underscored in the example. Then, the [ATR] Dissimilation Rule applies, changing the root vowel to [u]. There is no Level 2 affixation for this form, and the surface form is the result of Level 1 morphological and phonological processes.

### **5.5 Rule-Based Autosegmental Theory: Conclusions Regarding the Karimojong Case**

The stipulations and machinery of RBT/AT applied to Karimojong are only able to describe the surface forms of its verbs as long as major theoretical proposals are permitted to modify the theory. It is necessary to propose a headed structure and a system of feature percolation, employ a stratal variant of the theory and supplement it with an FG framework to account for all phenomena impacting ATR specification. The inability of AT alone to account for more complex structure of the ATR harmony system in the language should be considered a weakness of the theory.

Under RBT/AT, feature-filling processes are seen as inherently motivated. Yet, there is no theory-internal explanation regarding the motivation for feature changing rules. Theoretical explanations for the directionality of spreading, available in constraint-based theories, are lacking in RBT. Generative rules written in such instances across the world's languages must be regarded as merely descriptive of surface forms without any justification as to their cause. This should be regarded as another weakness in the theoretical proposal.

RBT/AT proposes to accommodate the three morphophonological levels in the language within two levels of morphophonological structure, one in which harmony processes occur, and another where they do not. . The determination of what constitutes a level is dependent upon the application of phonological rules, and what is permissible under a given theory. Rule-based AT allows serial processes of affixation and the cyclical application of phonological rules on each level, and with regard to ATR harmony, levels are separated according to phonological domains of application. Hence, rule-based theory allows two ATR harmony rule applications to occur on one level, and a second level is defined where no ATR harmony rules apply. The confusion regarding what constitutes a level may be built into the theory, and an infinite number of rule applications could logically be placed on a single level. As debates have raged regarding the number of lexical

levels existing in a given language, it may be time to recognize that the theory requires further improvement in this regard.

As will be seen in Chapter 6, Stratal Optimality Theory cannot allow more than one serial step per level, although constraint interactions may permit more than one harmony process to apply. What were defined as three morphophonological levels in §4.3 become three strata under Stratal Optimality Theory. As a starting point for the optimality-theoretic analysis, an introduction to the theory follows in the next section.

## **6.0 Optimality-Theory and Karimojong ATR Harmony**

This chapter presents the basic principles of Optimality theory and the constraint hierarchy that accounts for the ATR harmony and adjacency effects in Karimojong. It is shown through the ranking argument and subsequent tests of the applicability of the parallel model that serial rather than parallel derivation best accounts for attested forms in Karimojong verbs. The presentation of basic principles begins in §6.1, followed a discussion of the AGREE constraint family and the proposal of a specific AGREE constraint in §6.2. The ranking argument for the stratal model is carried out in §6.3. Tests of the parallel model and a discussion of the validity and applicability of alternative derivation strategies are carried out in §6.4.

### **6.1 Basic Principles of Optimality Theory**

#### ***6.1.1 The Grammar***

Optimality theory is based on the supposition that the grammar (phonology) of every language consists of a hierarchy of violable constraints, in which lower-ranking constraints are allowed to be violated in order to respect the conditions imposed by higher ranking, dominant constraints. A unique ranking of these constraints within a hierarchy for every language or dialect accounts for its specific characteristics. The constraints stem from universal grammar (UG), each one of which has the potential to determine the most harmonic output for a given language.

The constraints are of two types, representing two conflicting forces inherent in the construction of a language grammar. The first type is the markedness constraint. Markedness is a category for evaluating language structure. Unmarked structures are preferred cross-linguistically, and are often basic in most grammars. Marked values tend to be avoided universally but are adopted by grammars to create contrasts within languages, and account for language-specific characteristics. Markedness may be expressed as a continuum of features arranged according to degrees of markedness. Markedness constraints govern marked features in specific languages and language types.

The second type of constraint is the faithfulness constraint. Faithfulness can be seen generally as the extent to which an output is reflective of the lexical input, with general pressure to preserve as closely as possible the lexical contrasts encoded in the basic forms, resisting factors that reduce markedness. Every language needs to preserve the lexical contrasts encoded by sound oppositions to preserve semantic content.

An OT grammar is an input-output device that evaluates the plausibility of an output form based on the input form and the ranked hierarchy of constraints. The component that maps the input form to an infinite possibility of output forms and which is responsible for generating all possible output candidates is called the Generator, abbreviated as GEN. The second component has the task of evaluating the output candidates based on the constraint ranking inherent to the language, and this is termed the Evaluator, or EVAL. As is the case with most modern grammatical theories, the LEXICON contains the lexical representations, or underlying forms, of the morphemes in the language and is the source of the input representations. By the principle of Richness of the Base, there are no constraints at the level of underlying forms; nonetheless, to prevent an infinite possibility of underlying forms, the principle of Lexicon Optimization is also at work, in which the forms that are closest to the output forms are those that appear as input forms.

A constraint ranking has dominance relations that follow the Principle of Transitivity, which states: Where C1, C2 and C3 are constraints in a given hierarchy, if C1 dominates C2, and C2 dominates C3, then C1 dominates C3. These dominance relations play a key role in maintaining order in the hierarchy, which stands throughout the evaluation process of candidates.

### ***6.1.2 The Evaluation Process***

In standard parallel OT, the evaluation process is ruled by four basic principles (Kager, 1999; McCarthy, 2003): Economy, Strict Domination, Parallelism and Globality.

The Principle of Economy applied to candidates states that banned options are available to avoid violations of higher-ranking constraints, in other words, to define variants of the underlying form in terms of the dialectic of faithfulness vs. markedness. Those candidates containing constraint violations not necessitated by the demands of the higher-ranking constraints are rejected.

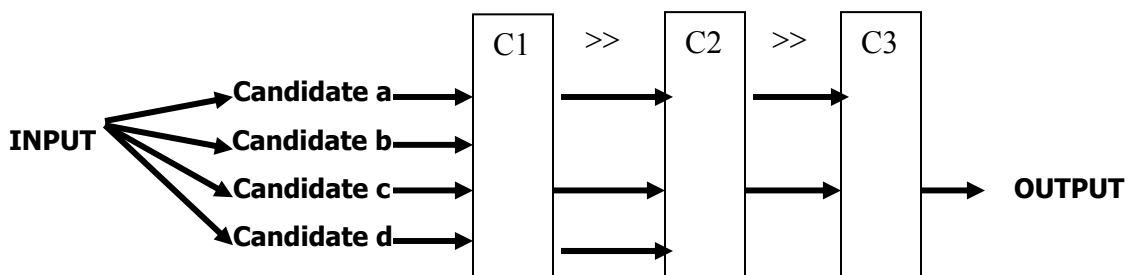
The Principle of Strict Domination states that the violation of higher-ranked constraints cannot be compensated for by the satisfaction of lower-ranked constraints. Once a higher-ranking constraint has been violated, the candidate is out of the running, independently of the number of lower-ranking constraints it may satisfy. The only exceptions are cases where *all* candidates violate the high-ranking constraint. In such cases, *gradient* violations occur, in which candidates violate the same constraint in more than one instance. The winning candidate would be that which violates the highest ranking constraint the fewest number of times.

The Principle of Parallelism stipulates that all constraints pertaining to a structure interact in a single hierarchy. The evaluation of candidates is said to occur in parallel, in that all candidates are evaluated by the hierarchy of constraints simultaneously. This is the most controversial principle in the case of complex output forms, as in Karimojong, where the extensions of phonological domains do not include the grammatical word in its entirety, or in cases of opacity, defined as the apparent concealment of previous rule applications in an output form, for which parallel OT uses a number of explanatory strategies with varying degrees of success. Among these strategies are: Sympathy Theory, Output-Output Correspondence and Uniform Correspondence the analyses of which appear in sections 6.4.2 through 6.4.4 for the Karimojong case.

Under the Principle of Globality, a language-particular constraint hierarchy H applies to every candidate of every possible phonological output of that language. Each candidate is evaluated for every aspect of its well-formedness.

A model demonstration of the process of evaluation, under the abovementioned principles is shown in (130). In this example, the principle of economy has restricted possible output candidates to four, all of which pass through the constraint hierarchy. Candidate (b) crucially violates C1, and so is no longer considered. The rest of the candidates pass to C2. Candidate (d) crucially violates C2 and is eliminated from consideration. This leaves Candidates (a) and (c) to pass to C3. Candidate a crucially violates C3, and is eliminated. Candidate (c) is the output candidate, not having violated any of the constraints. Under the principle of globality, constraints C1, C2 and C3, as part of the grammar, have to appear in the definition of every output form in the language.

(130) *Evaluation Process*



(Kager, 1999)

The proposal that the structure of a given form is based on a one-time evaluation and selection process greatly simplifies the explanation of how the sound structures of forms in a language are produced. Nevertheless, there are cases in which serial rather than a parallel evaluation and selection process better accounts for the forms in a language. As noted in Chapter 4, the facts of the Karimojong language are indicative of a serial process. In Sections 6.3 through 6.7, this assertion will be examined in light of an Optimality-Theoretic framework.

There is a variety of constraint systems which have been developed to account for the data in vowel harmony systems (Kramer, 2001). While the system of Featural Alignment (Akinlabi, 1994, 1996) was specifically proposed to address phenomena in African languages, the imperfect alignment of the harmony domain with the edges of the PW or of a sum total of grammatical category (GCat) units in Karimojong make this system an imprecise analytical tool. The proposal of the hierarchically organized recursive PW structure with feature percolation in §5.2 allows for a more straightforward constraint system. The constraint system to be employed is the AGREE family (Bakovic, 2003), which will be used to stipulate agreement in ATR specification between phonological heads and their dominant PW node.

## 6.2 AGREE Constraint Family

The format of an AGREE constraint is defined by Bakovic (2003) ensures agreement of adjacent segments.

This general definition follows in (131), where *hf* refers to ‘harmonic feature’.

(131) *General AGREE constraint*

AGREE<sub>[±hf]</sub>: Adjacent segments have the same value of [±hf].

(Bakovic, 2003)

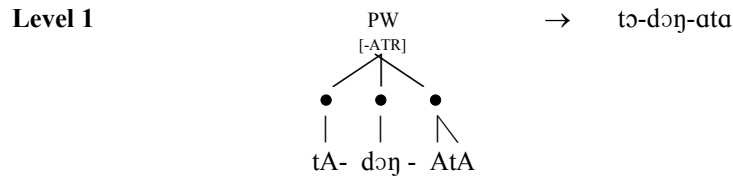
Nevertheless, within the PW word structure in Karimojong, feature percolation occurs from the head of the PW node. An AGREE constraint for ATR alternations in Karimojong must stipulate agreement between the feature specifications of the phonological heads with the dominant PW node. This modification of the basic AGREE format is proposed in (132).

(132) *PW Head Agreement*

AGREE [<sub>α</sub>ATR, Hd, PW]: The ATR specification of every phonological head has the same value as its dominant PW node.

An illustration of the stipulations of this constraint is shown in the Level 1 process (133). The [-ATR] specification has percolated from the head of the root vowel to the PW node. The ATR specifications of all the heads in the PW must agree in value, and therefore must all be ATR. The resulting output is [tɔ-dɔŋ-ɑtɑ].

(133) *Action of AGREE* [ $\alpha$ ATR, Hd, PW]



AGREE [ $\alpha$ ATR, Hd, PW] is one of several violable constraints within a hierarchy that determines the final shape of output forms. The ranking argument is developed in the next section.

### 6.3 General Ranking Argument

A ranking argument for standard forms of the three types of harmony found in Karimojong verbs will be constructed in this section. Bi-directional root control is explained in §6.3.1. Suffix-controlled processes in the [-ATR] and [+ATR] cases follow in §6.3.2 and 6.3.3 respectively.

#### 6.3.1 Bi-directional Root-Controlled Harmony

As shown in §3.1 and 3.2.1, bidirectional root-controlled harmony spreads a positive or negative ATR specification of the root vowel to the left and right. The underlying assumption within this OT analysis is that the recessive affixes receiving the ATR specification from the root are underlyingly underspecified, while that of the root vowel is specified. Spreading from the root vowel follows from the AGREE constraint in (132), which stipulates agreement between the feature [ $\alpha$ ATR] that percolates to the PW node and those of the phonological heads. Any optimal candidate with harmony violates IDENT I-O [ $\alpha$ ATR], defined in (134), when the unspecified alternating suffix input adopts the [ $\alpha$ ATR] feature of the root, causing its output feature specification to be distinct from that of the input.

(134) IDENT-IO [ $\alpha$ ATR]: Let  $\beta$  be an output segment and  $\gamma$  the input correspondent of  $\beta$ . If  $\beta$  is [ $\alpha$ ATR], then  $\gamma$  must be [ $\alpha$ ATR].

This begins with the form output form [ákìdónj]-‘to castrate’ in a ranking tableau in (135). The input form is /ákI-dónj/, since the vowel of the infinitive prefix, as noted above, is underlyingly underspecified. The tableau demonstrates that AGREE [ $\alpha$ ATR, Hd, PW] is crucially ranked over IDENT-IO [ $\alpha$ ATR]. Candidate (b) crucially violates AGREE [ $\alpha$ ATR, Hd, PW] as the ATR value of the head of the alternating prefix does not align with that of the PW node. Candidate (a) is aligned, but violates IDENT-IO [ $\alpha$ ATR] as harmonizing the [ATR] value of the prefix with that of the root, violating faithfulness to the input. The winning candidate and attested form, Candidate (a), demonstrates root control of the ATR specifications of the PW and leftward spreading.

(135) *AGREE* [ $\alpha$ ATR, Hd, PW] >> *IDENT-IO* [ $\alpha$ ATR]

PW /ákI-dónj/ – ‘to castrate’	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT-IO [ $\alpha$ ATR]
<p>a. ákì - dónj</p>		*
<p>b. ákI - dónj</p>	*!	

As vowels underspecified for ATR never appear in Karimojong outputs, yet exist in input values, a constraint governing this must be expressed within the analysis. Hence, the constraint INTERPRETABILITY [ATR] in (136) requires vowels to bear specification for tongue root position. To block underspecified vowels from the surface form, it must be highly ranked. The constraint ranking and corresponding tableau are shown in (134).

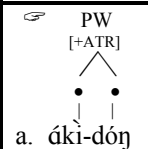
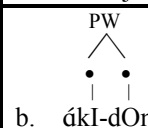
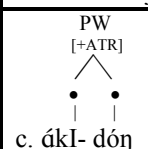
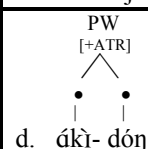
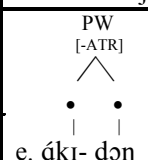
(136) INTERPRETABILITY [ATR]: All vowels must bear a specification for tongue root position.

(Pulleyblank, 1997)

In (137) appears the derivation of /ákI-dónj/-‘to castrate’, in which the prefix vowel is underspecified. The attested output form, Candidate (a) is indicated to be the optimal form when INTERPRETABILITY [ATR] is crucially ranked over AGREE [ $\alpha$ ATR, Hd, PW] and IDENT-IO [ $\alpha$ ATR], as the ATR specification of the prefix vowel agrees with that of the dominant PW node. Candidates (b) and (c) crucially violate this constraint, as both vowels in the output form have surfaced unspecified for ATR. Ranking this constraint below IDENT-IO [ $\alpha$ ATR]

would otherwise allow unspecified forms to surface in the output. Candidate (d) is disallowed due to a violation of AGREE [ $\alpha$ ATR, Hd, PW], in that the [-ATR] specification of the prefix vowel does not agree with the specification of the dominant PW node. Yet as a vowel specified for ATR, it is unaffected by INTERPRETABILITY. Candidate (e) changes the [ATR] specification of the root vowel to [-ATR]], and surfaces with a [-ATR] prefix vowel, incurring two violations of IDENT-IO [ $\alpha$ ATR], one more than Candidate (a), the attested output form.

(137) INTERPRETABILITY [ATR] >> AGREE [ $\alpha$ ATR, Hd, PW]- >> IDENT- IO [ $\alpha$ ATR]

/áki-dón/-‘to castrate’	INTERPRET [ATR]	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT-IO [ $\alpha$ ATR]
			*
	**!		*
	*!	*	
		*!	*
			**!

Thus far, the alternation of prefix vowels has been explained through initial underlying underspecification and subsequent agreement with the ATR specification of the dominant PW node, which has percolated from the root. Nevertheless, the constraint ranking must reflect that the identity of the root vowel of the output with respect to the input is maintained, and that the root vowel specification is dominant over those of the alternating affixes. The solution is a positional faithfulness hierarchy (Beckman 1999), in which a highly ranked constraint defines a privileged position with respect to other positions. A positional faithfulness constraint has the schema

shown in (138).

(138) IDENT –Position (F): Let  $\beta$  be an output segment in a privileged position P and  $\alpha$  the input correspondent of  $\beta$ . If  $\beta$  is [ $\gamma$ F], then  $\alpha$  must be [ $\gamma$ F]. “Corresponding segments in a privileged position must have identical specifications for [F].”

(Beckman, 1999)

The pattern of interaction of the positional faithfulness hierarchy used in this analysis is shown in (139). The positional faithfulness constraint in (140) has [ATR] as F, and the privileged position as the root. Hence faithfulness to the ATR value of the root vowel is more highly ranked than that of any of the affix vowels.

(139) Ranking schema for positional faithfulness: IDENT –Position (F) >> IDENT (F)

(Beckman, 1999)

(140) IDENT I-O ROOT [ATR]: Let  $\beta$  be an output segment in a root and  $\alpha$  the input correspondent of  $\beta$ . If  $\beta$  is [ $\alpha$ ATR], then  $\alpha$  must be [ $\alpha$ ATR].

In any given optimal form with root-controlled harmony, the root vowel with its underlyingly specified [ $\alpha$ ATR] value surfaces faithfully, while alternating segments, which are unspecified, violate IDENT-IO [ $\alpha$ ATR] when they adopt the [ $\alpha$ ATR] feature of the root on the surface. IDENT- IO [ $\alpha$ ATR] is crucially ranked below IDENT-IO ROOT [ATR], as demonstrated in the tableau in (141), which shows bi-directional root controlled

(141) AGREE [ $\alpha$ ATR,Hd, PW] >> IDENT- IO ROOT [ATR] >> IDENT-IO [ $\alpha$ ATR].

/áki-dóŋ-An/-to castrate frequently	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT- IO ROOT [ $\alpha$ ATR]	IDENT-IO [ $\alpha$ ATR]
<p>a. áki-dóŋ-on</p>			**
<p>b. áki-dóŋ-an</p>		*!	***
<p>c. áki-dóŋ-on</p>	*!		**

harmony with input /ákI-dóŋ-An/-‘ to castrate frequently’. To each side of the root /-dóŋ-/ is an affix with a head vowel underspecified for ATR, which receives the root specification. Candidate (c), which shows root faithfulness, but no spreading, violates the high-ranking AGREE constraint, as well as the general IDENT-IO [ $\alpha$ ATR] for a violation of faithfulness to the input of the prefix. Candidate (b) shows a change in the ATR specification of the root vowel crucially violating IDENT-IO ROOT[ $\alpha$ ATR]. The IDENT-IO [ $\alpha$ ATR] is twice violated but non-crucially, through changes in the prefix and root vowels. Optimal candidate (a), the attested form, violates only low- ranking IDENT-IO[ $\alpha$ ATR], maintaining faithfulness in [ATR] feature to that of the root over that of the prefix. This ranking therefore accounts for harmony in alternating affixes.

In summary, the constraint hierarchy that governs bi-directional root-controlled harmony and ensures output ATR specification is as follows in (142):

- (142) INTERPRETABILITY [ATR] >> AGREE [ $\alpha$ ATR,Hd,PW] >> IDENT- IO ROOT [ $\alpha$ ATR] >>  
 IDENT-IO[ $\alpha$ ATR]

### 6.3.2 [-ATR] Suffix-Controlled Harmony

Forms such as [ákì-dóŋ-ðr] and [ákì-dó-ðr] represent exceptions to the binary [a/o] alternation frame, proposed to stem from the phonologization of a co-articulation effect of [r] on mid and back vowels, also have an apparent relationship with a merger of [ɔ] and [q] in progress. Tongue retraction that occurs in the pronunciation of the rhotic consonant in the suffix [-Ar] produces a [-ATR] feature that overrides the ATR specification of the preceding vowel, if it had been originally targeted to be [+ATR]. This anticipatory co-articulation effect has become phonologized to the point where the speech community has generated a bi-directional [-ATR] spreading process. The bi-directional process spreads a [-ATR] feature specification to mid and high vowels to the left, including that of the root of [+ATR] verbs, and selects [-ATR] TAM markers to the right in the case of Form B conjugations. Its domain extends only two syllables to the left and to the right of the affected vowel segment.

For [-ATR] suffix-controlled spreading to be effected as shown in §3.22 and within the PW structure shown in §5.3.3, two new constraints must be proposed. The first constraint must override the specification of the root vowel and launch a spreading domain. It should assume the form of constraint mandating faithfulness to the ATR specification of the suffix vowel, and be ranked more highly than root-specification faithfulness.

This constraint is proposed in (143).

- (143) IDENT-IO SPEC SUFFIX [ATR]: Let  $\beta$  be an output segment in an underlyingly specified suffix and  $\gamma$  the input correspondent of  $\beta$ . If  $\beta$  is [ $\alpha$ ATR], then  $\gamma$  must be [ $\alpha$ ATR].

The second constraint must propose the domain restriction on this special type of spreading. It must be understood that domain restrictions on the spreading of consonant-generated features constitute an area unexplored within Optimality Theory, and cross-linguistic studies have yet to be carried out. Nonetheless, an adequate description of ATR harmony in Karimojong within an optimality-theoretic framework requires domain restrictions to describe the bi-directional harmony process triggered by the [-ATR] feature, which is both an anticipatory and carryover effect, and the carryover effect of supralaryngeal cavity enlargement that generates a [+ATR] feature after voiced obstruents, discussed in §3.4, §5.4 and 6.3.5. A general format for a constraint family governing domain restrictions is therefore proposed in (144).

(144) *Consonant Feature Harmony Domain*

DOMAIN C[F]: The Local Domain D of a feature [F] from consonant C is N1 syllables to the left of the head vowel, and N2 syllables to the right of it, where N1 and N2 are elements of defined sets of natural numbers. The head vowel is the vowel adjacent to the consonant principally affected by the spread of the feature.

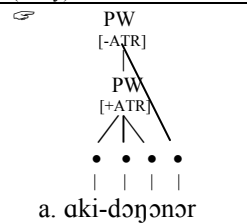
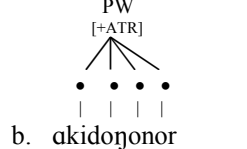
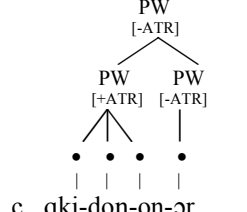
The constraint governing the harmony domain of the [-ATR] feature generated by [r] follows in (145).

- (145) DOMAIN [r]/[-ATR]: The Local Domain D of the [-ATR] feature generated by [r] is 2 syllables to the left and to the right of the head vowel within a prosodic grouping.

At this point of the analysis no ranking argument can be formulated that crucially ranks IDENT-IO SPEC SUFFIX [ATR] over DOMAIN [r]/[-ATR] or vice versa. The two constraints are ranked above AGREE [ $\alpha$ ATR, Hd, PW], as shown in this ranking tableau of the derivation of /akI-don-An-or/-‘to castrate frequently (away)’ in (146). For the itive suffix in this derivation the [-ATR] specification from the rhotic is considered the underlying ATR specification of the morpheme, and the [-Ar] suffix is therefore represented as [-or] in the input representation. Candidate (c) respects faithfulness to the specification of the suffix but not the stipulated domain of the consonant-generated feature, therefore showing a root-controlled spreading process with the itive suffix excluded. This also incurs multiple violations of AGREE[ $\alpha$ ATR, Hd, PW], as the [-ATR] specification in the

dominant PW node does not agree with the specifications of the heads of the root and its immediately adjacent affixes. The itive suffix has a separate intermediate prosodic word node with its [-ATR] feature, and the remaining affixes share the same intermediate PW node with the root. The dominant PW node receives percolation of the [-ATR] feature. Candidate (b) allows the [+ATR] root specification to percolate to the dominant PW node to override the [-ATR] specification on the itive suffix, crucially violating IDENT-IO SPEC SUFFIX [ATR] and showing exhaustive spreading throughout the PW. The candidate therefore lacks violations of AGREE, and incurs only one violation of IDENT-IO[αATR] through the feature-filling process carried out in the frequentive suffix [-An]. The winning candidate and attested form respects the [-ATR] specification of the suffix, and its stipulated spreading domain. The [+ATR] value of the prefix stems from the original specification of the root, and remains so as it is outside of the domain of the suffix-controlled [-ATR] spreading process. The phonological head of the itive suffix assumes a dominant position in the PW hierarchy, through which the [-ATR] feature percolates.

(146) *IDENT-IO SPEC SUFFIX [ATR], DOMAIN [r]/[-ATR,] >> AGREE[αATR,Hd,PW]*

/aki-don-An-or/ -‘to castrate frequently (away)’	IDENT-IO SPEC SUFFIX [ATR]	DOMAIN [r]/[-ATR,]	AGREE [αATR, Hd, PW]	IDENT-IO RT[αATR]	IDENT-IO [αATR]
 <p>a. aki-don-on-or</p>			*	*	**
 <p>b. akidononor</p>	*!	****	[+ATR]		**
 <p>c. aki-don-on-or</p>		**!	***		**

Thus, a summary of the constraint ranking covering Level 1 harmony processes is as shown in (147).

(147) INTERPRETABILITY [ATR] >> IDENT-IO SPEC SUFFIX [ATR], DOMAIN [r]/[-ATR,] >> AGREE [ $\alpha$ ATR,Hd,PW] >>  
 IDENT- IO ROOT [ $\alpha$ ATR] >> IDENT-IO[ $\alpha$ ATR]

### 6.3.3 [+ATR] Suffix-Controlled Harmony

As seen in the previous section, the dominance of suffix-controlled processes over bidirectional root-controlled processes is ensured through the faithfulness constraint IDENT I-O SPEC SUFX[ATR] for underlyingly specified suffixes, defined in (108), and its crucial ranking over IDENT IO ROOT[ $\alpha$ ATR] under the requirements of AGREE[ $\alpha$ ATR, Hd, PW], which spreads the specification throughout the PW. As shown in §4.3, the affixation of [+ATR] TAM markers and the dominant [+ATR] harmony process that results are processes confined to MP Level 2. Nonetheless, in Karimojong, much of the same constraint hierarchy holds wherever ATR processes occur. Suffix-controlled [+ATR] spreading is dominant over suffix-controlled [-ATR] spreading by virtue of the ranking of some of the same constraints as on Level 1. There is no conflict in relations of dominance between the specification of the [-ATR] itive suffix and that of the [+ATR] TAM markers as the latter is affixed on the following level in which suffix specification faithfulness applies only to the underlying form of the input on that level—the TAM marker—, and the constraint DOMAIN[ $\alpha$ ]/[-ATR] does not appear. This is illustrated in the stratal tableau in (148).

On Level 1, the causative morpheme /-tA/ becomes [-zi-] under root-controlled spreading and the C/[+ATR,hi] adjacency effect for which constraints will be presented in §6.3.5. As in (114), the dominance of faithfulness to the specification of the itive suffix, its domain of two phonological heads, and alignment ensures that (a) is the optimal candidate. On Level 2, the phonological heads in three morphemes do not align with the suffix specification for Candidate (a), crucially violating alignment. Candidate (c) also violates alignment; it respects the value of the itive suffix from Level 1, and fails to align with the remaining [+ATR] specification within the PW. Candidate (d) applies root control with the [-ATR] feature, but violates the highest ranking constraint—faithfulness to suffix specification, by overriding the [+ATR] specification of the TAM marker. On Level 3, the pronominal prefix [ε-] is affixed to which no harmony constraints are applicable.

(148) *Suffix Dominance across Strata*

<b>Level 1</b> /-tA-dɔŋ-On-ɔr/-	IDENT I-O SP SUFX[ATR]	DOMAIN [r]/[-ATR]	AGREE [αATR, Hd,PW]	IDENT-IO RT[αATR]	IDENT-IO [αATR]
<p>a. -zi-dɔŋ-ɔn-ɔr</p>			*	*	**
<p>b. -zidoŋonor</p>	*!	*			***
<p>c. -zidoŋonor</p>		**!	***		**
<b>Level 2</b> [-zidoŋonor] + /-jo/-	IDENT I-O SP SUFX [ATR]	AGREE [αATR, Hd, PW]	IDENT-IO RT[αATR]	IDENT-IO [αATR]	
<p>a. -zidoŋonorjo</p>		***!			
<p>b. -zidoŋonorjo</p>			*	***	
<p>c. -zidoŋonor-jo</p>		*!	*	**	
<p>d. -zidoŋon-ɔr-jo</p>	*!	****		*	

**Level 3:** [ε-] + [-zidoŋonorjo] → [εzidoŋonorjo] - 'They were frequently caused to be castrated (away)'

### 6.3.4 Adjacency Effects

The C/[+ATR, hi] adjacency effect discussed in §3.4 and §5.4.1, in which the [+ATR] feature generated by supraglottal cavity enlargement for the prolongation of voicing, is governed by the constraint proposed in (149) as part of the DOMAIN constraint family proposed in (144).

(149) *Domain of C/[+ATR, hi] Adjacency Effect*

DOMAIN C/[+ATR, hi]: The Local Domain D of the [+ATR] feature generated on the high vowel by voiced obstruent C is N phonological heads to the right of the consonant, where  $N \in \{1,2\}$ .

It is crucially ranked over DOMAIN<sub>[r]/[-ATR]</sub> as it blocks the harmony domain of the rhotic-generated [-ATR] feature. This can be seen in the tableau in (150). Candidate (a) shows alternation of all vowels within the domain of the rhotic-generated [-ATR] spreading show [-ATR] values, which crucially violates DOMAIN C/[+ATR,hi]. Candidate (c) completely overrides the [-ATR] suffix specification and crucially violates IDENT-IO SPEC SUFX<sub>[αATR]</sub>. Winning Candidate (b), respects the specification of the [-ATR] suffix, but overrides the extension of its domain through the action of the C/[+ATR, hi] adjacency effect.

(150) *DOMAIN C/[+ATR, hi] >> DOMAIN [r]/[-ATR]*

/akI-bu-ɔr /	IDENT I-O SP SUFX [αATR]	DOMAIN C/[+ATR,hi]	DOMAIN [r]/[-ATR]	AGREE [αATR, Hd, PW]	IDENT I-O RT[αATR]	IDENT- IO [αATR]
<p>a. a.ki-bu-ɔr</p>		*!			*	**
<p>b.aki-bu-ɔr</p>			**	*		*
<p>c.aki-bu-ɔr</p>	*!					*

The dominance of DOMAIN C/[+ATR, hi] over DOMAIN [r]/[-ATR] explains data showing that the [+ATR] causative morpheme blocks spreading of the rhotic-generated [-ATR] feature. As presented in §2.4.3 the causative morpheme /-tA-/ in [+ATR] verbs appears obligatorily with [+ATR] vowel [-i], which appears as well with voicing and spirantization of the /t/: t → z. The anterior and markedly higher position of the tongue used to pronounce these segments sharply counters the lowered and retracted position of the rhotic, and of the [-ATR] spreading from the phonologized co-articulation effect. It is proposed that the voicing of the consonant [z] produces an additional [+ATR] feature that blocks the [-ATR] spreading domain that would be otherwise unaffected. The phonology of [t] spirantization in Karimojong is an issue outside of the scope of this thesis. The tableau supporting this assertion appears in (151). Candidate (c) crucially violates the domain stipulations of the rhotic generated feature, instead allowing root-controlled harmony. Candidate (b) allows the full expression of the domain of the rhotic-generated [-ATR] feature, which violates DOMAIN C/[+ATR,hi] by allowing the vowel within the causative morpheme to be [-ATR]. This form is also unattested. The winning candidate, Candidate (a), accommodates all spreading processes and adjacency effect in their proper domains, and is the attested form.

(151) C/[+ATR, hi] Adjacency Effect in [+ATR] Causative Forms

/aki-tA-dŋ-ɔr/	IDENT I-O SPEC SUFX	DOMAIN C/[+ATR,hi]	DOMAIN [r]/[-ATR]	AGREE [αATR, Hd, PW]
<p>a. aki-tA-dŋ-ɔr</p>			*	**
<p>b. aki-zi-dŋ-ɔr</p>		*!		*
<p>c. aki-tA-dŋ-ɔr</p>			**!	

The second adjacency effect to be accounted for in the constraint ranking is that of ATR dissimilation among central and back vowels, which was discussed in §3.4. Before [-ar] suffixation in [-ATR] verbs, central

and back [-ATR] verbs raise slightly and assume a [+ATR] feature. Vowel [u] becomes [u], and [ɔ] becomes [o]. The constraint in (152) prohibits a sequence of [-low] central and back vowels with the same [-ATR] specification as the following low vowel.

(152) [+back] ATR Dissimilation

\* V / \_\_\_ + V C : Vowels which are [-low] and [-ATR] at a morpheme boundary followed by a vowel that is [+low] and [-ATR] are prohibited.

-low	/	+low
-ATR		-ATR
+back		+back

Ensuring the attested output form in Karimojong involves constraints on the various alternative processes that may be employed by the language in face of the prohibition on the sequence. Among them are metathesis, prohibited by LINEARITY-IO, which is presented in (153), deletion, controlled by MAX-IO in (154), and faithfulness to the feature [low] which is governed by IDENT-IO [low], presented in (155). A demonstration of the combined action of these constraints to define this conspiracy appears in the tableau in (156), though the prosodic structure is omitted for ease of exposition.

(153) LINEARITY-IO The output reflects the precedence structure of the input segments and vice-versa.  
(Pater, 1996)

(154) MAX-IO: Input segments must have output correspondents.  
(McCarthy & Prince, 1995)

(155) IDENT-IO [low]: Any correspondent of an input segment specified as [+low] must also be [+low] in the output.  
(Pater, 1996)

Example (156) shows through the Level 1 the derivation of [adoar]- ‘ to snap one’s fingers (Itive), the constraint conspiracy that permits the attested form. Candidate (d) crucially violates the back vowel ATR dissimilation constraint. Candidate (a) avoids this violation through metathesis, but crucially violates LIN-IO. Candidates (b) and (c) likewise avoid the violation through deletions that crucially violate MAX-IO. Candidate (f) avoids the prohibited sequence through a change in the [+ATR] feature of the suffix vowel, incurring a violation of AGREE[αATR,Hd, PW]. The height specification of the first vowel in the sequence of Candidate (g)

complies with this prohibition, but crucially violates the faithfulness constraint IDENT-IO [low]. Winning Candidate (e) effects the vowel change [ɔ] → [o].

(156) [+back]/ ATR Dissimilation Effect

[-doar]- ‘snap one’s fingers (Itive)

Level 1 /-dɔ-Ar/	LIN-IO	MAX-IO	IDENT-IO [low]	* V / ___ + VC -low -ATR +back / +low -ATR +back	AGREE [αATR, Hd, PW]	IDENT- IO ROOT [αATR]	IDENT-IO [αATR]
a. -dɔər	*!						
b. -dər		*!					
c. -dər		*!					
d. -dɔər				*!			*
e. -doar					*	*	*
f. -dɔər			*!		*		*
g. -dɔər			*!				

It should be kept in mind that as Karimojong is a language with numerous vowel deletions and processes of coalescence, MAX-IO and LINEARITY-IO must be ranked low in comparison with constraints governing moraic structure, the licensing of voiceless vowels and vowel sequences. Presentation of the relevant constraints governing these processes, and analysis of them are beyond the scope of this thesis.

6.3.5 Cumulative Constraint Ranking

The overall ranking of constraints governing ATR harmony processes and adjacency effects in Karimojong under a stratal model is presented in (157). It can be noted that the number of constraints decreases at the higher levels.

(157) Constraint Hierarchy for ATR Harmony in Karimojong

**Level 1:**

INTERP [αATR], LIN-IO, MAX, IDENT-IO[low] >> \* V / \_\_\_ + VC >> IDENT-IOSPEC SUFX[αATR] >>

-low -ATR +back / +low -ATR +back

DOMAIN C/[+ATR,hi] , DOMAIN[r]/[-ATR] >> AGREE [αATR,PW] >> IDENT-IO RT[αATR] >> IDENT-IO [αATR]

**Level 2:**

IDENT-IOSPEC SUFX[αATR] >> AGREE [αATR,PW] >> IDENT-IO ROOT [αATR] >> IDENT-IO [αATR]

**Level 3:**

IDENT-IO [αATR]

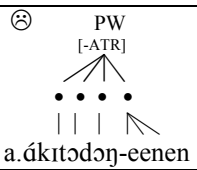
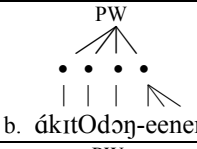
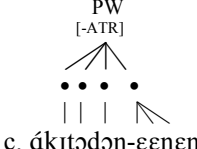
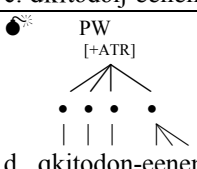
## 6.4 Parallelist Optimality Theory

### 6.4.1 Simple Application of Parallelist OT

That a parallel optimality-theoretic model does not best account for the facts of Karimojong surface forms can be demonstrated by including a variety of affixation processes, including for those affixes transparent to harmony, in a one-step input-output tableau, in which phonological processes are proposed to occur in parallel. This is shown in (158).

The attested output form, Candidate (a), cannot be a product of the application in parallel of all of the constraints in the hierarchy, as the [+ATR] specification of the vowels in the rightmost morpheme do not agree with the specification on the dominant PW node, crucially violating the AGREE constraint. Candidate (b) crucially violates INTERPRETABILITY by permitting a vowel segment unspecified for ATR to surface. Candidate (c) incurs three violations of faithfulness to the suffix vowel input specifications, in the input had [+ATR] specifications and at the output [-ATR] values. The winner in this tableau, Candidate (d), shows [+ATR] spreading to all of the phonological heads in the PW. This form is unattested.

(158) *Parallel Model Tableau*

/akI-tA-dɔŋ-eenen/	INTERP [ATR]	IDENT-IO SPEC SUFX [αATR]	AGREE [αATR, Hd, PW]	IDENT-IO ROOT [αATR]	IDENT-IO [αATR]
 <p>a. ákitɔdɔŋ-eenen</p>			***!		**
 <p>b. ákitɔdɔŋ-eenen</p>	*!				
 <p>c. ákitɔdɔŋ-eenen</p>		***			*****
 <p>d. ákitɔdɔŋ-eenen</p>				*	***

This leads to the proposal that parallelist theory cannot account for Karimojong output forms. This cannot be proven, however, until all parallel analytical strategies have been explored: Sympathy Theory, Output-Output Correspondence, and Uniform Exponence. These will be discussed in the following sections.

#### 6.4.2 Sympathy Theory

Sympathy Theory is employed under those circumstances in which forms analyzed under serial derivation do not appear as winning candidates in parallel tableaux. The idea behind it is that EVAL selects a sympathetic candidate that is the most harmonic in obeying a specified constraint, called a *Selector Constraint*. Rankable constraints require the output form to resemble the sympathetic candidate, which is available to influence the output form. One or more sympathy constraints are used to determine the optimal candidate. Sympathy constraints define faithfulness to a sympathy candidate, (marked with  $\otimes$  in tableaux) which is the optimal candidate obeying the selector constraint (marked with  $\star$ ). The standard version of this constraint is one that was crucially violated by the attested output form under parallel derivation. This higher ranking constraint allows the previously failed attested output form to be the winning candidate. A Sympathy tableau based on the parallel derivation in (158) appears in (159).

In (159), Candidate (b), in which the suffix [-eenen] remains with a [+ATR] specification, while the remainder of the word, with the exception of one underspecified form, is [-ATR], is the sympathetic candidate. The selector constraint is  $\star$ AGREE [ $\alpha$ ATR, Hd, PW]. In other words, the output should obey Candidate (b) with regards to the stipulations of that constraint. AGREE[ $\alpha$ ATR, Hd, PW] mandates agreement of the ATR specification of each phonological head with that of the dominant PW node. Candidate (b) shows [+ATR] specification only in the [-eenen] suffix. The output candidate, the attested form, likewise shows a [+ATR] specification only on the [eenen] suffix. Candidate (c), by effecting a feature change to a [-ATR] specification on [-eenen], crucially violates suffix specification faithfulness. Candidate (d) allows [+ATR] spreading and violates the selector constraint. Candidate (a), which has [-ATR] spreading from the root but allows the [-eenen] to retain its [+ATR] specification for its vowels, is maximally faithful to the selector constraint and is the winning candidate in the tableau. This is the attested output form.

(159) *Sympathy Theory Approach to Parallel Derivation*

/akI-tA-dɔŋ-eenen /	★ AGREE [αATR, Hd, PW]	INTERP [ATR]	IDENT-IO SPEC SUFX [αATR]	AGREE [αATR, Hd, PW]	IDENT-IO ROOT [αATR]	IDENT-IO [αATR]
<p>a. ákitɔdɔŋ eenen</p>				***		**
<p>b. ákitAɔdɔŋ eenen</p>		*!		***		*
<p>c. ákitɔdɔŋ eɛnen</p>			***!			*****
<p>d. ákitodɔŋ eenen</p>	***!				*	***

Sympathy Theory raises a series of concerns. The first among them is that Sympathy theory applied in the present case utilizes a markedness constraint as the selector constraint, when the theory has been restricted to apply only to cases to input-output faithfulness under the principle of Selector Confinement (McCarthy, 1999: 339) presented in (157). For Sympathy to apply to the case in (160), some modification of the original proposal must be made.

(160) ★-Confinement

The selection of a sympathetic candidate must be confined to a subset of candidates that obey an IO-faithfulness constraint F.

A second concern has been raised by Bermudez-Otero (2003), Green (2004), and Kiparsky (2007) who point out that the generation of a sympathy candidate and its incorporation into the evaluation process is in and of itself a derivational step, while a Sympathy Theory tableau, within the logic of its formalism, claims

otherwise. Bermudez-Otero (2003:3) using the computation in (161) asserts that Sympathy at least mimics derivation:

(161) *Equivalence of Parallel Sympathy Theory and Serial Derivation*

$$I \rightarrow a \rightarrow O \quad \approx \quad I \rightarrow \otimes \rightarrow O$$

Bermudez-Otero goes on to point out that Sympathy theory also does not handle those cases in which two intermediate representations are crucially required. Such a case from Catalan is reported in Bermudez-Otero (2002b). Hence:

$$(162) \quad I \rightarrow a \rightarrow b \rightarrow O \quad \approx \quad \times$$

A third issue is the plausibility of claiming sympathy constraints to be part of UG, when they are so specifically tailored to the evaluation of individual forms. The number of cases of opacity across the world's languages is extensive, and no explanation has been made as to how constraints simultaneously so specific, numerous and varied in type can be said to represent universals. Universals are tendencies that are verified under careful investigation to occur cross-linguistically, and the ad hoc creation of constraints to explain cases of opacity is minimally a contradiction in methodology. That being said, studies regarding the implications for universals research of the adoption of sympathy theory remain to be carried out. Included would be a calculation of the number of constraints/universals that the theory would potentially generate, a number anticipated to be unreasonably large before some rationalization/modification to the theory would necessarily be proposed.

The fourth issue raised in the literature involves learnability. Under Sympathy Theory, every active IO-faithfulness constraint can potentially play the role of a selector constraint, and if the data in Karimojong were considered, this could also apply to markedness constraints. This would cause the learner to have to contend with a large set of potential  $\otimes$ -candidates a dilemma labeled the 'bouquet problem'. Dinnsion et al (2000) use the Elsewhere Condition to claim that the most specific candidate should be chosen, but provides no rationale or algorithm or description of how this is to come about.

In cases of phonological opacity, Sympathy Theory severs the connection between alternations and opacity, so there is no account for how opaque grammars are acquired, and complicates the manner in which diachronic

change may be understood. In diachronic change, surface properties that are generated opaquely are re-analyzed as having been generated underlyingly. As observed by Bermudez-Otero (2003), Dinnsen et al (2000) does not make this prediction.

Learnability under Stratal Optimality Theory is described by Bermudez-Otero as straightforward, using the principles of Cyclic Application in (163) and Level Segregation (164)—which originate in generative theory, and Cycle-Internal Transparency, shown in (165). They are as stated in Bermudez-Otero (2003).

(163) *Cyclic Application*

Given a linguistic expression  $e$  with a phonological input representation  $I$ , the phonological function  $P$  applies recursively from the inside out within a nested hierarchy of phonological domains associated with (but not necessarily isomorphic with) the morphosyntactic constituent structure of  $e$ .

Hence, if  $I = [[x][[y]z]$ , then  $P(I) = P(P(x),P(P(y),z))$ .

(164) *Level Segregation*

The phonology of a language does not consist of a single function  $P$ , but a set of distinct functions or cophonologies  $\{P_1, P_2, \dots, P_n\}$  such that the specific function  $P_i$  applying to domains of type  $\delta_i$  is determined by the type of morphosyntactic construction associated with  $\delta_i$  (stem, word, phrase).

Surface phenomena can arise due to interactions between cycles, resulting in opacity, or because phonological processes apply only on specific levels and therefore only to a subset of morphemes within a given output form. However, under Cycle-Internal Transparency, within each cycle, the mapping between the input and the output is transparent, and is carried out in parallel as in monostratal OT.

(165) *Cyclic-Internal Transparency*

Each cycle involves a single pass through GEN and EVAL.

$$P_i(\delta_i) = \text{EVAL}_i(\text{GEN}(\delta_i))$$

Learning a phonological grammar consists of the acquisition of a series of cophonologies within a stratal construction. The input at a level  $n$  provides the output at level  $n-1$ , and “the learner of an interleaved grammar does not tackle all of the alternations *en masse*, but peels away levels of morphosyntax one by one like onion layers” (Bermudez-Otero, 1999b: 102). From the given set out output forms, the learner finds the appropriate ranking of constraints, which in most cases, involves purely phonotactic learning. However, learners also

develop evidence from alternations in the process of input assignment.

Bermudez-Otero maintains that input assignment follows from the principle of Input Optimality (Bermudez-Otero, in preparation) in (166).

(166) *Input Optimality*

An input representation is optimal iff it has no competitor that

- Generates an identical set of output alternants
- Generates all output alternations no less efficiently
- Generates some output alternant more efficiently.

There is a selection of a set  $J$  of potential inputs whose outputs are equivalent and with each member maximally similar to an output alternant. If  $J$  contains more than one member, the potential input can be chosen according to the following heuristics:

(167) *Hale's Heuristic*

Prefer inputs that are well-formed outputs.

(Hale, 1973:420)

(168) *Heuristic for Asymmetric Paradigms*

In an asymmetric paradigm, prefer those inputs which generate the central member of the paradigm most efficiently.

An asymmetric paradigm is one in which certain forms, such as citation forms, or the nominative singular enjoy a special status and are considered more central in a given language.

Input assignment in opaque grammars has the learner using evidence from alternations to detect deviations from the identity map (an output representation equal to the input) for items that do not alternate. Bermudez-Otero (2003:31) proposes that this be carried out under the principle of 'Archiphonemic Prudence'. Given two input elements  $/\alpha/$  and  $/\beta/$  at level  $n$ , in which maintain a contrast between them in environment  $[\_\_]_e$  and neutralize the contrast in environment  $[\_\_]_f$ . The output realization for  $/\alpha/$  and  $/\beta/$  in  $[\_\_]_f$  is  $\gamma$ . Tokens of  $[\gamma]_f$  in the output of  $n$  as an 'archiphonemic string'. For the archiphonemic string in non-alternating item  $i$ :

...under Archiphonemic Prudence, the learner relies on evidence from alternations such as  $[\alpha]_e \sim [\gamma]_f$  and  $[\beta]_e \sim [\gamma]_f$  to assign an input representation to  $i$  at level  $n$ . First, the learner creates two potential representations for  $i$  in the input to  $n$ : one where the input correspondent to  $\gamma$  is  $/\alpha/$ , and another where the input correspondent of  $\gamma$  is  $/\beta/$ . The input candidates are otherwise identical with the output realization of  $i$ ... These input candidates are then 'quarantined': they are not included in the data set triggering phonological acquisition at  $n-1$ ; learning at  $n-1$  proceeds exclusively on the basis of non-

quarantined inputs to  $n$ . When the constraint hierarchy of level  $n-1$  is known, the learner is in position to choose between two quarantined candidates for input representation of  $I$  at level  $n$ : if the input candidate containing  $/\alpha/$  is not a well-formed output at level  $n-1$ , the learner chooses the input candidate containing  $/\beta/$ .

Hence, Stratal Optimality Theory offers a coherent view of learnability that Sympathy Theory does not. Taken with the other three reasons so expressed—its equivalence to a derivational step, the specificity as opposed to the universality of its constraints, as well as the need to apply to markedness rather than faithfulness constraints to account for Karimojong data, Sympathy Theory constitutes an implausible argument for parallel derivation. For its resemblance to ad hoc and brute force argumentation, Sympathy Theory has begun to be abandoned as an argument for parallel derivation. Strategies based on Paradigm Uniformity, a more firmly grounded concept cross-linguistically, will be discussed in the following section.

#### ***6.4.3 Paradigm Uniformity and Transderivational Constraints***

Proposals to explain the neutrality of morphemes to ATR harmony processes may employ the concept of Paradigm Uniformity. Paradigm Uniformity is the notion that languages exhibit a preference for morphemes which are invariant across contexts—uniform paradigms. A paradigm uniformity condition can be presented in a formal statement such as in (169).

(169) All surface realizations of  $\mu$ , where  $\mu$  is the morpheme shared by the members of paradigm  $x$ , must have identical values for property  $P$ .

(Steriade, 1999)

Output-Output Correspondence (OOC) and Uniform Exponence (UE) are constraint types governing the property  $P$  that the base and the derived form share, based on the assumption that words sharing a morphological base form a network of common phonological influences. It is similar to the concept of identity between the base and reduplicant under reduplication, which is proposed to be merely a special case of a larger general phenomenon of back-copying, which can occur to another surface form.

This line of explanation was developed for cases purportedly unexplained by serial derivation models. Nevertheless, with the spread in popularity of the parallel framework, it also became the means to justify pre-eminence for the new framework and to scrap serialism. While similar, OOC and UE differ slightly in format and approach. OOC works with the relationship between a base and a derived form, while UE is a more general constraint stipulating uniform behavior of lexical items.

**6.4.3.1 Output-Output Correspondence**

OO constraints are tightly focused on the relationship between the base and the derived form, strictly adhering to the principle of the base including a smaller number of features than the derived form. The formal definition of a base under OOC follows in (170).

(170) *Base*

- a. A base is a free-standing output form—a word.
- b. The base contains a subset of grammatical features of the derived form.

(Kager, 1999)

OO is effected in Karimojong through correspondence between the base and an affixed form, and involves faithfulness to the ATR specifications of the base. This is effected with the faithfulness constraint proposed in (171).

(171) *Base-Affix Identity in [ATR] Specification*

**IDENT B-A [ $\alpha$ ATR]:** Let  $\gamma$  be a vowel in the base and  $\beta$  a correspondent in the affixed form. If  $\gamma$  is [ $\alpha$ ATR], then  $\beta$  is [ $\alpha$ ATR].

The case of a verb form containing a pronominal prefix is shown in (172). The form [ $\epsilon$ -ló-tére] – ‘...and he

(172) *Base-Affix Identity with Neutral Pronominal Prefix*

$\epsilon$ -ló-tére – ‘he has been dried in the sun (Indicative/Subjunctive Mood, Form A)

(Novelli, 1985:239)

Input: / $\epsilon$ -ló-téré/ Base: [ $\epsilon$ -ló- $\delta$ ]	IDENT-IO B-A [ $\alpha$ ATR]	IDENT-IO SPEC SUFX [ $\alpha$ ATR]	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT-IO ROOT [ $\alpha$ ATR]	IDENT-IO [ $\alpha$ ATR]
<p>a. <math>\epsilon</math> - ló -téré</p>			*	*	*
<p>b. <math>\epsilon</math> - ló -téré</p>	*!	**			**
<p>c. e - ló -téré</p>	*!			*	**

has been dried in the sun (Indicative/Subjunctive Mood, Form A) contains the neutral pronominal prefix [ε-]– ‘he’ with the vowel underlyingly specified as [-ATR]. The input /ε-lɔ-térè/ has the root vowel /ɔ/ underlyingly specified as [-ATR]. Dominant TAM marker /-tére/ has a [+ATR] specification. The base in this case, [ε-ló-ò]- ‘he was drying in the sun’ also has a dominant TAM marker, and shows the pronominal prefix maintaining its underlying [-ATR] specification. Under AGREE and IDENT I-O SPEC SUFFIX, the root vowel assumes the [+ATR] value of the specified suffix, and, in agreement with the base, the ATR specification of the pronominal prefix vowel remains unchanged for Candidate (a), the winner. Candidate (b) crucially violates the high-ranking OOC constraint, IDENT-IO B-A<sub>[αATR]</sub>, by maintaining root faithfulness as opposed to faithfulness to the base. Candidate (c) also violates this high-ranking constraint by allowing the [+ATR] specification of the pronominal prefix to alternate and agree with the ATR specification of the [+ATR] suffix.

The example in (172) shows the most common case in Karimojong—that in which the pronominal prefix is neutral to ATR harmony processes. If Output-Output Correspondence has validity, the constraint ranking in (172) should follow the principle of Globality—in that it should be valid for forms across the language.

However, quite different results are obtained in the Narrative Mood, where the pronominal prefix is underlyingly underspecified. Example (173) shows the case of the Form A Narrative Mood past perfect of [-dɔŋ] – ‘pinch, [ító-dɔŋ-itetè̀], in which the dominant [+ATR] TAM marker [-(i) tetè̀] is affixed, but causes the pronominal prefix to alternate. The base of this paradigm is the simple past form [ító-dɔŋ-ì̀], in which the [+ATR] TAM marker [-ì̀] remains neutral. Under a serial model, this neutrality would be explained by having this neutral TAM marker affixed on a separate level in which ATR harmony rules do not apply. An OOC constraint ranking using this form as the base produces pathological results, as the attested output form, Candidate (d), which has exhaustive [+ATR] spreading, violates the high-ranking OOC constraint by not retaining the [-ATR] values of the root and the prefix vowel of the base. Candidate (a), which allows for suffix dominance and neutrality, representing the pattern of the great majority of Karimojong forms, violates the OOC constraint. Candidate (c) crucially violates suffix specification faithfulness, and the unattested winning candidate of the tableau is that which respects the ATR values of the root and prefix of the base and faithfulness to the [+ATR] specification of the suffix.

(173) *Base-Affix Identity with Pronominal Prefix Alternation*

[ítɔ-dɔŋ- i tetèi] – ‘3s/pl had been pinched’ (Form A)

(Novelli, 1985:272)

Input:/ítA-dɔŋ-itetèi/ Base: [ítɔ-dɔŋ-ì]	IDENT-IO B-A [ $\alpha$ ATR]	IDENT-IO SPEC SUFX [ $\alpha$ ATR]	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT-IO ROOT [ $\alpha$ ATR]	IDENT-IO [ $\alpha$ ATR]
<p>a. itɔ- dɔŋ- itetèi</p>	*!		*		
<p>b. i tɔ-dɔŋ-itetèi</p>			**		
<p>c. tɔ-dɔŋ-itetèi</p>		***!			***
<p>d. tɔ-dɔŋ-itetèi</p>	*!			*	**

The inconsistency across paradigms and the stipulations of Principle of Globality demonstrate that OOC cannot be a viable solution for explaining affix neutrality. Determining which of the more than 140 pronominal prefixes serves as the base and model for the remaining non-alternating forms remains problematic. Even if all pronominal prefixes were neutral under harmony, an OOC argument at best would be circular: the suffix does not alternate in construction Y because it does not alternate in construction X. It would provide no explanation for its neutrality in construction X. Such would be the argument for constructions containing [-eenen], and the variable neutrality of the TAM marker [-ere], shown in §3.3.4.1 creates the same problem as the variable neutrality of the pronominal prefix.

Similar to OOC is the concept of Uniform Exponence, which provides a more general format and need not rely on the concept of the base. This is developed in the next section.

6.4.3.2 *Uniform Exponence*

A formal statement of Uniform Exponence follows in (174).

(174) **Uniform Exponence:** a lexical item (stem, affix, word) has the same realization for property P in its various contexts of occurrence.

(Kenstowicz, 1996)

Employing UE to neutral affixes in Karimojong would involve a constraint prohibiting harmony processes in pronominal prefixes, the [-eenen] frequentive, and neutral TAM markers. This Uniform Exponence constraint is labeled UE[\*Harmony].

The case of pronominal prefixes is exemplified the parallel ranking tableau in (175) with the input /ε-dɔŋ/ + /jo/. Winning Candidate (a) is the attested output form in which the principle of Uniform Exponence mandates the non-alternation of pronominal prefix [ε-] under suffix-controlled [+ATR] spreading governed by AGREE [ $\alpha$ ATR, Hd, PW] and IDENT-IO SPEC SUFX[ $\alpha$ ATR]. Candidate (b) crucially violates the Uniform Exponence [\*Harmony] constraint by allowing the pronominal prefix to alternate and receive a [+ATR] specification. This ranking tableau therefore shows that under parallelism, a UE constraint successfully assures the neutrality of the pronominal prefix.

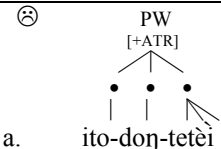
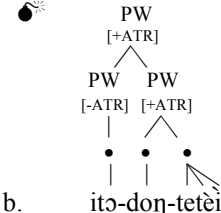
(175) *Uniform Exponence and Pronominal Prefix Neutrality*

/ε-dɔŋ/ + /jo/	UE [*Harmony]	IDENT-IO SPEC SUFX [ $\alpha$ ATR]	AGREE [ $\alpha$ ATR, Hd, PW]	IDENT-IO ROOT [ $\alpha$ ATR]	IDENT-IO [ $\alpha$ ATR]
<p>a. ε-dɔŋ-jo</p>			*	*	*
<p>b. e-dɔŋ-jo</p>	*!			*	**

Under the Principle of Globality, the same constraint set applied to cases throughout the language should yield attested forms in the output. In (176), the above constraint set is applied to a Narrative Mood derivation. In the case of / itɔ-dɔŋ/ + /tetèi/- ‘and you have pinched’, it produces pathological results. The attested output

form, Candidate (a), which has a pronominal prefix alternate under suffix-controlled [+ATR] harmony, incurs a crucial violation of UE [\*Harmony] and is not the winning candidate. The winning candidate in the tableau, an unattested form, maintains the neutrality of the pronominal prefix under the dominant suffix-controlled harmony process.

(176) *Uniform Exponence and Alternating Pronominal Prefix*

ito-dɔŋ + /tetèi/ 'and you have pinched'	UE [*Harmony]	IDENT-IO SPEC SUFX [αATR]	AGREE [αATR, Hd, PW]	IDENT-IO ROOT [αATR]	IDENT-IO [αATR]
⊗ a. 	*!			*	**
● b. 			*	*	*

The case of the continuous aspect marker [-ere] is similar. In (177), the input form /aka-dɔŋ-Akin-ere / -'I pinching (for the purpose of)' has a [-ATR] specified root form, a non-alternating pronominal prefix, the dative suffix [-Akin] with an underspecified head, and the TAM marker already specified for ATR. Stipulations of the highly-ranked UE constraint block harmony participation for both the pronominal prefix and the TAM marker, and allow Candidate (a), the attested form, to be the optimal candidate. Candidate (c) shows crucial violations of the UE constraint by allowing both suffix-controlled [+ATR] spreading from the TAM marker and alternation of the pronominal prefix. Candidate (b) also crucially violates UE by allowing the suffix-controlled

(177)

/aka-dɔŋ-Akin-ere / '-I am being pinched for the purpose of'	UE [*Harmony]	IDENT-IO SPEC SUFX [(ATR)]	AGREE [αATR, Hd, PW]	IDENT-IO ROOT [αATR]	IDENT-IO [αATR]
☞ a. aka-dɔŋ-ákin-éɛ̀			**		*
b. aka-dɔŋ-okin-ere	**!		**	*	**
c. aqɔ-dɔŋ-okin-ere	**!			*	**
d. aka-dɔŋ-ákin-éɛ̀	*!	**			***

harmony process, but respects UE for the pronominal prefix. Candidate (d) violates the UE constraint and suffix specification faithfulness by altering the ATR specification of suffix [-ere]. It likewise incurs three violations of general ATR specification faithfulness. Prosodic structure is not shown for ease of exposition.

As seen in (177), an analogous form lacking only the dative [-Akin] shows dominant spreading from the [-ere] suffix. A case could be made that [-ere] is an active suffix that has its action blocked by the dative suffix. The dative, however, in other instances is seen as either a participant in harmony, or transparent, lending credence to the argument that an explanation for the data resides in the variable behavior of [-ere]. Were this the case, however, it would mean variability in the action of a UE constraint for [-Akin]—allowing the suffixes in some instances to be recessive, and others to be opaque under the same type of harmony process.

One case of [-ere] as an active suffix controlling [+ATR] spreading appears in (178). The derivation of the input form /εke-dɔŋ-eré/-‘I was pinching’ shows the attested form, Candidate (a), which shows [+ATR] spreading from the suffix, crucially violates UE and is not the winning candidate in the tableau. Candidate (b), which allows neither spreading from the TAM marker nor the alternation of the pronominal prefix, is the optimal candidate. Candidate (c), which allows both the dominant [+ATR] spreading and alternation of the pronominal prefix, crucially violates UE [\*Harmony] twice. In all forms, the UE constraint controls the neutrality of the frequentive suffix [-ere]. Hence, the variability in ATR harmony participation of a single TAM marker shows that UE cannot apply to all output forms as the Principle of Globality requires.

(178) *Pathological Results with UE [\*Harmony]*

/aka-dɔŋ-ere/- ‘I was being pinched’	UE [*Harmony]	IDENT-IO SPEC SUFX [αATR]	AGREE [αATR, Hd, PW]	IDENT-IO ROOT [αATR]	IDENT- IO [αATR]
⊗ a. aka-dɔŋ-eré	*!		**	*	*
● b. aka-dɔŋ-eré			***		
c. ɔkɔ-dɔŋ-eré	***!				***

It can be concluded that Output-Output Correspondence constraints and Uniform Exponence cannot work as viable strategies for explaining affix neutrality and justifying a parallel optimality-theoretic model in Karimojong. One additional proposal for an analysis of spreading, Headed Spans, must be considered before a discussion of the general conclusions regarding ATR harmony in Karimojong. This is presented in the following section.

## 6.5 Headed Spans Proposal

Headed Spans (McCarthy, 2004) is a proposal which attempts to describe spreading processes within Optimality Theory by using faithfulness and markedness constraints. Every span has a head segment with an  $\alpha$  value for a feature [F] that is shared by the other members of the span, which occur in a contiguous string. Directionality would be expressed through markedness constraints requiring the head to lie on a certain edge of the span. Faithfulness constraints require [ $\alpha$ F] segments heading spans in the input to head them in the output—similar to IDENT constraints in standard OT. Substituting for Align and Agree constraints in OT are markedness constraints that adjacent spans violate.

The crucial element of the Headed Spans proposal that determines its applicability to the Karimojong case is that within the proposal, different types of harmony require different constraint rankings. Bidirectional root-based harmony would have a set of constraints which can be labeled Constraint Set B. Leftward suffix-based harmony would be governed by a Constraint Set L.

Given these principles and the irregularities in the language, demonstrating that the Headed Spans proposal, in its present form, cannot work for Karimojong is relatively straightforward. In (179-a), bidirectional root-controlled harmony spreads a [-ATR] feature so that the vowel [a/or] suffix is realized as [a]. This would occur under Constraint Set B which governs bidirectional root-controlled harmony. In (179-b), the same suffixation process is carried out on a verb which permits [+ATR] root controlled harmony. This leftward suffix-based process is governed by a different set of constraints—Constraint Set L. Under the Headed Spans proposal, the same suffixation process would have to be governed by two unique constraint hierarchies—which contradicts basic assumptions of Optimality Theory—that a set of constraints defines the output forms of the language.

### (179) *Constraint Ranking Variability Under Headed Spans*

- |                     |                         |                         |
|---------------------|-------------------------|-------------------------|
| a) [akɪ - dɔŋ] + Ar | → á-dóŋ-á <sup>39</sup> | <b>Constraint Set B</b> |
| b) [akɪ - dɔ] + Ar  | → akɪ-dó-ɔ̀             | <b>Constraint Set L</b> |

Therefore, it can be stated that Span Theory, in its present form, cannot adequately account for the surface forms in Karimojong ATR harmony data.

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<sup>39</sup> As noted in §2.43, the infinitive prefix changes from akɪ → [a-] upon affixation for Class 1 verbs.

## 6.6 Conclusions: Optimality Theory and Karimojong ATR Harmony

As analyses for from Karimojong, show, the AGREE constraint family provides a flexible analytical framework that accommodates complex spreading phenomena. Originally proposed to stipulate feature agreement with adjacent segments, this thesis proposes that it require phonological heads to agree with the PW node in ATR value. When it is combined with a positional faithfulness hierarchy, and faithfulness to underlying suffix specification and domain restriction, the three types of harmony spans in Karimojong can be defined within one constraint ranking. These are: bi-directional root controlled harmony, involving both positive and negative ATR specifications; [-ATR] suffix-controlled harmony, a phonologization of a rhotic-generated co-articulation effect, and [+ATR] suffix-controlled harmony, driven by TAM markers. Constraints controlling adjacency effects impacting individual vowel segments and harmony spans have also been proposed and their validity demonstrated. It has been shown that the complex phenomenon of ATR harmony in Karimojong can be described within a constraint-based framework, though it requires that Optimality Theory adopt a serial, rather than a parallel model of derivation.

It has also required positing new constraints and constraint families, for which cross-linguistic research has yet to be performed. The DOMAIN C constraint family defines domains of influence for consonant-generated features, which applies to the rhotic-generated [-ATR] harmony domain, and the voiced consonant [+ATR] adjacency effect. Since a distinction between vowels which are underlyingly specified and those that are not is an integral part of explaining spreading behavior, faithfulness to an underlying specification must be proposed to account for the dominance of suffix-controlled spreading over root control.

The serial framework adopted here also questions one of the cardinal tenets in Optimality Theory—Globality. While a strong similarity exists between the Level 1 and Level 2 constraint rankings, Level 2 constraints are much fewer in number, and Level 3, where harmony processes are absent, contains only one—faithfulness to input ATR specification, which is never violated. As shown by Chapter 4, levels of affixation are intimately tied to historical processes of language change.

This suggests that further research into the relationship between the complexity of constraint hierarchies and historical processes of incorporation is warranted. Optimality Theory had been begun with diachrony only a peripheral, if not an antagonistic, concern. It may turn out that it is diachronic research that will support and sustain OT as a valid framework for phonological analysis.

## 7.0 Conclusions

ATR harmony patterns in the Karimojong verb can be likened to a trail of footprints marking the structure and history of the Karimojong language. Three types of ATR harmony processes affect Karimojong verbs: bidirectional root-controlled harmony, [-ATR] suffix-controlled harmony, proposed in part to emanate from the phonologization of tongue retraction required to pronounce the itive suffix [-Ar], and [+ATR] suffix-controlled harmony. From a study of the data, it can be concluded that the language has three morphophonological levels determined by the application or absence of ATR harmony processes: a first level where bidirectional root-controlled harmony and [-ATR] suffix controlled harmony apply, a second level dominated by [+ATR] suffix control, and a third level where no ATR harmony processes apply. These processes are not the only determinants of the ATR specification of a given vowel segment. There are adjacency effects, among them a symbiotic relationship between the consonant voicing continuancy and a [+ATR] specification, based on the speaker's strategy of expanding the supraglottal cavity. This effect is capable of blocking dominant [-ATR] suffix-controlled spreading. There is also an [ATR] dissimilation effect, in which a [-ATR] mid or high [+back] vowel before a suffix beginning with [a] will change to [-ATR]. This is seen as an effort by the speech community to preserve height information and lexical contrast, all the more understandable given the presence historically of vowel mergers and phonetic effects involving the vowel [a], which provide crucial evidence for a serial derivation model for the language.

These are not the only factors that appear to be at work for ATR specifications in Karimojong. In a number of Karimojong suffixes, the harmony processes apply to vowels in certain positions within suffixes. Aside from epenthetic and stem enlarging vowels, which can be explained as being aggregated at later stages of the word-formation process, there are still vowels with feature values that mark them as being part of the harmony set, but which do not participate in harmony. This is explained through the presence of a phonological structure, or P-structure, which is defines a system of headmarking and feature percolation that channels the spreading of ATR features to vowels within the structure, leaving others untouched.

The vowel harmony patterns so described contribute to settling the major question in the debate over parallel and serial derivation models. The parallel derivation models proposed thus far have not accounted for output forms in Karimojong within a framework that constitutes a consistent or viable model for a grammar of the language. Serial derivation, on the other hand, may do so within either of two major theoretical proposals:

Rule-Based Autosegmental Theory and Optimality Theory. Nevertheless, both of these theoretical proposals depend upon the P-structure to account for the data, which orthodox theoretical views may consider to constitute substantial modifications to the theories.

The model of the phonology-morphology interface proposed here for Karimojong works with either of these two theoretical proposals, and provides a coherent account for synchronic vowel harmony data and for the language's diachronic evolution. The morphophonological levels and their corresponding phonological processes represent stages of historical development, with Level 1 processes considered to be the oldest, Level 2 to be newer, and Level 3 affixes, which do not alternate to be the most recent. Affixes in transitional phases of incorporation into the ATR harmony system, which initiate or receive spreading in some usages but are neutral in others are affixed on the level that corresponds to their spreading behavior. Narrative mood pronominal prefixes, which participate in bidirectional spreading and receive [+ATR] suffix-controlled spreading, are Level 1 affixes, while those of the indicative and subjunctive moods, which are neutral under ATR harmony spreading rules, are Level 3 affixes. Affix [-ere] is a Level 3 affix in those instances where it is neutral, but a Level 2 affix where it triggers [+ATR] harmony.

Subjects of further research should be the consonant-generated adjacency effects found to impact the Karimojong ATR harmony system, a significant development that reinforces the role of phonetic grounding in disharmony. In Karimojong, the case of the phonologization of one consonant-generated effect—tongue retraction in V + r sequences, produces a dominant form of suffix-controlled harmony. Yet the Voiced Consonant/[+ATR] adjacency effect is capable of blocking this process. Within a constraint-based system, this has led to the proposal here of the DOMAIN C/[F] constraint family, which acts within harmony domains governed by AGREE. AGREE in Karimojong, is used not to define spans of adjacent segments, but is assumed to continue exhaustively within the domain of a dominant prosodic word node, and concerns itself with agreement between the specifications of segments governed by heads, and the specification of the dominant PW node.

In that it combines synchronic and diachronic explanation, this work can be considered to be part of the Amphichronic Program (Kiparsky 2004, 2006, in press) of linguistic explanation. It remains to be demonstrated in further research to what extent the findings here constitute universals of language, or consist of language-specific or areal phenomena. Cross linguistic studies on vowel harmony systems will validate the use of P-

structure in vowel harmony systems and the role of consonant-generated features in disharmony phenomena—and hence the claim that the constraints proposed here constitute universals.

It has been noted by both John Goldsmith (1989) and Larry Hyman (to appear) that African languages have played a key role in developing modern phonological theory, although most of theoretical work has concentrated on West African, rather than East African languages. It is evident from the Karimojong case that East African languages have a great deal to contribute to further developments. It will require, however, detailed study and the care usually reserved for the process of language description, such as has been demonstrated by Novelli, to continue to make these discoveries. This is a validation of the approach of “languages first, theory second” advocated by those schools of linguistics that have traditionally focused on description and functional explanation, often at the expense of participating in the theoretical debates of the moment, usually first postulated by formal schools of thought. It is through the strategy of employing multiple working hypotheses, both formal and functional, as has been done in this thesis, for the field of phonology to continue to make progress.

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<sup>40</sup> ROA = Rutgers Optimality Archive, <http://roa.rutgers.edu>

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**Appendix: Guide to Selected Karimojong Affixal Morphemes**

Level	Morpheme	Examples	[ATR] Feature Spreading
1	Narrative Mood pronominal Prefix [(at)OO-], [itO-],[tO-]	oo-doŋeenente- ‘...that had/has/have freq. pinched’ to-doŋuni- ‘...that is castrating/will castrate for...’ tòdòŋàè- ‘...and he was pinched’.	Archiphonemic vowel varies with the ATR specification of the environment
1	Infinitive prefix akI- a-	[akI-dòŋ] ‘to pinch’ [aki-doŋ] ‘to castrate’ [ákí-bé] ‘to agree’ [á-òli] ‘to get lost’	Archiphonemic [I] alternates according to the ATR specification of the root. [a] does not alternate.
1	Causative Prefix [t+ stem vowel] Class I verbs. [z + i/I-] for Class II verbs. /t/ → [z] / _____ {i,I}	éké-tá-càpì- ‘I shall cause you to weed.’ ákízìlìp- ‘to cause to pray’ aki-zi-doŋ- ‘to cause to castrate’	The vowel for each form appears according to the ATR specification of the verb.
1	[-Un]- ‘often’ [-Un] – ‘this way, toward’ [-UnUn] – (above) compounded	ákí-sáòn- ‘often go slowly’ ákibú ùn- ‘often knock down’	Archiphoneme alternates according to the ATR specification of the root.
1	Derivational suffixes with Characteristic Vowels [-(a/or) – ‘away from’ [-(a/okin)- Dative	ádaŋar- ‘pinch away from’ ákìbùòr ‘knock down away from’ ásákin- ‘to go slowly + DAT	Suffixes with [a] for [-ATR] verbs. Suffixes with [o] for [+ATR] verbs.
1	[-or] Irregular Suffix	ákídóŋòr- ‘castrate away from’	Drives leftward [-ATR] harmony in irregular verb forms. with original [+ATR] roots.
1	Inflectional TAM markers, with characteristic vowels Form B conjugations -(j)a/o, -à/òè, -(j)ata/oto,	tòdòŋja – ‘cause pinching-pres/fut’ tòdòŋjo- ‘cause castrating’ tòdòŋàè – ‘if/would cause to pinch’ tòdòŋata – ‘causing/will cause to pinch oneself	appear for [-ATR] verbs.

2	<p>TAM Markers, Form A conjugations</p> <p>--o/-jo           [-ete],  -(i)tor            -(i)tere  -oe,                -(u)ito,  -oto,               -itere  -ok                 -okizi  -okizi             -ĩ  -ere</p>	<p>akidoṅunjo- ‘to be pinching/will pinch freq.  ídoṅúnetè -‘you s/p are pinching/will pinch frequently’  èdòṅùnèrè-‘he frequently was pinched’  ídoṅúnì – ‘you s/p are pinching/will pinch’  todoṅito- ‘have/had caused to pinch’</p>	<p>Induce leftward spreading, changing even the root vowel and suffixes that harmonize with it.</p>
3	<p>Frequentive Suffix/Infix</p> <p>[-eenen(e)]-‘frequently’</p> <p>-itit-frequently</p>	<p>iki-doṅeenen-e-terè ‘you frequently were being/had been pinched  ákí-mókí-éénén] – to often handle firmly  ì-dòṅ-ítít íjòṅ-‘ You (s) had pinched.’</p>	<p>Transparent to harmony. Harmony affects preceding or surrounding suffixes.</p>
3	<p>Pronominal Prefix</p> <p>[ε-]-‘he/she’  [iki-]-ýou s/pl, we (PASS)  [a-]-‘I’        [i-]-‘you pl’  [oko-]-‘I’ (PASS)  [ito-]-‘you, PASS, narr. mood  [akα-]-‘I’ PASS, Ind. Class1  [εke-]-‘I’ PASS, Ind. Class 2</p>	<p>ε-doṅ-un-ì – ‘he/she was frequently pinched’  iki-doṅ-un-ì-you were frequently pinched’</p>	<p>Transparent to harmony.</p>
3	<p>Subjunctive/Conditional Mood</p> <p>k’ + (pronominal)</p>	<p>k’-iki-dòṅ-àr –‘that you pinch away’</p>	<p>Transparent to harmony.</p>
3	<p>TAM Markers</p> <p>-ere – PASS. Pres/past continuous</p> <p>-(u)*it-pres./past perfect</p> <p>*Epenthetic vowels are usually [+ATR] and do not participate in harmony.</p>	<p>ε-dòṅ-an-ar-ere ‘he is/was frequently being pinched (away from the deictic center)’  αdòṅ-ar-it- ‘has/had pinched away from’</p>	<p>Transparent to harmony.</p>