

# Introduction

Since the establishment of morphology as an autonomous component in Generative Grammar with Chomsky (1970) and Halle (1973), a number of theories dealing with word structure and the organization of the lexicon have been developed. Examples of such theories include the theory of Word Formation (Aronoff 1976), the theory of Level-Ordered Morphology (Siegel 1974, Allen 1978), the X-bar theory of word structure (Selkirk 1982) and the theories dealing with the interaction between morphology and phonology such as the theory of Lexical Morphology and Phonology (Kiparsky 1982, 1985; Mohanan 1982, 1986) and the theory of Prosodic Morphology (McCarthy 1979, 1981, 1982; McCarthy and Prince 1986 et seq.). In phonology, parallel developments have been achieved since the standard theory of Chomsky and Halle (1968). The traditional view that the input to phonological representations is matched to the output by a set of rewrite rules has been challenged by theories such as the theory of Constraints and Repair Strategies (Paradis 1988) and Government Phonology (Kaye et al. 1985, 1990). The first theory explains phonological alternations by appealing to a set of surface-unviolated constraints complemented by repair strategies whose role is to solve any violations resulting from constraint conflicts; the second attempts to replace rules by a set of universal principles common to all linguistic systems along with a series of language-specific parameters.

The proposals concerning the role of constraints in grammar advanced in the aforementioned works and others were very important to the emergence of a theory of constraints and constraint interaction, known as Optimality Theory (Prince and Smolensky 1991, 1992, 1993, McCarthy and Prince 1993a). The central idea of Optimality Theory (henceforth OT) is that Universal Grammar consists of a set of ranked and violable constraints on output structures together with a general means of resolving their conflicts. The means that OT resorts to in order to resolve conflicts is to rank constraints in a strict dominance hierarchy. Higher-ranked constraints take precedence over lower-ranked ones. The constraints themselves fall into two types: well-formedness constraints and faithfulness constraints. Well-formedness constraints

enforce segmental or prosodic markedness, whereas faithfulness constraints militate against any changes between an input and its output.

The basic principles of OT have been applied to the areas where prosody and morphology interact. The characterization of patterns of reduplication, root-and-pattern morphology and truncation is now achieved through the interaction of more general principles of phonological and morphological well-formedness. Within the OT model of Prosodic Morphology interaction takes the form of constraint domination, where prosodic well-formed constraints have priority over morphological requirements. Later developments within the OT framework have given rise to Correspondence Theory (McCarthy and Prince 1995, 1999). In Correspondence Theory (henceforth CT), faithfulness is conceived of as a set of constraints on correspondence relations between the input and the output, the base and the reduplicant.

It is within the general framework of OT and CT that we propose to analyze some aspects of the prosodic phonology and prosodic morphology of a variety of Moroccan Arabic — Casablanca Moroccan Arabic (henceforth CMA). The aspects of CMA prosody that will be considered are the syllable structure and the stress system which, we judge, are germane to an adequate analysis of the prosodic morphology. As to the morphological aspects that will be treated, they include the nisba adjective, the causative, the passive participle and the diminutive formation. The choice of these morphological classes stems from three reasons. First, some of these classes have received little attention from researchers. The works that have been undertaken so far treat them as residual phenomena (for the passive participle, see Youssi 1986, Marsil 1988, Boudlal 1993. For the nisba adjective, see Al Ghadi 1990, Boudlal 1993. For the diminutive, see Benhallam 1980, Al Ghadi 1990). Second, the works that have dealt at length with these morphological classes have failed to come up with an account that is explanatorily adequate and this is either because these works have not had recourse to prosody as is the case with the analysis of the diminutive in Lasri (1989) or because of the limitations of the theoretical framework adopted as it is the case with the analysis of the causative in Bennis (1992). Third, most of the analyses undertaken in these works resort to rules and/or mechanisms that are language-specific and as such fail to recognize that individual grammars are best understood to derive from a large set of ranked and violable constraints pertaining to Universal Grammar.

Our objective in the present dissertation is to exploit the basic tools available in the OT framework and see to what extent they can allow us to adequately analyze the aforementioned

aspects of CMA prosody and morphology. Attaining this objective means a significant move towards the establishment of an individual grammar of CMA based on the reranking of a set of violable universal constraints.

The dissertation is organized into six chapters. Chapter one, which contains the preliminaries, gives details about the relevant phonology and morphology of the variety of MA to be analyzed as well as the theoretical framework that will be adopted in this dissertation.

Chapter two offers a constraint-based account of CMA syllable structure and its interaction with schwa epenthesis. Therein, we argue that prosodic structure assignment and consequently schwa epenthesis are governed not by the step-by-step syllable structure building rules proposed within the derivational frameworks, but by universal constraints such as the constraint requiring the onset and the constraint prohibiting the coda. The recalcitrant problem of schwa occurrences will be shown to derive from the interaction of well-formedness constraints and faithfulness constraints and their relative ranking. In particular, it is argued that the syllabification of words on the pattern CCəC, where the schwa appears before the final consonant in trisegmental verbs, adjectives and a class of nouns, follows from a prosodic constraint requiring that the stem be iambic. The nominal class showing the CəCC pattern will be shown to abide by markedness constraints requiring that the sonority value of the consonant serving as a coda to the schwa syllable be as close as possible to that of the nucleus. Our account of CMA syllable structure incorporates the proposals made within the derivational frameworks undertaken by our predecessors, subject to drastic changes and reformulations to conform to the theoretical framework herein conceptualized.

Chapter three analyzes the stress system of the language and is divided into four major sections. In the first section, we present a review of the previous discussions of MA stress and state their limitations. In the second section, we set the background for an empirical study of stress in CMA whose objective is to quantify the results obtained from a perceptive test given to native speakers. A sample of native speakers of CMA were given a list of items and asked to place stress relying on their intuitions. Later, the recordings of 5 subjects were subjected to an instrumental test to see whether or not the results obtained in this test match up those obtained from the quantitative test. It will be shown that the location of stress depends on whether or not the items considered are in isolation or in context. When words occur in isolation, the foot types obtained are trochaic. On the other hand, when words occur in context, the foot types obtained

are iambic. This puzzle about the stress system (i.e. allowing both iambic and trochaic feet in the language) cannot be accounted for within a parametrized theory where a language is forced to choose between iambs and trochees. Within the OT model, it will be shown that the location of stress in both isolation and context cases leading to trochaic and iambic feet follows from the Selkirk (1978) prosodic hierarchy, namely the organization of prosodic words into phonological phrases.

Chapter four treats the three linguistic cases of cyclic syllabification, the nisba adjective and the causative derivation in the light of the extended version of CT. In derivational models, underlying sequences such as /CCC-C/, where the final consonant is a subject affix, surface as [CCəC-C] and not as \*[CəCC-əC] with the schwa being epenthesized before the final consonant of the stem. Benhallam (1990), for example, assumes that cases such as these require a cyclic treatment whereby schwa epenthesis applies in the first cycle to give the stem [CCəC] but is blocked from application in the second cycle after the addition of the suffixal consonant. Such an analysis works for quadrisegmental bases on the pattern /CCCC-C/ but cannot be generalized to account for sequences such as /CCC-C/ where the affixal consonant is the object marker. These sequences surface as [CəCC-əC] and not as \*[CCəC-C] as predicted by cyclic syllabification. The analysis we will offer in this chapter derives cyclic syllabification from the interaction of constraints requiring identity between the base form and its morphologically related output form, much in the spirit proposed in works such as Basri et al. (1998) and Selkirk (1999). The principles advanced in the extended version of CT will also be tested to see if they can adequately account for the formation of the causative and the formation of the nisba adjectives derived from compounds. It will be shown that the best way to characterize the causative in CMA is by assuming that it involves reduplication. As to the nisba adjectives, it will be argued that a fair account of this morphological class requires reference to principles governing morphological structure.

Chapter five deals with the passive participle and justifies the need for an iamb-based analysis of this morphological category. The assumption made here is that the passive participle morpheme is the prefix [m-] and not the discontinuous morpheme [m-...-u-...]. The prefinal vowel that shows up in some passive forms is argued to be the language default vowel which is epenthesized for prosodic purposes. Two possible hypotheses are tested to explain the passive participle formation. The first is based on the assumption that the verbal base to which the

passive participle prefix is adjoined must conform to an iambic foot without ever specifying the nature of this iamb. The second, which is adopted in this work, posits that iambicity holds on the passive participle form rather than on the verbal stem. It will be argued that augmentation by u-epenthesis applies for the sole purpose of achieving an output form that conforms to the most harmonic iambic foot consisting of a sequence of a light and a heavy syllables. The cases that do not show this augmentation surface with an iambic foot which consists of a sequence of two light syllables.

Finally, chapter six presents further support to the iamb-based analysis witnessed with the passive participle in chapter five. We will show that the diminutive resorts to two different types of augmentation to achieve an iambic foot: internal augmentation by the addition of schwa syllables to monosyllabic bases which are masculine, and external augmentation by the suffixation of the feminine morpheme to a class of inherently feminine monosyllabic words. In both cases, it will be shown that the iambic foot type achieved is of the one that consists of two light syllables. The chapter also considers the process of labialization because of its tight relevance to the diminutive. It will be shown that the realization of the round-feature morpheme, responsible for the labialization of the initial segment of the base form, follows from the interaction of faithfulness constraints and markedness constraints on labialized consonants.

## Preliminaries

### **1. INTRODUCTION**

This chapter presents the preliminaries which we judge necessary to the understanding of the whole dissertation. It is divided into 5 major sections. Section 2 gives a brief review of the literature on Moroccan Arabic as well as on the other varieties used in Morocco. Section 3 presents the variety of Moroccan Arabic that constitutes the subject of study in this work, i.e. Casablanca Moroccan Arabic. In particular, we will point out some of the characteristics that distinguish this variety from the other varieties of Moroccan Arabic. Section 4 is about the procedure followed in the collection the data. Section 5 gives background knowledge about the phonology and morphology of the variety to be studied. Therein, we list the consonant and vocalic inventories as well as the relevant morphological categories that will be dealt with at length in the core chapters. Finally section 6 establishes the theoretical background for the analysis of some aspects of the phonology and prosodic morphology of Casablanca Moroccan Arabic. It will especially lay down the basic tenets of Optimality Theory and Correspondence Theory which constitute together the theoretical framework adopted in the present work.

### **2. REVIEW OF THE LITERATURE ON MOROCCAN ARABIC**

The body of linguistic research on MA could be traced back to the early forties with Harris's (1942) famous article which was subsequently followed by Cantineau (1950), Brunot (1950), Harrell (1962) and Abdelmassih (1970), among others. Although the works of these scholars were mainly didactic and descriptive in nature, they made very important contributions to the study of MA. The main concern of these scholars was to make the preliminary

investigations into the MA sound system (Harris, 1942) or establish courses for foreign learners (Brunot 1950, Harrell 1962, and Abdelmassih 1970).

The neglect of MA by Moroccan linguists was partly due to the diglossic relationship of MA and classical Arabic (henceforth CA). Ferguson (1959) described the different functions of CA (the high variety) and MA (the low variety). CA is the medium of written communication because it is highly codified whereas MA is a medium of oral communication. The neglect could also be due to the complexity of the linguistic situation in Morocco. This complexity is due to what Youssi (1983, 1986, 1990) refers to as a triglossia situation with multilingualism. This situation is characterized by a competition between Arabic, Berber and French, on the one hand and between CA, MA and Middle Moroccan Arabic (MMA), on the other<sup>1</sup>.

It was not until the mid-seventies that Moroccan researchers have turned to the study of their native language. Works such as Youssi (1977, 1986) Benhallam (1980), Benkirane (1982), Benkaddour (1982) tried not only to set up the phonemic system of sounds but also to test the hypotheses advanced by different schools (See Benhallam 1989 for a review of these works).

Youssi (1986) addresses different aspects of MMA. In phonology, for example, he deals with the phonematic characteristics of MMA and the different syntagmatic relations holding between phonemes. His presentation of these aspects is based on the relations and functions of the double articulation. The consonantal system he established is based on three orders of correlational oppositions: simple versus tensed, inflated versus non-inflated and rounded versus unrounded<sup>2</sup>. The relations between phonemes as well as their arrangement are assumed to be important to morphology. In morphology, on the other hand, he proposes three classes. He determines the predicative function of verbs and their formal variations in relation to their classes of compatibility (modification related to tense, aspect, person etc...).

Benhallam (1980) tackles syllable structure and the interaction of phonology and morphology within the framework of Generative Phonology of Chomsky and Halle (1968). He distinguishes between phonological and phono-lexical rules on the one hand, and morphological and morpho-lexical rules, on the other. In phonology, he considers the consonantal systems of

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<sup>1</sup> According to Youssi (1989), Middle Moroccan Arabic (also called Modern Moroccan Arabic (Youssi 1992)) is based on both Literary Arabic and Moroccan Arabic. Literary Arabic provides the essential of the lexicon while Moroccan Arabic provides the essential of the grammar.

<sup>2</sup> Instead of gemination and emphasis, Youssi (1998) uses the corresponding terms tensing and inflation.

both MA and Standard Arabic (henceforth SA) and the effect of certain phonological rules on syllable structure. He also shows that schwa epenthesis in MA and other aspects of the phonology of SA, such as vowel/glide alternation, can best be described in terms of a theory that makes use of the syllable.

Benkirane (1982) tries to set up the different types of syllables in MA within a non-linear framework. He investigates the issue of syllable boundary in MA in relation to three acoustic parameters which are fundamental frequency, intensity and duration. He also considers some syllable-based phonological rules such as stress and schwa epenthesis. Although his analysis is phonetically oriented, it remains, nonetheless, one of the very few experimental studies on MA.

Benkaddour (1982) examines some aspects of the phonology and non-concatenative morphology of the Rabati MA within the framework of non-linear phonology. He studies the phonotactic constraints and the interaction between syllable weight and stress. He also shows the importance of prosody in the application of certain phonological rules such as schwa deletion and schwa epenthesis and their interaction with stress and syllable structure. He applies McCarthy's (1979) version of autosegmental theory to account for some aspects of the non-concatenative morphology of MA.

Later work on MA was undertaken with the purpose of reconsidering some of the recalcitrant problems raised in the works above or treating other aspects that have not been dealt with. Examples of this body of research include Bellout (1987), Ait Hammou (1988), Marsil (1988), Hammoumi (1988), Rguibi (1990), Al Ghadi (1990), El Himer (1991), Imouzaz (1991), Bennis (1992), Mawhoub (1992), Nejmi (1993), Boudlal (1993), Meliani (1994), Hammari (1996), to cite but a few. The common denominator among these theses is that they all apply recent approaches or theories in phonology to analyze aspects that relate to the phonology and/or morphology of MA.

The theses that have been written on MA so far do not clearly state what is meant by MA. This fact shows that the writers of these theses do not deal with the same variety. In fact the divergence of these theses can be attributed to language variation. In this respect, Benhallam (1998) presents data that relate to variation in MA and discusses three main problems that these data pose: schwa strengthening, diphthongization and q/g variation.

Schwa strengthening refers to situations of variation between the schwa and the full vowels [i, u, a] found in the northern and less urban central areas of Morocco. Benhallam (1998)



(see also Rguibi, forthcoming, and Hammari 1996, 2000) has shown that the variation related to vowel quality is both an instance of dialectological variation and an illustration of historical development. For illustration, consider some of the examples taken from Benhallam (1998: 28):

-1-

a.	məqla	maqla	frying pan
	lmuDəf	lmuDaʃ	the place
	mxədda	mxadda	cushion
b.	ɣəzlan	ɣuzlan	gazelles
	qəTRa	quTRa	drop
	nəSS	nuSS	half
c.	waħəd	waħid	one
	lqərd	lqird	the monkey
	RRaʒəlRRaʒil		the man

In 1a, the schwa alternates with the vowel /a/; in 1b, it alternates with the vowel /u/; and in 1c, it alternates with the vowel /i/. Benhallam has shown that the alternation between the schwa and the full vowels could be viewed either as a process of schwa strengthening, i.e. a process whereby the schwa becomes a full vowel; or as a process of vowel reduction. Whichever the case is, the alternation exists and reflects dialectal variation among the different varieties of MA. The northern varieties of MA, such as the Tazi MA (Rguibi, forthcoming) or Rhafsai MA (Hammari, 1996, 2000), use a full vowel where other varieties use the schwa.

The second type of variation that constitutes a point of divergence among the different works on MA relates to diphthongization. Diphthongization is a variation found in rural areas in most cases. It is a phenomenon whereby high vowels alternate with the corresponding diphthongs as in the items below taken from Benhallam (1998: 30):

-2-

lfuDa	lfawDa	disorder
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DDu	DDaw	light
zzitun	zzaytun	olive
STila	STayla	small bucket

Here again, diphthongization is a characteristic of rural varieties, such as the variety spoken in El Jadida (Benhallam and Dahbi 1990). In other varieties of MA, such as the southern variety of MA spoken in Taroudant (Al Ghadi 1990), the diphthongs are monophthongized. This process can be attributed to the influence of Berber where diphthongs are inexistent.

The third type of variation Benhallam (1998) cites is q/g variation. This variation concerns the segments  $\text{ʔ/q/g}$  with the first two acting as mutually exclusive variants of each other depending on the variety considered. Native speakers of the variety of MA spoken in Fès, for example, tend to use  $[\text{ʔ}]$  instead of  $[\text{q}]$ . But the use of  $[\text{ʔ}]$  is in the process of fading away, especially for the young generation. As to the q/g variation<sup>3</sup>, it seems that it is a way of differentiating urban and northern from rural and southern varieties. Because native speakers may not be consistent all the time in the use of either /q/ or /g/, Benhallam assumes that speakers can be sorted out into two classes: those who maximize the use of /q/ (qal speakers) and those who maximize the use of /g/ (gal speakers).

In addition to what has been mentioned above, variation may also be due to the contact between MA and other languages in Morocco such as CA, the native Berber varieties and foreign languages. The influence of CA (the official national language of the country) on MA is perspicuous in the speech of the young generation. The spread of education has led people to use some intermediate forms between CA and MA thus resulting in what is referred to as MMA (Youssi, 1986, 1992). This influence has led some Moroccan linguists to consider CA as the reference language to the extent that one may even think that it is impossible to study MA without ever referring to CA. As a matter of fact, we cannot neglect the fact that MA and CA are related. However, there are significant differences between the two languages in their phonologies, morphologies and lexicons. This makes it necessary to describe each language separately without even referring to the other.

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<sup>3</sup> Benhallam (1998) (see also Moumine 1990, 1995) has pointed out that the substitution of /q/ for /g/ in certain contexts leads to change in meaning: e.g.  $[\text{q}\text{ə}l\text{b}]$  “heart” vs.  $[\text{g}\text{ə}l\text{b}]$  “stomach”,  $[\text{q}\text{ə}r\text{ʔ}a]$  “bottle” vs.  $[\text{g}\text{ə}r\text{ʔ}a]$  “pumpkin”. This type of variation is not relevant to the cases being discussed above.

In addition to the influence of CA, there are other native languages that are in a contact situation with MA. These include the three local varieties of Berber with their different regional accents: Tarifit in the northern part of the country (the Rif mountains), Tamazight in the central part (the middle Atlas) and Tashlhit in the southern part (the High Atlas) (See Boukous 1979 for a sociolinguistic profile of Morocco). Here again, the northern varieties of MA are influenced by Tarifit, the central varieties are influenced by Tamazight, while the southern varieties are influenced by Tashlhit.

The contact between Berber and MA is established at different linguistic levels. At the phonological level, Boudlal (1998) has shown that a number of cases involving labialization of the consonants /k, g, x, γ, q/ in what he calls southern varieties of MA are in fact cases of contact between Tashlhit and these varieties of MA. By virtue of this contact, the corresponding labialized consonants of /k, g, x, γ, q/ have been established as separate phonemes in certain varieties of MA.

At the morphological level, a number of affixes have been incorporated into the morphology of MA such as the Berber feminine discontinuous morpheme [ta-...-t] found in items such as [tamγart] “woman” and [tafunast] “the cow”. However, such a morpheme is used in MA not only to express gender but also to derive nouns of profession as seen in the items below:

-3-

<i>Noun</i>	<i>Noun of profession</i>	<i>Noun Gloss</i>
gəzzar	tagəzzart	butcher
xərraz	taxərrazt	shoe maker
ħəddad	taħəddadt	blacksmith
Səbbay	taSəbbayt	painter

At the lexical level, for example, the MA lexicon has integrated a number of lexical items from Berber such as [bhira] “vegetable garden” and [gaduma] “hoe”. It has also retained a number of words of Berber origin characterized by the initial vowel such as [argan] “a kind of oil derived from Argan tree” and [amlu] “a mixture of Argan and almonds”.

In addition to CA and the native varieties of Berber, foreign languages do undoubtedly have an influence on MA. Their influence is characterized by cases of lexical borrowing from French and Spanish. Here again, the northern varieties of MA are influenced by Spanish while

the other varieties are influenced by French. All the cases of borrowing have undergone the phonological and morphological processes of MA in their way to being fully integrated. Examples of lexical borrowing include words such as [RwiDa] “wheel”, [falTa] “fault” and [Bala] “shovel”, from Spanish and words like [Tabla] “table”, [kaSiTa] “casette” and [Rubini] ‘water tap’, from French.

In short, the influence of the above languages and varieties on MA is really considerable. It is this influence resulting from situations of language contact which is partly held responsible for having different varieties of MA. In this respect, Boukous (1998: 9) distinguishes between four major varieties of MA which are given below:

(i) The Urban Variety which is used in traditional Moroccan cities such as Fès, Rabat, Salé and Tetuan and is marked by characteristics features from Andalusian varieties of Arabic.

(ii) The Mountain Variety (called Jebli) which is used in the north-west of the Morocco and is characterized by the influence of Berber at the levels of phonology, morphology and the lexicon.

(iii) The Bedouin Variety which is used by Arabophones of Bani Hilal and Bani Maaqil origin who settled in the plains of Gharb, Chawiyya, Doukkala and the neighboring cities such as Mohammedia, Casablanca, El Jadida, Marrakech, etc ...

(iv) The Hassani Variety used by speakers of Bani Maaqil origin now living in the Sahara in the southern part of Morocco.

It should be noted that each of these varieties has its own specificities and at the same time each shares the bulk of the grammar with the rest of the varieties, a fact which has led some linguists to establish a MA where regional variations are not represented (Cf. Benhallam and Dahbi 1990 who establish the consonantal and vocalic inventories of what they call Average Moroccan Arabic)

The corpus on which the present work is based is drawn from the variety of MA spoken in Casablanca.

### 3. CASABLANCA MOROCCAN ARABIC

The variety of MA spoken in Casablanca (henceforth CMA) is characterized by certain particularities attributed to Bedouin dialects<sup>4</sup>. Despite the heterogeneity of the inhabitants of the city of Casablanca, we can, nonetheless, speak of a somehow homogeneous variety where regional variations have been gradually neutralized to yield the variety referred to as CMA described in works such as Khomsi (1979), Moumine (1990), Imouzaz (1991, forthcoming), Mawhoub (1992), Boudlal (1993) and Nejmi (1993).

#### 3.1 Geographical Situation

Casablanca is a coastal city located at the western side of Morocco on the Atlantic Ocean. It is situated between Rabat in the north and El Jadida in the south. Casablanca is one of the newly born cities, founded at the beginning of the twentieth century. Despite its recent establishment, it has developed in such a short period that it is now considered the biggest economic and industrial city in Morocco. The development is essentially due to its strategic port on the Atlantic coast, a fact which makes the city of Casablanca a bridge between Morocco and the rest of the world.

Because of its economic leadership, Casablanca has received millions of new settlers since the beginning of the present century. At the moment, its population is estimated to be more than four million. Most of the new settlers have come from the neighboring plains of Chawiyya, Doukkala and Chyadma bringing with them their rural dialects. By the middle of the century, especially after the independence of Morocco in 1956, other new settlers from the south of the country (the Souss and the Dra Valleys) arrived in the city to contribute to the economic development of Morocco. With urbanization and modernization taking place, great contact has developed between Casablanca and the neighboring rural areas.

#### 3.2 Dialectal Situation

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<sup>4</sup> On the different types of MA dialects spoken in Morocco, the reader is referred to Boukous (1998).

As a result of the migration of the rural speakers of the neighboring areas to Casablanca as well as migrants from other regions of the country, especially Berber-speaking areas, Casablanca has become a melting pot of different rural and urban dialects. Undoubtedly, contact between these varieties has taken place, causing dialect mixture and giving rise to new dialectal forms.

Besides varieties of MA, foreign languages, namely French, Spanish and English, have also established their presence in the city. Given the interaction of foreign languages as well as the different regional varieties of MA and Berber, the linguistic situation in Casablanca seems quite difficult to define. It should be pointed out here that our purpose is not to study language variation or establish a diachronic study of MA but rather study some aspects of the phonology and prosodic morphology of CMA.

Despite the heterogeneous dialectal situation in Casablanca, it is still possible to speak of one specific variety of CMA. Moumine (1990), for example, describes the linguistic situation in Casablanca and shows that the presence of so many languages in the city has led to the emergence of an interdialect. As a matter of fact, it is this interdialect that later developed into what came to be known as CMA whose native speakers could be identified throughout Morocco. Of course this dialect shares most of the grammatical features of the other varieties of MA but at the same time differs from them with respect to certain phonological and morphological aspects. The difference and similarity between CMA and other varieties of MA will be made clear, when relevant, as we proceed in this dissertation.

Our concern with establishing the variety of MA dealt with in the present work stems from our objective to achieve the greatest degree possible of homogeneity. This objective cannot be achieved unless the corpus drawn from the variety under study shows some consistency to enable us to capture a greater degree of regularity and to come up with significant generalizations

#### **4. THE DATA**

The analysis presented in this study is based on CMA, of which the writer is a native speaker. The data were collected in Casablanca among family members and friends, in particular. In collecting the data, certain variables have been taken into consideration. The informants I have

chosen were all born in Casablanca. Furthermore, their parents have been living there for a long period. For the sake of homogeneity, I have disregarded the data collected from informants whose parents speak Berber.

The corpus chosen is representative of the phonological and morphological aspects dealt with in CMA; however, it can in no way be said to be exhaustive. The corpus has been enriched by data from published work on the grammar of MA, especially Harrell (1962) and Abdelmassih (1973). Only the data identified by native speakers of CMA were included in the corpus. Other sources of material include the substantial body of data on MA found in Youssi (1986) and other works on CMA, particularly works such as Imouzaz (1991), Mawhoub (1992), Boudlal (1993) and Nejmi (1993).

## **5. BASIC PHONOLOGY AND MORPHOLOGY OF CASABLANCA MOROCCAN ARABIC**

This section sets the linguistic background of the variety of MA being studied. It introduces the consonantal and vocalic system of CMA as well as the morphological aspects that will be dealt with at length in the core chapters.

### 5.1 Consonant and Vowel Inventories

The consonantal system of MA has received various treatments from different linguists. These linguists do not agree on the number of the consonant phonemes the language should have. Some claim that MA has 31 consonant phonemes (Harrell, 1962); others (Benhallam 1980, Benkirane 1982, Benkaddour 1982 and Youssi 1986) claim that there are only 27 consonant phonemes in MA. The disagreement on the number of consonants is mainly due to the status of the glottal stop and the primary emphatic consonants.

The consonantal inventory of CMA is summed up in the following chart:

	Labial	Alveolar	Alveo-palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	b	t, d T, D		k, g k <sup>w</sup> , g <sup>w</sup>	q, q <sup>w</sup>		(ʔ)
Fricative	f	s, z S, Z	ʃ, ʒ		x, ɣ x <sup>w</sup> , ɣ <sup>w</sup>	ħ, ʕ	h
Nasal	m	n					
Liquid		l r, R					
Glide	w		y				

Two remarks about the chart above are in order. First, the glottal stop [ʔ] is set between parentheses to show that it is not part of the phonemic inventory of CMA (and all the varieties of MA); it is prothesized before vowel-initial words for onset purposes. Second, the inventory includes labialized dorsal consonants, a characteristic of Bedouin dialects of which CMA is one member (See Aguade 1994 on the phenomenon of labialization). In previous work on MA, labialization of dorsal consonants has always been considered as a case of dialectal variation (cf. Harrell 1962, Youssi 1998 and Boudlal 1998 for the non-distinctiveness of rounding in certain varieties of MA). While this is true, to some extent, in certain words in CMA, it is nonetheless distinctive as will be seen below.

That labialized dorsals should figure in the phonemic inventory of CMA is corroborated by items where labialization accompanies the word in its various realizations. Boudlal (1998) refers to these as cases of lexical labialization. Consider the following examples for illustration:

-5-

<i>Singular</i>	<i>Plural</i>	<i>Diminutive</i>	<i>Gloss</i>
k <sup>w</sup> ərsi	k <sup>w</sup> rasa	k <sup>w</sup> risi	chair
g <sup>w</sup> əffa	g <sup>w</sup> faf	g <sup>w</sup> fifa	basket
q <sup>w</sup> ənt	q <sup>w</sup> nat	q <sup>w</sup> niyyət	corner
x <sup>w</sup> zana	x <sup>w</sup> zayən	x <sup>w</sup> zina/x <sup>w</sup> ziyna	tent
ɣ <sup>w</sup> zala	ɣ <sup>w</sup> zalat	ɣ <sup>w</sup> zila/ɣ <sup>w</sup> ziyla	gazelle



Given the data above, it would be inappropriate not to grant labialized dorsals a phonemic status. Stating that labialized consonants in 5 are derived from their simple counterparts would simply be ad hoc since we would have to claim that labialization is part of the morphemes denoting the singular, the plural and the diminutive. In other words, for the morphological categories where labialization is lexical, we would have to state that labialization is a morpheme associated with that particular morphological category. Further evidence for considering labialized dorsals to be underlying comes from doublets where a labialized dorsal stands in opposition to its non-labialized counterpart. Consider the examples in 6 for illustration:

-6-

a.	<i>3sg.Perfective</i>		<i>2sg.Imperative</i>		<i>Gloss</i>
	xrəʒ		x <sup>w</sup> rəʒ		leave
	dxəl		dx <sup>w</sup> əl		enter
	tqəb		tq <sup>w</sup> əb		pierce
	qtəl		q <sup>w</sup> təl		murder
	gʕəd		g <sup>w</sup> ʕəd		sit down
b.	<i>Adj. (pl.)</i>		<i>Verb</i>		
	k <sup>w</sup> bar	big	kbar		he grew up
	q <sup>w</sup> dam	old	qdam		he/it became old
	r <sup>w</sup> aq	thin	rqaq		he/it became slim
	rx <sup>w</sup> aS	cheap	rxaS		it became cheap
	ɣ <sup>w</sup> laD	fat	ɣlaD		he/it became fat
c.	k <sup>w</sup> ħəl	kohl	kħəl		black (mas. sg)
	x <sup>w</sup> əDRa	vegetables	xəDRa <sup>5</sup>		green (fem. sg.)
	g <sup>w</sup> əlsa	site for selling st.	gəlsa		sitting
	ʕ <sup>w</sup> ər	sterility	ʕər		he became sterile

<sup>5</sup> This doublet is taken from Youssi (1998: 207). In fact the author considers the non-labialization or the labialization of [x] to be mere dialectal variation. While we believe that this is partly true of certain dialects, we do maintain that in CMA, labialization may be distinctive.

In 6a, labialization contrasts the perfective and the imperative; in 6b, it distinguishes the plural adjective and the verb; and finally in 6c, it contrasts the noun and the adjective in the first two items, the noun and the noun in the third and the noun and the verb in the final. The substitution of labialized consonants for the corresponding non-labialized will result in a change of meaning. Thus both simple and labialized dorsals must be considered as separate phonemes in CMA .

At considering the data in 6, one may argue that labialization has a morphological status since it serves to contrast different morphological classes such as the perfective and the imperative (e.g. qtəl/q<sup>w</sup>təl), the singular and the plural (e.g. kbir/k<sup>w</sup>bar, qdim/q<sup>w</sup>dam ...), the adjective and the verb as in 6b, and therefore labialization should be a morpheme marking these morphological categories as argued by El Medlaoui (1992) rather than lexically associated with the dorsal consonants. If we assume that this is the case, we should expect, for example, the plural morpheme to consist of the vocalic melody as well as the feature of rounding that associates with dorsal consonants. However, this is not the case as shown in the examples below taken from Boudlal (1998: 52):

-7-

<i>Singular</i>	<i>Plural</i>	<i>Gloss</i>
kəlb	klab/*k <sup>w</sup> lab	dog
gərba	grabi/*g <sup>w</sup> rabi	water container (made up out of goat skin)
qəhwa	qhawi/*q <sup>w</sup> hawi	cafe/coffee
xruf	xərfan/*x <sup>w</sup> ərfan	sheep
γəmza	γəmzat/*γ <sup>w</sup> əmzat	wink

If labialization were part of the plural morpheme, we would have first to explain why the asterisked forms are ruled out even if they contain labialized dorsals. Second, we would have to explain why it does not hook up to the initial dorsal consonants of the attested plural forms as is the case with the diminutive forms where the feature causing labialization is assumed to be part of the diminutive morpheme. (See chapter six for details on the labialization of dorsal and labial consonants).

One additional remark about the consonantal inventory of CMA is that the labialized dorsals make it look different from that established for AMA as described in Benhallam and

Dahbi (1990) and Youssi (1998) <sup>6</sup>. This is no surprise given the fact that the consonantal system Benhallam and Dahbi (1990) propose for AMA is intended for the purpose of describing all the varieties of MA regardless of regional variation.

Having given the consonantal inventory of CMA, let us now turn to the vocalic inventory. Generally, the previous works done on vowels agree on the fact that MA has three underlying vowels which are /i, u, a/. The crucial issue, which is the point of divergence is related to the status of the schwa. Should it be assigned a phonemic or a phonetic status ?

For most works on MA, the schwa is assumed to be purely phonetic and therefore epenthetic (Benhallam 1980, 1988, 1990a, Marsil 1988, Al Ghadi 1990, El Himer 1991, Imouzaz 1991 and Boudlal 1993, among others). On the other hand, Benkaddour (1982) (see also Rguibi 1990, forthcoming), distinguishes two schwas: the phonemic schwa and the phonetic schwa. According to him, the phonemic schwa serves as a morphological contrast between verbs of the type /CCəC/ such as /DRəb/ “hit” and /lʔəb/ “play”, and nouns of the type /CəCC/ such as /DəRb/ “hitting” and /ləʔb/ “play/game”. As to the phonetic schwa, its function is to break up a three-consonant cluster that the language does not allow (e.g. /l-bnat/ —> [ləbnat] “the girls”).

In the present work, we assume that the vocalic inventory of CMA consists of three underlying vowels which are /i, u, a/ and an epenthetic schwa. This vowel system is given in 8 below. The schwa is enclosed between parentheses to denote its epenthetic status.

-8-

High	i	u
Mid	(ə)	
Low	a	

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<sup>6</sup> Youssi (1998) does not use the term AMA. But the consonantal inventory he gives corresponds exactly to that of Benhallam and Dahbi (1990).

Unlike Benkaddour (1982) and Hammoumi (1988), we do not think that the language should have long vowels since it is not distinctive. If length is used, it is simply for stylistic purposes (Youssi 1986).

It should be noted that each of the four vowels in 8 has different phonetic variants depending on the consonantal environments in which they occur. For this purpose, Youssi (1986) groups the consonants of MA into three groups: simple consonants which are labials, alveolars and palatals; back consonants which are velars, uvulars, pharyngeals and laryngeals; and finally emphatic consonants. The phoneme /i/ appears as [i] in the environment of simple consonants, [ɪ] next to back consonants and [iː] next to emphatics. The phoneme /u/ appears as [u] next to simple consonants, [ʊ] next to back consonants and as [uː] next to emphatics. The phoneme /a/ appears as [æ] next to simple consonants, [ɑ] next to back consonants and [aː] next to emphatics. Finally, the schwa appears as [ə] next to simple consonants, [ɤ] next to back consonants and [ʌ] next to emphatics.

In the absence of a truly experimental study of the phonetic variants of MA vowels, the variants given above remain mere approximations and therefore will not be represented in the present work.

## 5.2 Morphology

This subsection deals with some aspects of the prosodic morphology of CMA which we judge need to be explored given the theoretical framework adopted in the present work. First, the definition of the root-and-pattern morphology will be established. Second, examples of the relevant derivational processes that will be dealt with in the core chapters will be given.

### 5.2.1 Root-and-Pattern Morphology

Most words in MA, and other Semitic languages, are built on a basic consonantal skeleton called the root. This root occurs in patterns with different vowels to convey specific meanings. For example, the root /ʃRb/, which has something to do with the concept of "drinking", has the following patterns, among others:

ʃRəb	he drunk
ʃRib	drinking
ʃəRba	one drink
ʃəRRəb	cause to drink

Harrell (1962) distinguishes three basic root types in MA : trilateral, quadrilateral and atypical roots <sup>7</sup>. Trilateral roots are composed of three segments. The roots which have four constituent elements are called quadrilateral. Roots with fewer than three or more than four segments are called atypical. Trilateral and quadrilateral roots are further classified as strong or weak. Strong roots are those composed entirely of consonants such as the root /ktb/ which is realized as [ktəb] “he wrote”. On the other hand, weak verbs are those which have, at least, a glide as one of its constituent elements such as /wSl/, /dwb/, /dwy/ realized respectively as [wSəl] “he arrived”, [dəwwəb] “cause to dissolve”, and [dwi] “speak”<sup>8</sup>.

For the purpose of the present work, and following Al Ghadi (1990), the traditional terms biliteral (or biconsonantal), trilateral (or triconsonantal) and quadrilateral (or quadriconsonantal) will be replaced with the terms bisegmental, trisegmental and quadrisegmental (where segment stands for vowels and consonants). The reason for such appellations lies in the fact that the roots in MA may consist of both consonants and vowels, an issue that has been argued for in Al Ghadi (1990), and other subsequent works such as Bennis (1992), Boudlal (1993) and Meliani (1994).

### 5.2.2 Relevant Morphological Processes

The central issue in the present work is to account, by means of constraints, for some aspects of the phonology and prosodic morphology of CMA. The phonological aspects that will be dealt with are mainly syllable structure and stress. As to morphology, the aspects that will be dealt with include nisba adjectives derived from compound nouns, the causative, the passive

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<sup>7</sup> According to Harrell (1962), atypical verbs include verbs such as [dda] “he took” and [ʒa] “he arrived” which do not conform to the general root-and-pattern system of the language.

<sup>8</sup> It will be seen in chapters four and five below that verbs with high vocoids may be represented with a glide underlyingly as is the case with /wSl/ or with a high vowel as is the case with /dub/.

participle and the diminutive. Representative examples of these aspects are given in the following subsections.

### 5.2.2.1 The Nisba

The nisba formation is characterized by the suffixation of the morpheme [-i] to the base. Consider the examples in 10 for illustration:

-10-

	<i>Base</i>	<i>Nisba</i>	<i>Gloss</i>
a.	fas	fasi	from Fès
	məknaš	məknaši	from Meknes
	tunəs	tunsi	from Tunisia
b.	ʕəbda	ʕəbdi	from the Plain Abda
	x <sup>w</sup> riɓga	x <sup>w</sup> riɓgi	from Khouribga
	taza	tazi	from Taza
c.	sla	slawi	from Salé
	sma	smawi	sky-blue
	Səħra	Səħrawi	from the Sahara

When the base ends up in a consonant, nothing special happens after the affixation of the nisba morpheme. However, when the base ends up in a vowel, two different processes could happen: truncation or glide epenthesis. If the final vowel of the base is the feminine suffix, it gets truncated after the suffixation of [-i] (10b). If this vowel is part of the base, the glide [w] is epenthesized to serve as an onset to the nisba suffix (10c).

What interest us more in the present work are not items like those in 10 above but those nisba adjectives derived from compound nouns and nouns with the affix [t-...-t]. Below we give examples of these nisba adjectives:

-11-

	<i>Base</i>	<i>Nisba</i>	<i>Gloss</i>
a.	bni-məllal	məllali	from Beni-Mellal
	DDar-(ə)biDa	biDawi	from Casablanca
	wlad-ħəddu	ħəddawi	from Oulad Haddu

b.	tarudant	rudani	from Taroudant
	tafilalt	filali	from Tafilalt
	taḥənnawt	ḥənnawi	from Tahannaout

The common characteristic among the nisba adjectives above is that they are all derived from names of Moroccan localities. When the nisba affix is attached, part of the base is truncated: in 11a it is the left-hand member of the compound; in 11b it is the affix [ta-...-t].

This phenomenon of truncation is taken in chapter 4. In particular, we will try to answer questions such as the following: What is it that conditions this truncation? Is the output of these forms governed by some prosodic constraint delimiting its size and forcing deletion from the base?

#### 5.2.2.2 The Causative

The causative is formed by doubling the second segment of the base form as seen in 12 below:

-12-

	<i>Base</i>	<i>Causative</i>	<i>Base gloss</i>
a.	ktəb	kəttəb	write
	wSəl	wəSSəl	arrive
	dwa	dəwwa	speak
	bka	bəkka	cry
b.	dub	dəwwəb	dissolve
	nuD	nəwwəD	stand up
	fiq	fəyyəq	wake up
	Tiḥ	Təyyəḥ	fall down

The causative has been analyzed as a case involving circumscription of a prosodic category which is the minimal syllable (Bennis 1992). It involves the gemination of the second segment of the base and operates at the left side of the minimal syllable as in 12a or at the right side thereof as in 12b.

In chapter four, this category will receive due consideration. In particular, we will point out the limitations of a circumscriptive analysis and propose an alternative analysis couched in a constraint-based framework.

### 5.2.2.3 The Passive Participle

The passive participle is obtained by the prefixation of [m-] and sometimes the infixation of [-u-] to the base which is the verb as shown in the examples below:

-13-

	<i>Vb. Stem</i>	<i>Passive P.</i>		<i>Gloss</i>
a.	ktəb	məktub		written
	DRəb	məDRub		hit
	dir	mədyur		done
	wləd	məwlud		born
b.	kri	məkri		rent
	səlləf	msəlləf	lent	
	kərkəb	mkərkəb		rolled
	sali	msali		finished
	surt	msurət		locked

The items in both 13a and 13b prefix the morpheme [m-] in the passive participle. The items in 13a proceed to further infixation of [-u-] before the final segment of the base.

In chapter four, we will decide on whether or not the prefinal vowel is part of the passive participle morpheme. If it is part of the passive morpheme, we will have to explain why it does not show up in items such as those in 13b. If it is not a morphemic vowel, we will have to explain why it appears in 13a but not in 13b

### 5.2.2.4 The Diminutive

In most MA words, the diminutive is formed by the infixation of the segment [-i-] after the second segment of the base, as seen in 14 below:



	<i>Base</i>	<i>Diminutive</i>	<i>Base gloss</i>
a.	kəlb	k <sup>w</sup> liyyəb	dog
	qərd	q <sup>w</sup> riyyəd	monkey
	bab	bb <sup>w</sup> iyyəb	door
b.	wdən	wdina	ear
	zit	zwita	oil
	bənt	bnita	girl
c.	kura	kwira	ball
	TəbSil	TbiSil	plate
	Siniyya	Swiniyya	tray

Three remarks need to be made about the items in 14. First, labial and dorsal consonants get labialized in the diminutive, a fact which points out that labialization is part of the diminutive morpheme. Second, the output of the diminutive consists minimally of two syllables and maximally of three. Third, monosyllabic bases are augmented by the addition of [yyə] as in 14a or the suffixation of [-a] as in 14b.

In chapter six, we will focus mainly on the augmented cases and show whether or not such an augmentation is dictated by some prosodic requirement on the output. We will also try to explain why in some cases augmentation is achieved by the addition of [yyə] while in others, it is achieved by the suffixation of [-a].

## 6. THEORETICAL BACKGROUND

Research in Prosodic Morphology can be divided into two stages. The first stage started with McCarthy (1979) who was the first to deal with languages having a non-concatenative morphology within a non-linear theoretical framework. He proposed a prosodic theory of non-concatenative morphology which was continuously revised until it developed into what came to be known as Circumscriptive Prosodic Morphology. The second stage in the history of Prosodic Morphology was characterized by a restatement of the principles of Prosodic Morphology within

Optimality Theory (McCarthy and Prince 1993a), thus paving the way to Correspondence Theory (McCarthy and Prince 1995, 1999 and related work).

The theoretical framework we propose for the analysis of the phonological and morphological problems raised above combines the proposals of two separate but closely related theories: Optimality Theory and Correspondence Theory. In what follows, we present the historical background that has led to the emergence of this Optimality Theory and Correspondence Theory.

### 6.1 Prosodic Morphology Before Optimality Theory

Non-linear phonology came as a reaction against Chomsky and Halle's (1968) position on the linear nature of phonological representations. Prosodic Phonology, which is a sub-branch of non-linear phonology, introduced notions such as the mora, the syllable and the foot. These notions were later applied to the study of morphology and in the area where prosodic phonology and morphology interact, thus giving rise to the theory of Prosodic Morphology.

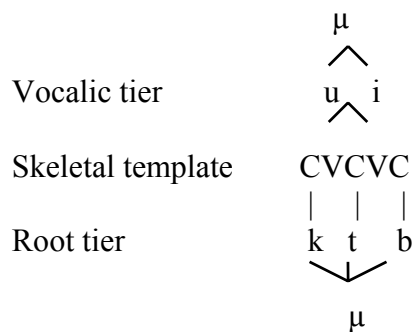
#### 6.1.1 Prosodic Morphology

With the emergence of Autosegmental Phonology (Goldsmith, 1976, 1979), the characterization of non-concatenative morphology was made much easier than the boundary apparatus utilized in Chomsky and Halle (1968). McCarthy (1979, 1981) applies the principles of Autosegmental Phonology to the phenomena of discontinuous affixation in Semitic Morphological systems, particularly that of CA. The adaptation of these principles to account for languages having non-concatenative morphologies gave rise to the theory of Non-concatenative Morphology (McCarthy, 1979, 1981, 1982), which later develops into Prosodic Morphology (McCarthy and Prince 1986 et seq.).

The central concept involved in non-concatenative morphology is the 'template': a skeletal morpheme that is segmentally unspecified except for information on the positions of consonants and vowels. According to McCarthy (1979, 1981), morphemes are no longer represented in a linear fashion as is the case with the standard theory of phonology embodied in Chomsky and Halle (1968), but on different levels called tiers, all of which are linked to a

templatic skeleton. As CA is structured in such a way that the roots are made up solely of consonants and the vocalism is provided by morphology, the mapping of different tiers to the skeleton is ensured by a set of autosegmental principles (see McCarthy, 1981). In CA, the consonants always associate with the C-slots while the vowels with the V-slots. For McCarthy (1981), the skeleton in CA is found to be templatic in that it always corresponds to some morphological meaning and is therefore morphemic. For example, the passive form [kutib] “it was written” would be represented autosegmentally as in 15:

-15-



The root provides the basic meaning of “write”, the template represents the perfective active and the morpheme [u i] represents the passive.

Of close relevance to Templatic Morphology are two principles: the Obligatory Contour Principle (OCP, Leben’s 1973) and Tier Conflation (TC, McCarthy 1986). The OCP prohibits adjacent identical elements from occurring on the same tier. TC has the effect of conflating different tiers into a linearized fashion.

In a later version of Prosodic Morphology, McCarthy and Prince (1986, 1990b) argue against segmental templates in favor of prosodic ones. They claim that Prosodic Morphology operates not with CV units but with authentic units of prosody such as the mora, the syllable, the foot, and the prosodic word. They further argue that segmental templates are incapable of specifying that certain elements in the template are obligatory while others may be optional. The new version of Prosodic Morphology is later developed into the theory of Prosodic Circumscription (McCarthy and Prince 1990a; Lombardi and McCarthy 1991).

### 6.1.2 Circumscription within Prosodic Morphology

The theory of Prosodic Morphology, developed in McCarthy and Prince (1990a), is based on three main theses which are stated as follows:

-16-

a. Prosodic Morphology Hypothesis (PMH)

Templates are defined in terms of authentic units of prosody : mora ( $\mu$ ), syllable ( $\sigma$ ), foot (Ft), prosodic word (PWd), and so on.

b. Template Satisfaction Condition (TSC)

Satisfaction of templatic constraints is obligatory and is determined by the principles of prosody, both universal and language-specific.

c. Prosodic Circumscription of Domains (PCD)

The domain to which morphological operations apply may be circumscribed by prosodic criteria as well as by the more familiar morphological ones. In particular, the minimal word within a domain may be selected as the locus of morphological transformation in lieu of the whole domain.

The first thesis states that templates in Prosodic Morphology are defined in terms of the authentic units of prosody and not in terms of CV units. Following Selkirk (1980), McCarthy and Prince (1993: 2) maintain that the authentic prosodic units are defined in a hierarchical way and in terms of dominance. Thus the prosodic word dominates the foot, and the foot dominates the syllable which, in turn dominates the mora. Each of these prosodic categories is defined in terms of the lower one in the hierarchy. The mora, being the lowest unit, serves to determine syllable weight. A light syllable consists of one mora [ $\sigma\mu$ ], a heavy two moras [ $\sigma\mu\mu$ ]. The syllable is the unit that bridges two levels; the moraic level and the foot level. The foot according to McCarthy and Prince (1986) is assumed to be governed by a constraint which requires that it be binary under syllabic or moraic analysis. Together the prosodic hierarchy and the foot binarity constraint derive the minimal word. The notion “minimal word” corresponds to “minimal foot” and is found to play a major role in prosodic morphology. For example, the minimal word in CA is an iambic foot, that is a sequence of light-heavy syllables, or light-light syllables or simply a heavy syllable.

The second thesis in 16 requires that all the elements of a template be obligatorily satisfied by virtue of TSC. Under this condition, no morphological template is allowed to contain excess material which presents serious mapping problems to segmental theories (for the statements of these problems, see McCarthy and Prince, 1986). At the same time, the theory of

Prosodic Morphology allows the presence of optional material which is governed by both universal and language-specific characterization of the prosodic units constituting the template.

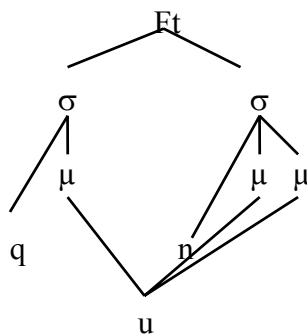
The third thesis in 16 demands that morphological operations be circumscribed by prosodic criteria as well as morphological ones. Central to prosodic circumscription is a parsing function  $\mathcal{F}$  which locates a prosodically-delimited domain of application of morphological rule which is smaller than the base. According to McCarthy and Prince (1990a), circumscription can be either negative or positive. In negative circumscription, some prosodic constituent  $\mathbf{C}$  at the edge  $\mathbf{E}$  (left/right edges) of a form is disregarded (set as extrametrical) and the morphological operation  $\mathbf{O}$  applies to the remainder. The formula  $\mathbf{O}/\mathcal{F}(\mathbf{C}, \mathbf{E})$  is written to denote the application of  $\mathbf{O}$  to a particular form minus the constituent  $\mathbf{C}$  (the residue) parsed out at edge  $\mathbf{E}$  by the parsing function  $\mathcal{F}$ .

In positive circumscription, the prosodically-delimited constituent at the edge serves itself as the base of morphological operation. In this case, the formula  $\mathbf{O}/\mathcal{F}(\mathbf{C}, \mathbf{E})$  is written to denote the application of  $\mathbf{O}$  to the constituent  $\mathbf{C}$  parsed out at edge  $\mathbf{E}$  by  $\mathcal{F}$ .

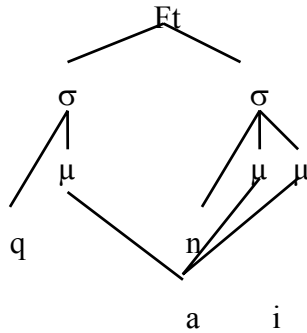
In CA, for example, the domain of the plural is assumed to be a circumscribed minimal word which consists of two moras (McCarthy and Prince 1990a). Adopting McCarthy and Prince's circumscriptive model, the derivation of the plural form [qanaafid] from the singular [qunfud] 'hedge hog' proceeds by scanning the base [qunfud] into a minimal word which is [qun] and a residue which is [fud]. The circumscribed domain which is [qun] is then mapped onto an iambic foot. The whole picture is represented as follows:

-17-

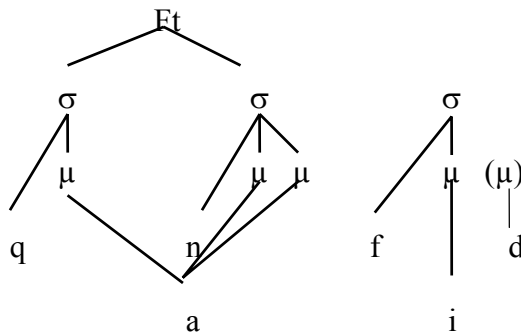
a. Mapping of circumscribed [qun] onto an iambic foot



b. Association of first vowel of the plural melody /a i/



c. Reestablishing the residue and association of the second vowel of the plural melody /a i/



As seen above, the morphological operation **O** proceeds by mapping the minimal word into an iambic foot. The result of the mapping is concatenated with the residue, which is the final heavy syllable of [qunfud]. The vowels that associate to the moraic positions are those of the plural morpheme [a i]. They overwrite the vowels of the singular base.

However, with the recent developments in phonological theory, particularly, with the emergence of constraints embodied in Optimality Theory (Prince and Smolensky 1993), McCarthy and Prince (1993a) reformulate Prosodic Morphology in such a way that it is conceived of as a theory of constraint interaction. In the following section, we expose the basic tenets of Optimality Theory and see how the principles of the new version of Prosodic Morphology will fit into the Optimality Program.

## 6.2 Optimality Theory

### 6.2.1 Introduction

Optimality Theory differs from earlier phonological theories in at least two aspects. First, previous works in phonology assume that the task of a phonological theory is to define the underlying form (input) and the surface form (output) of a linguistic object. The matching between the input and the output is achieved via phonological rules. However, with the rise of Prosodic Morphology, the form of morphemes has been shown to be largely governed by constraints on the well-formedness of the output. Parallel developments in phonological theory were very important to the emergence of OT (Prince and Smolensky, 1991, 1992, 1993, McCarthy and Prince 1993a). OT abandons the idea that the input-output matching is accomplished by rules. In place of this is the function Gen (standing for Generator) which produces for any given input a large number of candidate analyses.

The second distinguishing aspect of OT is that it abandons the widely held view that constraints are language-particular statements of phonotactic truth. Instead of this is the claim that constraints are essentially universal and of general formulation, with a great potential for disagreement among the well-formedness of analysis. The redefinition of constraints on universal grounds does not deny the role individual grammars play in phonological analysis. Prince and Smolensky (1993) hold that the role of an individual grammar consists in the ranking of universal constraints.

Four basic assumptions underlie OT. These are stated in 18 below:

-18-

- a. violability
- b. Ranking
- c. Inclusiveness
- d. Parallelism

The first assumption holds that constraints in OT are violable, but this violation should be minimal. Minimal violation according to McCarthy and Prince (1993) is defined in terms of the ranking of constraints. In OT, the optimal form is selected by a set of well-formedness constraints ranked in a hierarchy of relevance, so that a lower-ranking constraint may be violated to secure a higher-ranking one. Inclusiveness means that the candidate analyses are generated by general

considerations of structural well-formedness. No rules or repair strategies are admitted, contra to other constraint-based theories (LaCharité and Paradis, 1993). The fourth assumption of OT, parallelism, means that there is no serial derivation; all the possible candidate analyses produced are evaluated according to the constraint hierarchy. The candidate that passes the higher-ranking constraints is the output form.

### 6.2.2 The Construction of Grammar in OT

In OT, grammar must define a parsing of input and output forms. For any given input, the function Gen which is part of Universal Grammar, produces a large set of candidate analyses associated with that input. For example, Gen involves the construction of many different prosodic parses or many different linear arrangements of morphemes. The function Eval (standing for Evaluator) determines the relational harmony of the candidates, ordering them by how well they best-satisfy the constraint system of the language. An optimal candidate is at the top of the harmonic order of the candidate set. According to Prince and Smolensky (1993), grammar in OT can be schematized as follows:

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$$\text{Gen}(\text{input}_i) = \{\text{cand}_1, \text{cand}_2 \dots \text{cand}_n\}$$
$$\text{Eval}(\{\text{cand}_1, \text{cand}_2 \dots \text{cand}_n\}) \rightarrow \text{cand}_k \text{ (real output)}$$

As could be seen in 19, the candidate analyses are supplied by Gen. For Prince and Smolensky, three basic principles underlie the function Gen :

-20-

- a. Freedom of analysis
- b. Containment
- c. Consistency of exponence



Freedom of analysis means that Gen can supply candidates with moraic, syllabic or other prosodic structure, and with additional segmental material, ranging from empty nodes to fully-specified vowels or consonants. No rules or repair strategies need to be posited.

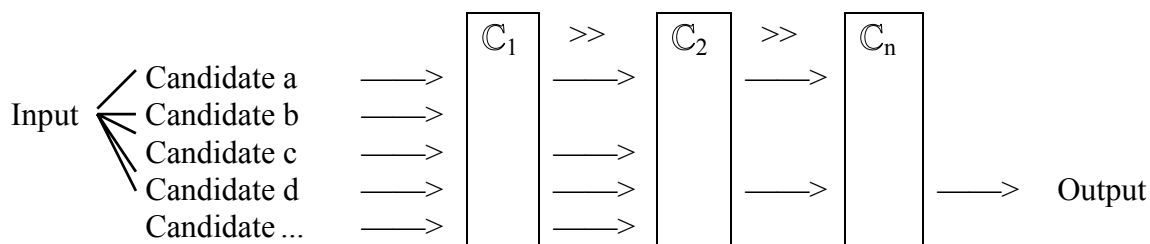
Containment demands that the input must be present in any possible candidate form. For example, containment means that segmental deletion phenomena such as [k] deletion in English “know” should be looked at as a case of underparsing (“<k>now”, where < > enclose underparsed material). Under containment, phonologically deleted segments are present in the output but unparsed syllabically. In later development within the OT framework (McCarthy 1995 et seq.), the principle of containment was abandoned in favor of a more general way of faithfulness regulating the relation between the input and the output.

Consistency of exponence is a hypothesis about the phonology-morphology interface. It means that the lexical specifications of a morpheme can never be affected by Gen. In other words, it demands that the phonological exponents of any given morpheme be identical in underlying and surface forms.

The central proposal in OT is that constraints are violable and are ranked in a hierarchy of relevance. The output candidates produced by Gen are evaluated according to a set of hierarchically ranked constraints ( $C_1 \gg C_2 \gg \dots C_n$ , where the symbol “ $\gg$ ” shows domination relation) each of which may eliminate some output candidates. The elimination process in OT is schematized below:

-21-

Mapping of input to output in OT grammar (Kager 1999: 8)



The function Eval proceeds by evaluating all the possible candidates and then chooses the one that is most harmonic with respect to the set of ranked constraints, i.e. the real output (optimal) candidate.

Closely related to constraint violability is the notion of constraint conflict. To best-exemplify this notion, consider the following example taken from McCarthy and Prince (1993a). Assume that a grammar consists of two constraints : constraint A and constraint B. Assume further that Gen generates cand<sub>1</sub> and cand<sub>2</sub> from input<sub>i</sub>. If A and B disagree, we say that we have a constraint conflict. This conflict is represented in the constraint tableau in 22 below. Violations are marked by an asterisk and a fatal violation is marked by !; the optimal candidate is marked by ↵.

-22-

Candidates	A	B
↵ Cand <sub>1</sub>		*
Cand <sub>2</sub>	*!	

Cand<sub>1</sub> meets constraint A but fails constraint B, whereas Cand<sub>2</sub> meets constraint B but fails constraint A. Assuming that Cand<sub>1</sub> is the optimal output, the grammar requires that A dominates B (written as A>>B).

The basic tenets of OT have been applied to the domain of Prosodic Morphology, firmly establishing what is known as the OT-based Prosodic Morphology.

### 6.2.3 Prosodic Morphology within Optimality Theory

Prosodic Morphology within OT (PMOT) is a theory about prosody-morphology interface. It is based on the idea that patterns of reduplication, root-and-pattern morphology, and infixation and related phenomena result from a combination of independent and general constraints, ranked under OT. The basic tenets of this theory are stated in McCarthy and Prince (1993a: 103) as follows:

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#### a. Prosodic Morphology Hypothesis (PMH)

Templates are constraints on the prosody/morphology interface, asserting the coincidence of morphological and prosodic constraints.

### b. Template Satisfaction Condition

Templatic constraints may be undominated, in which case they are fully satisfied, or they may be dominated, in which case they are violated minimally, in accordance with the general principles of Optimality Theory.

### c. Ranking Schema

$P \gg M$

The first thesis means that templates should be conceived of as constraints on the interaction between prosody and morphology. In the standard version of the PMH (cf. 23a above), templates are said to consist of authentic units of prosody. However, in PMOT, they are a particular kind of constraint of the large ALIGN family, asserting the coincidence of morphological and prosodic constituents or their edges.

The second thesis of PMOT is also a revision of the TSC expressed in the standard theory of Prosodic Morphology (cf. 23b above). The new formulation of TSC states that templates may be undominated, which means that they are obligatorily satisfied; or they may be dominated, which means that they are violated. However, if they are ever violated, the violation should be minimal, i.e. to secure higher-ranking constraints.

The ranking schema  $P \gg M$  means that if some morphological domain is to be prosodically conditioned, then in that domain  $P \gg M$ , that is prosody dominates morphology.

In subsequent work within the OT framework, McCarthy and Prince (1993b) claim that the constraints on the interface between prosody and morphology are of the general form ALIGN, which requires that the edge of any grammatical category (G Cat) align with the corresponding edge of some prosodic constituent (P Cat). In this view, templatic categories such as the “Minimal Word” are no longer needed since their effect can be derived from constraint interaction. McCarthy and Prince expand on Prince and Smolensky’s (1993) model of constraints on faithfulness of the output to the input, and also on McCarthy and Prince’s (1993a) model of constraints on identity between the base and reduplicant and propose a theory unifying both faithfulness and identity - Correspondence Theory (1995, 1999).

## 6.2.4 Correspondence in Optimality Theory

In OT, grammar is defined as a set of constraints belonging to UG and ranked on a language-particular basis. These universal constraints involve two types: markedness constraints and faithfulness constraints. Markedness constraints as McCarthy (1997) puts it, militate against structural elaboration of various kinds while the antagonistic faithfulness constraints demand identity of linguistically related forms.

Correspondence Theory treats identity between the base and the reduplicant like faithfulness of the output to the input. Faithfulness and identity follow from the same kind of formal constraints on the correspondence relation between representations. According to McCarthy and Prince (1995: 15), correspondence is a function formally viewed as follows:

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### **Correspondence**

Given two strings  $S_1$  and  $S_2$ , correspondence is a relation  $\mathcal{R}$  from the elements of  $S_1$  to those of  $S_2$ . Elements  $\alpha \in S_1$  and  $\beta \in S_2$  are referred to as correspondents of one another when  $\alpha \mathcal{R} \beta$ .

Correspondence is at minimum a relationship between segments. For McCarthy (1995) it can be extended to features and prosodic units such as moras, syllables, feet, heads of feet, as well as tones and distinctive features and feature nodes. Furthermore, correspondence need not be limited to base and reduplicant and input and output relations; it can also be extended to cover cyclic and truncatory phenomena (Benua 1995, 1997), circumscriptural phenomena (McCarthy 1997) and relations between separate words (Benua 1995, 1997, Burzio 1996, Kenstowicz 1996, 1997, Kager 1996, Basri et al 1998, Selkirk 1999). (See chapter four for an extended version of CT and an illustration of the areas it covers)

Some of the constraint families on correspondent elements are given in 25 below. These constraints refer to a pair of representations ( $S_1$ ,  $S_2$ ) standing to each other as input/output (I-O), base/reduplicant (B-R) and output/output (O-O). The constraints also refer to the correspondence relation ( $\mathcal{R}$ ) defined for the representation being compared:

-25-

Constraints on the correspondent elements (McCarthy 1995: 123-125)

- a. MAXIMALITY (MAX):  
Every element of  $S_1$  has a correspondent in  $S_2$ .  
Domain ( $\mathcal{R}$ ) =  $S_1$
- b. DEPENDENCE (DEP)  
Every element of  $S_2$  has a correspondent in  $S_1$ .  
Range ( $\mathcal{R}$ ) =  $S_2$
- c. IDENTITY-[F] (IDENT-F):  
Correspondent segments in  $S_1$  and  $S_2$  have identical values for feature [F]  
If  $x \mathcal{R} y$  and  $x$  is [γF], then  $y$  is [γF]
- d. CONTIGUITY (CONTIG)
- i. I-CONTIG (No Skipping)  
The portion of  $S_1$  standing in correspondence forms a contiguous string.  
Domain ( $\mathcal{R}$ ) is a single contiguous string  $S_1$ .
- ii. O-CONTIG (No Intrusion)  
The portion of  $S_2$  standing in correspondence forms a contiguous string.  
Range ( $\mathcal{R}$ ) is a single contiguous string  $S_2$ .
- e. {RIGHT, LEFT}-ANCHOR ( $S_1, S_2$ )  
Any element at the designated periphery of  $S_1$  has a correspondent at the designated periphery of  $S_2$ .
- f. LINEARITY (No Metathesis)  
 $S_1$  is consistent with the precedence structure of  $S_2$ , and vice versa.  
Let  $x, y \in S_1$  and  $x', y' \in S_2$ .  
If  $x \mathcal{R} x'$  and  $y \mathcal{R} y'$ , then  
 $x < y$  iff  $\neg (y' < x')$
- g. UNIFORMITY (No Coalescence)  
No element of  $S_2$  has multiple correspondents in  $S_1$ .  
For  $x, y \in S_1$  and  $z \in S_2$ , if  $x \mathcal{R} z$  and  $y \mathcal{R} z$ , then  $x = y$ .
- h. INTEGRITY (No Breaking)  
No element of  $S_1$  has multiple correspondents in  $S_2$ .  
For  $x \in S_1$  and  $w, z \in S_2$ , if  $x \mathcal{R} w$  and  $x \mathcal{R} z$ , then  $w = z$ .

The MAX constraint family is a reformulation of PARSE-seg connected to syllabification and phonetic interpretation in Prince and Smolensky (1993). It prohibits phonological deletion,

demands complete copying of base in B-R relation and completes I-O mapping in root-and-pattern morphology.

The DEP constraint family is also a reformulation of FILL in the containment model of Prince and Smolensky (1993). It subsumes the anti-epenthesis effect of FILL without requiring that epenthetic segments be literally unfilled positions whose content is specified by phonetics.

The IDENT constraint family replaces PARSE-feature and FILL-feature-node in Prince and Smolensky (1993). It requires that correspondent segments be featurally identical to one another. When undominated, IDENT requires complete featural identity between correspondent elements. Alteration in featural identity arises only when this constraint is outranked by another.

To exemplify the constraints MAX, DEP, and IDENT, consider the following tableau adapted from Kager and Zonneveld (1999: 15):

-26-

S1	S2	MAX	DEP	IDENT[high]
a. a <sub>1</sub> b <sub>2</sub> i <sub>3</sub>	a <sub>1</sub> b <sub>2</sub> i <sub>3</sub>			
b. a <sub>1</sub> b <sub>2</sub> i <sub>3</sub>	a <sub>1</sub> b <sub>2</sub>	*		
c. a <sub>1</sub> b <sub>2</sub> i <sub>3</sub>	a <sub>1</sub> b <sub>2</sub> i <sub>3</sub> <u>m</u>		*	
d. a <sub>1</sub> b <sub>2</sub> i <sub>3</sub>	a <sub>1</sub> b <sub>2</sub> e <sub>3</sub>			*

In 26a S1 is identical to S2 and therefore the three constraints are satisfied. In 26b, the final segment of S1 is deleted in S2. This deletion results in a clear violation of MAX. In 26c, the underlined segment in S2 does not figure in S1 and as such S2 incurs a violation mark of DEP. Finally in 26c, the identity of the vowel [i] in S1 has been altered, causing a violation of the constraint IDENT [high].

The constraint family CONTIG characterizes two types of contiguity: I-CONTIG and O-CONTIG. I-CONTIG rules out deletion of elements internal to the input string (e.g. xyz —> xz). O-CONTIG rules out internal epenthesis (e.g. xz —> xyz).

The ANCHOR constraint family subsumes Generalized Alignment (McCarthy and Prince 1993b) and captures the effect of the constraint ALIGN (GCat, Left/Right, PCat, Left/Right). It can be extended to cover two prosodic categories such as the foot and the head syllable in the same foot. McCarthy and Prince (1999) cite the example of the foot (b<sup>í</sup>.ta) in which the left edge of the foot anchors with the left edge of the head syllable.

LINEARITY simply preserves the linear order of elements in the input or the base. McCarthy (1995) cites the example of Rotuman whereby the final two segments of the input /pure/ metathesize in the incomplete phrase [puer], thus causing violation of the constraint LINEARITY.

UNIFORMITY and INTEGRITY rule out two types of multiple correspondence. UNIFORMITY is violated when two elements of S1 are fused in S2. INTEGRITY is violated when one element of S1 is split or cloned in S2.

To sum up, this model of CT formulated within the OT framework seems to open up new horizons for the understanding of the interaction of prosody and morphology. It is this general framework that is adopted for the analysis of some aspects of the phonology and prosodic morphology of CMA.

## 7. CONCLUSION

This chapter has reviewed some aspects of the phonology and morphology of CMA as well as the theoretical framework that will be adopted for the analysis of these aspects.

After a brief review of previous works on MA, we have presented the phoneme inventories of the variety under study. We have shown that while CMA shares common characteristics with other varieties of MA, it differs from them by the number of consonant phonemes it consists of. In particular, we have shown, based on the concept of opposition, that the consonant inventory of CMA should also comprise the labialized dorsals /k<sup>w</sup>, g<sup>w</sup>, x<sup>w</sup>, γ<sup>w</sup>, q<sup>w</sup>/. In morphology, we have listed some representative examples of the morphological categories which will be studied in depth in the core chapters of the present work. These categories include the nisba adjective derived from compound nouns and names of localities with the affix [ta-...-t],

the causative, the passive participle and the diminutive. Finally, we have stated the basic principles of Optimality Theory and Corresponding Theory which constitute the theoretical framework that will be adopted for the analysis of the aspects mentioned above.