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77-8533

SAIB, Jilali, 1943-
A PHONOLOGICAL STUDY OF TAMAZIGHT BERBER: DIALECT OF THE AYT NDHIR.

University of California, Los Angeles, Ph.D., 1976
Language, linguistics

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UNIVERSITY OF CALIFORNIA

Los Angeles

A Phonological Study of Tamazight Berber: Dialect of the Ayt Ndhir

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

Jilali Saib

1976

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The thesis of Jilali Saib is approved.

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To my parents and the

other Imazighen

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ACKNOWLEDGEMENTS

I owe a debt of gratitude to many people--too many to properly acknowledge all of them here.

First, I would like to thank Professor Penchoen for making it possible for me to come to UCLA. I have learned a great deal from him on Berber linguistics while working as his language informant.

Second, I owe gratitude to Professors Emonds, Fromkin, Hyman and Esau (now at Texas A & M), and my colleagues Bill Greenberg and Kathy Dahlgren for having shown faith in me at a critical moment of my career as a graduate student at UCLA. Without their understanding and their support I might never have come this far.

Third, I would like to thank the members of my doctoral committee: Professors Fromkin, Emonds, Schuh, Wald, Hyman, and Otero. Each of them has contributed a great deal towards the form and substance of this study. I am indeed fortunate to have had to work under the guidance of such a highly inspiring, helpful and understanding group of scholars.

My greatest inspiratory debt should be assigned to Professors Vicki Fromkin, Larry Hyman and Russell Schuh. A great deal of what I know about phonology and linguistic research comes from them. Their personalities and tireless assistance have provided me with standards of rigor and honesty. Vicki especially has seen this dissertation through several revisions, has patiently read each non-final revision, and has provided insightful comments and suggestions. The form in

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which I now present this study has greatly benefited from Vicki's many comments and suggestions. With her unique blend of demanding expectations and gentle encouragement she has been the best chairperson one could ever hope for. Larry and Russ have helped in many ways, both as friends and scholars. Their assistance has been invaluable.

Thanks are also due to Professor Michael Brame, of the University of Washington, and Professor Raimo Anttila of UCLA. Mike Brame, whom I met through Joe Emonds, did me the signal favor of taking the time to comment on the preliminary versions of three of the chapters. Through his teaching, Raimo was instrumental, long before it became fashionable to do so, in opening my eyes to the excesses of the generative camp.

Some of the research upon which this study is based was supported by a grant from NSF, GS-41820. I would like to thank NSF as well as Dr. Guessous of the University of Morocco and Mr. Aguejdad for their assistance.

Special thanks go to the many Imazighen, i.e. Berbers, who have contributed their valuable time, both as informants and guides.

Many people have provided invaluable assistance with the typing. They are: my wife Raminta, Renee Wellin, Teddy Graham, Linas Raslavicius, Nijole Baskys, and L. M. H. I wish to thank them for putting up with my not so often legible hand-writing and my many inconsistencies.

Finally my deepest thanks go to my wife Raminta for her patience, help and love, and to my parents for having graciously endured a much too long separation.

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"Schwa Insertion in Berber: un problème de choix!" To appear in Afroasiatic Linguistics, Vol.6 .

"On the Underlying Word Order in Modern Standard Arabic" To appear in UCLA Papers in Syntax.

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ABSTRACT OF THE DISSERTATION

A Phonological Study of Tamazight Berber:

Dialect of the Ayt Ndhir

by

Jilali Saib

Doctor of Philosophy in Linguistics

University of California, Los Angeles, 1976

Professor Victoria A. Fromkin, Chairman

The present study focuses on the major areas of Berber phonology within the framework of generative phonology (cf. Chomsky and Halle, 1968). Specifically, one subdialect of Tamazight, Ayt Ndhir, is taken as the focal dialect and serves as the starting point for a description encompassing other subdialects of Tamazight, and for some topics, Berber in general.

The aim of the study is primarily to provide a descriptively adequate account of several phonological processes operating in Berber. Some theoretical discussion is included especially in those cases where the Berber data have some bearing on the issues.

Chapter 1 specifies the approach followed in the study as well as its scope. It also discusses the status of Berber and the state of Berber linguistics.

Chapter 2 discusses the segmental phonemes of Tamazight Berber and provides the Morpheme Structure Conditions which are applicable to them.

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Chapter 3 is concerned with the question of how geminate consonants should be treated in Berber. The possible approaches to geminates are discussed and a case is made for treating these segments as sequences of two identical consonants in Berber. In addition, a general convention for interpreting each of the two identical consonants in the sequences as redundantly [+tense] is introduced and defended. It is also claimed that the mutual strengthening effect that the two elements of geminate sequences have on one another is responsible for the non-application of weakening processes to geminates.

Chapter 4 investigates the process of spirantization in Berber from both the diachronic and synchronic points of view. In the diachronic account, questions concerning the cause of this weakening process, the degree of its spread within the inventory of segments as well as its spread throughout the Northern Berber domain, are considered. In the synchronic account, questions pertaining to the representation of segments of Tamazight-Ayt Ndhir, especially the representation of simple/geminate consonant alternations and the stop/spirant alternations are discussed. The conclusion is that this dialect no longer has a spirantization rule, and that spirants, which historically derive from single stops, are posited as underlying segments.

Chapter 5 deals with the problem of schwa in Berber. Specifically, the question of whether schwas are inserted or present in underlying representations of C_1C_2 and $C_1C_2C_3$ verb stems is examined in detail. This examination consists of proposing, motivating, and evaluating a number of analyses possible within the generative framework. It also considers recent proposals concerning "abstractness" and "concreteness"

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of underlying represnetations, and alternative orderings of phonological rules. It is concluded that the "concrete" analysis - in which all schwas are in the underlying representation - is superior.

Chapter 6 investigates the changes which affect the initial vowel of the feminine nouns when they occur in "construct state" environments (i.e. when the noun is in the nominative or the oblique case). The traditional approaches to the problem, which posit a distinction between constant and non-constant vowels, are critically evaluated. An analysis based on the syllable structure of the nouns and motivated by a search for phonological conditioning is presented and defended.

The Appendix provides supplementary information on the plural and intensive form (i.e. imperfect aspect) derivations, which were only briefly touched upon in the main body of the study.

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Chapter 1

BACKGROUND

1.0 Introduction: The present study focuses on the major areas of Berber phonology within the framework of generative phonology as articulated in Chomsky and Halle's Sound Pattern of English (1968), hereafter SPE, and as subsequently modified in a number of later studies. Specifically, one subdialect of Tamazight (=Tamaziɣt) - Ayt Ndhir - is taken as the focal dialect and serves as the starting point for a description encompassing other subdialects of Tamazight, and, for some topics, Berber in general.

Regarding the subsequent modifications of Chomsky and Halle's theory, much consideration is given to several post-SPE works such as those of generative phonologists like Kiparsky (1968, 1971, 1973), Fromkin (1971a, b and 1974), Hooper (1972, and 1973), Howard (1973), Shibatani (1973), and others. Familiarity with the underlying assumptions, claims and formalism in SPE (i.e. the transformational generative framework or simply T-G) is henceforth assumed. In addition, alternative theories such as Vennemann's Natural Generative Phonology (Vennemann 1971, Hooper 1973, hereafter N-G.) are taken into account, especially in those cases where T-G fails to account for the data.

1.1 Aim of the study. Approach taken: The aim of this study will be primarily to provide a descriptively adequate account of several

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phonological processes operating in Berber. As will be evident from the review of previous scholarship on Berber given below, these processes have not up to now received an adequate treatment, if indeed they were treated at all. Theoretical discussion will be of secondary importance, even though, because of our theoretical orientation, this study will also contain a number of observations about current issues in phonology on which the analysis of the Berber data has some bearing. Specifically, some implications of the analyses for a more extended treatment of Berber phonology and for the phonological theory in general, will be drawn. In this respe , the present study may also be viewed as a test of certain claims embodied in current theories of generative phonology. It is thus hoped that this work will be of value to both Berberists and theoretical linguists.

Two reasons have motivated the choice of presenting a study mainly concerned with description. First, and foremost, such a description is sorely needed to fill a gap in Berber studies, in the list of which we have yet to find a thorough phonological account. Second, a thorough descriptive analysis of a language should make a contribution to the field of linguistics. With the advent and wide acceptance of the theory of generative grammar, great emphasis was put on theoretical issues. As in other sciences, the theory makes a number of empirical claims which can only be tested by applying such theories to the actual descriptions of human languages. The contribution made by data-oriented studies is, therefore, of paramount significance. An in-depth analysis of a language (and languages) makes cross-language comparisons possible. As such, it contributes

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to our understanding of the nature of human language in general. Furthermore, one of the main reasons for developing a general (meta theory) in linguistics is to make possible insightful descriptions of individual languages.

In recent years many papers have been concerned with proving or disproving a particular theoretical claim, using data from real languages only in bits and pieces. Examples of this selective use of data can be found in, for example, papers devoted to the abstractness controversy (cf. Kiparsky 1968, Hyman 1970, Kisseberth 1969, Crothers 1971, Vennemann 1972 and 1973), and to the controversy over the ordering of phonological rules (Koutsoudas et al 1974, Vennemann 1971). Despite the high level of argumentation of these works, even when they seem convincing, the most they succeed in demonstrating, is the ability of this or that theoretical construct to deal with some specific pieces of data. In contrast, a full description can demonstrate whether the current theories - with all their constructs - can adequately deal with the total intricacies of a real language.

In making the above statements, it is not the intention of this investigator to underestimate (or downgrade) the importance that theory plays in linguistic research. As a case in point, it is often when one tries to utilize the formal devices made available by the generative theory that the implications become evident and that new questions arise. Rather, the purpose is to help reemphasize the importance of description in linguistic studies. If theoretical assumptions determine, to a large degree, the form of the linguistic data, the description of the data often shows inadequacies in those

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theoretical assumptions. Theories are at best approximations to the 'truth'; solid descriptive and data-oriented analyses should remain as a useful source for future theories.

Thus, even though - as stated above - this study is based on (and for the most part accepts) the T-G assumptions, this should not be interpreted as meaning that in situations where the data call for it, i.e. when certain facts of Berber phonology cannot be adequately handled within the model, there is to be no further modification of (or outright deviation from) those assumptions. Alternative analyses and competing theories such as N-G or Koutsoudas et al's No Extrinsic Ordering Hypothesis (see references above) will be considered. This inquiry into Berber phonology is undertaken following Chomsky and Halle's basic assumptions about natural language and in keeping with their views. In SPE they state:

> "We have decided to publish this study in its present intermediate stage in the hope that it will stimulate criticism and discussion of basic issues and perhaps involve other investigators in the immense task of extending this sketch to the whole of English, providing the same sort of description for other languages, and enriching and sharpening (and, no doubt, revising in many ways) the phonological theory on which it is based." (p. vii).

They state further:

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> "it is a near certainty that the phonological theory we propose will be shown to require substantial revision as research progresses." (p. ix), and "It is obvious that any theory of a particular language or any general theory of language that can be proposed today will be far from adequate, in scope and in depth." (p. ix).

It should be clear from the above quotes that no assumption contained in any of the current theories is to be regarded as sacrosanct. In principle, then, if Linguistics is to qualify as a science, its theories should be considered adequate only inasmuch as they are successful in accounting in a motivated way, for a sizable (if not the total) body of linguistic phenomena exhibited by a real language. This is not to say that they must be complete. Residual problems will always exist, and new ones will occur during the course of investigations. As Kuhn (1970:79) pointed out concerning what he termed 'normal' science, '...no paradigm that provides a basis for scientific research ever completely resolves all its problems.' But, he also added (p. 80): 'Normal science does and must continually strive to bring theory and fact into closer agreement, and that activity can easily be seen as testing or as a search for confirmation or falsification.' The same has been said of linguistics (Fromkin 1965 and 1974). In fact, Chomsky and Halle's predictions (cf. quotes above) have proven to be correct, even for English. Moreover, generative phonologists working with languages other than English have time and again encountered problematic areas where the SPE model, while adequate in many respects, is far from adequate in others. Many

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modifications and refinements have come about, owing to this state of affairs. It is to be expected that the study of Berber would be no exception.

Among the assumptions of the SPE model which are most pertinent for the study of Berber languages and/or dialects are the following: the questions of underlying representations, uniqueness of phonological solutions, rule ordering, and multiple and iterative application of phonological rules. Oftentimes diachronic (mainly comparative) evidence is appealed to in order to reach a better understanding of the problem at hand, and to further motivate certain analyses. This, of course, raises the question of whether the analyses presented here can be considered as reflecting - as is the stated goal in current theories of generative grammar - Berber speakers' intuitions about their language. In other words, could analyses in which an appeal is made to historical/comparative facts be considered psychologically real?

According to the 'orthodox' view which is based on the Saussurian dictum and for which all generative practitioners claim adherence in principle, diachronic consideration ought not to influence the synchronic analysis. Saussure's dictum, it might be recalled, stipulates that a sharp distinction be drawn between diachrony and synchrony. Perhaps the clearest expression of this adherence, in principle, to the above mentioned orthodoxy, is in the following quote from King (1969:36) who states that he is '...concerned only with accounting for the intrinsic knowledge underlying speech in one dialect, and the existence of a second dialect is absolutely irrelevant to this

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goal. In short, the similarities (and divergences) between the two grammars are a result of purely synchronic analyses carried on for each dialect individually and are in no way an assumption upon which our analysis is based.' In contrast is the view that inferences drawn from contemporary analyses of other dialects is perfectly legitimate. This question of utilizing insights from other dialects is discussed below (Section 1.4 and Chapter 4). Suffice it to say, here, that we are faced with a dilemma as regards the question of psychological reality. The 'orthodox' view is correct in stating that, since native speakers do not have access to historical/comparative data, these data cannot be said to be part of their competence. Consequently, any analysis based on them cannot be psychologically real. However, as will become evident throughout this study,historical evidence may play an important role in the formulation and selection of the best synchronic solution. In fact, the temptation to use this evidence has been so great that some linguists - mainly those concerned with dialectology (Campbell 1971) - have decided to abandon the psychological reality goal. King himself admits (1970:36) that "In practice, of course, our expectation of what to find in one dialect is conditioned by what we know of other related dialects, and we use anything we can get our hands on to come up with a good analysis."

In our case, additional considerations have dictated that we use comparative evidence to further motivate some of our synchronic analyses. First, due to historical levelling and restructuring, many aspects of the morphological and phonological systems of Berber have become so irregular that many processes are now 'opaque.' Historical

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evidence, when available, helps explain this pervasive opacity. Second, cross-dialectal comparison can shed light on the present situation, as it serves as a guide in the search for internal evidence necessary to resolve some issues. Third, this evidence also proves helpful in resolving the almost endemic problem of non-uniqueness, as certain processes can be accounted for by a number of analyses of equal complexity. Oftentimes, the proposed evaluation measure whose function it is to select the best analysis among the competing ones, fails to do so.

Returning to the question of the propriety of using comparative/historical evidence as an explanation in synchronic analyses, we agree with Kiparsky (1974) that the 'semi-taboo' placed on such use be lifted. In a paper delivered at the Milwaukee conference on 'Testing Linguistic Hypotheses',Kiparsky stated that: "Historical and synchronic questions have become so closely interconnected that the division [prescribed by Saussure] has in practice become hard to maintain." (1974:16). Consequently, he suggests that linguists 'rethink the goals of linguistics in such a way as to make the theory explicitly accountable for change. That is keeping the distinction between structure and change, give up that between two separate kinds of linguistics.' (1974:16).

I am also in agreement with Kiparsky that such a revision of the current theoretical assumptions would have good results. The results which are reproduced here in a way different from Kiparsky's are the following:

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1) 'a whole area of important questions' previously overlooked by non-historical linguists, will no longer be so. (p. 13)

2) Linguists will hopefully cease 'to put things [presumably historical facts] at all costs into the synchronic grammar so that it will be possible to talk about them officially there.'

(To a certain extent, this has been practiced by Chomsky and Halle in SPE).

3) The linguists' search for explanations will hopefully not be focused in the wrong direction (p. 14). An example of this is the persistence of certain linguists in trying to find an explanation, based solely on the synchronic situation, for facts for which 'historical linguistics has long had an explication.' (p. 14).

(A case in point cited by Kiparsky is represented by the ill-spent efforts expended on trying to explain the relationship between the element be in the English passive construction and the auxiliary be, or the one between the by in the agent phrase and the preposition by. These facts are explainable historically.)

From the foregoing, it can be concluded that, whether one is dealing with messy synchronic situations (such as exemplified by Berber) or not, the Saussurian dictum, quite unsurprisingly, proves to be too rigorous. In fact, this has already been the feeling of a number of Post-Saussurian linguists of the late nineteen forties though, as reported in Leroy (1967:89), only few of them came out

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against it. A notable opponent to the Saussurian dictum mentioned by Leroy is the Romance philologist Von Wartburg. Wartburg, writes Leroy, 'maintained that Linguistics must do away with the gap between descriptive science and historical science.' In the words of Wartburg, 'Linguistics in the future must seek to reach a stage at which the two points of view will be organically united so that it can be clearly seen how system and movement exert a mutual influence on one another.' (Cf. Leroy p. 89-90). [1]

In the debate over psychological reality (Ohala 1973, Skousen 1973, Kiparsky 1974, Fromkin 1974), some linguists consider only those processes that are productive (i.e. automatic) to be psychologically real. But productivity can be defined in different ways. Certainly, natural languages contain a range of so-called non-productive processes. That is, we find in natural languages regularities or generalizations which appear to be 'frozen', and relationships between forms which may not be 'productive' in the sense of being used by speakers in performance. Inasmuch as the native speakers are able to master them, i.e. learn them, these processes must clearly constitute an integral part of their competence, and therefore be 'psychologically real.'

In summary then, what follows in the subsequent chapters is primarily a descriptive study of Berber phonology. The description will be based on the SPE model and its subsequent revisions, but will also utilize, when need arises,hypotheses from some competing theories much as the natural generative theory. Historical/comparative evidence will be utilized as needed in an attempt to explain the

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synchronic facts. Admittedly, the approach followed is eclectic to a certain extent; but, this eclectism is motivated by the overriding goal of producing, hopefully, a good descripion. The articulation of alternatives to the SPE theory, should not mean that it is to be abandoned in toto. Given our stated goal, we may well do to follow a suggestion made by Fromkin (1965:609) at a time similar to ours marked with a hesitancy between competing theories:

> "The existence of multiple theories does not necessarily argue for the abandonment of all but one of them. At the present stage of Linguistics it may be profitable to be eclectic, taking concepts from various theories where they seem to add to the descriptive and explanatory power of the grammar."

1.2 The Berber People and Language: The name 'Berber' (Arabic: barbar or berber; French: berbère) is a cover term used to refer to the indigeneous non-Arabic population of North Africa whose ancestors were the original inhabitants of the area. A disagreement still remains among historians as to what the origin of this term is and what it means. According to one interpretation, based on the writings of Saint Augustinus, himself a native Berber, the name 'Berber' comes from barbari 'barbarians', an appellation used by the Roman colonists to refer to the indigeneous population which opposed the Roman Empire and/or the Christian doctrines. (De Slane, quoted by Guernier 1950: 25-26). Under another interpretation, that advanced by Letourneux (cf. Guernier, idem), the name 'berber' derives from the Arabic root berbera 'to jabber, to mumble', apparently because the Berber

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idiom that the Arabs heard spoken was unintelligible to them. It is to this latter interpretation that Guernier and many others subscribe. In any event, the term is foreign to the Berbers who prefer to refer to themselves as Imazighen, Ichelhiyen, Irifiyen, Iqbayliyen, etc. (all masculine plural nouns), depending on the tribal confederation to which they belong. However, of all these names, Imazighen (singular amazigh) 'the noble (or free) men', the name used by the Berbers of Central Morocco, is said to have a wide acceptance throughout the Berber speaking areas. Its meaning derives from that assigned to the phonologically similar ancient tribal name Mazices (also spelled Mazikes and Makses) found in the writings of Herodotus and those of Pliny. The name was that used by the Berber population living in Lybia and Northwestern Egypt. The present study is based on the dialects of Tamazight spoken in Central Morocco.

The Berber language is subdivided into a number of dialects or languages (see discussion below regarding the use of these terms) spoken all across North Africa. The geographical distribution of Berber dialects (cf. Map p. 13, which is adapted from A. Basset 1952) is, on a west to East axis, from the Atlantic Coast in the West to the Oasis of Siwa (Egypt) in the East. On a North to South axis, Berber is spoken from the Mediterranean to Senegal, Mali and Niger. As is evident from the map, the areas in which Berber is spoken are often not contiguous. Some Arabic speaking areas break up the continuity of the Berber domain, often leaving 'islands' or pockets, where a Berber dialect (or subdialect) is still stubbornly preserved. Genetically, Berber (or Berbero-Libyan) has been shown to possess a

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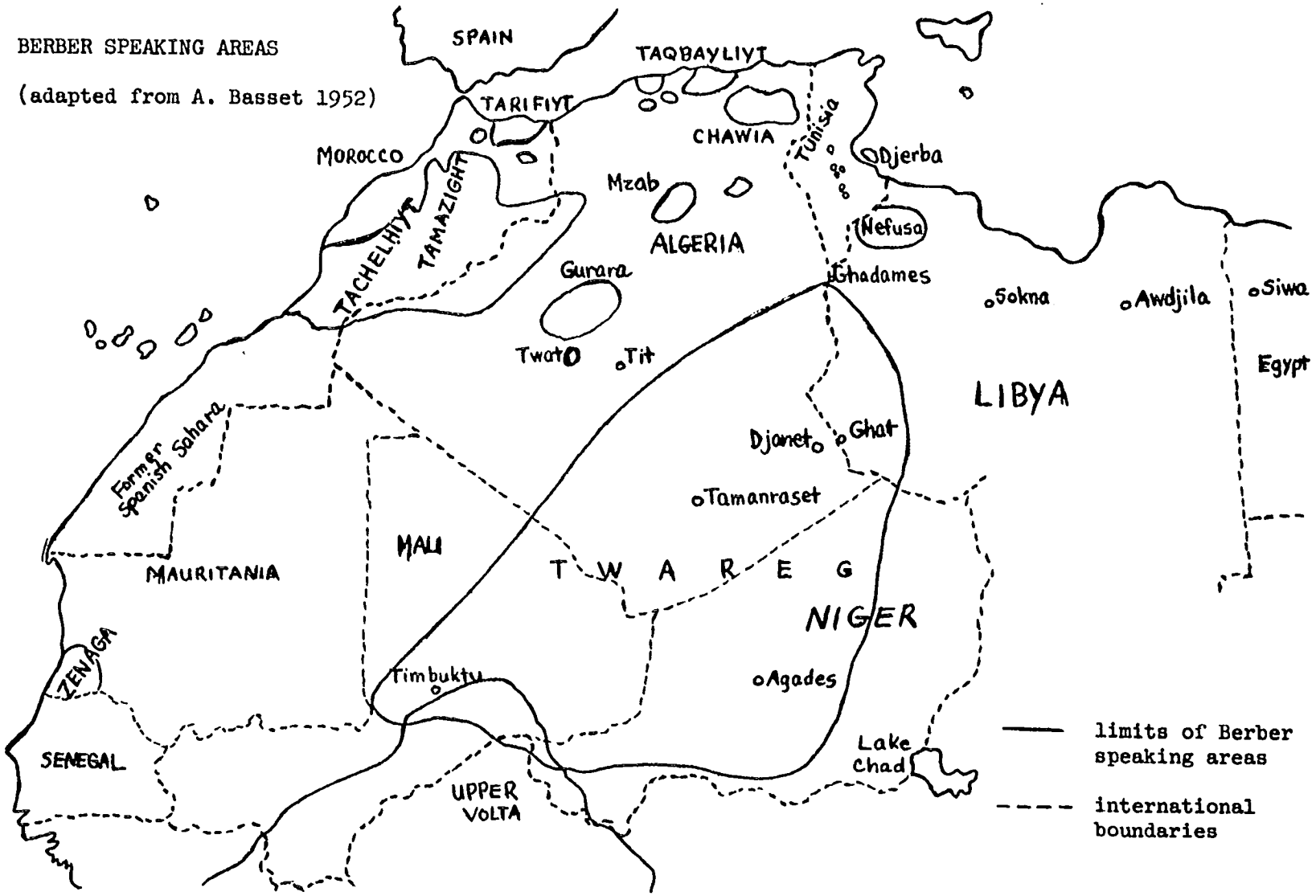

number of features which are common to the Afro-Asiatic language family (formerly Hamito-Semitic; cf. Greenberg 1955, Diakonoff 1965). As a branch represented by a number of closely related living dialects with a wealth of forms, the cognates of which are found in ancient Semitic languages, Berbero-Libyan has proved useful to the reconstruction of earlier stages of other languages of the family.

Since the Berber people and their language are known only to a few linguists and anthropologists, a brief discussion regarding their numbers and the present status of their language is worthwhile. By far,the heaviest concentration of Berber speakers is in Morocco, followed by Algeria and Tunisia, though official statistics on their numbers are conspicuously absent from all the census taken under the auspices of the national governments of North Africa. The numbers available in these census are those of the Moslem population with no breakdown as to the numbers of Berbers and Arabs.[2]

But even the statistics made available by the French have been questioned by the leading French Berberist, André Basset. According to Basset (1952:3-4) the results of these census are to be taken with a great deal of caution. As he correctly points out, the number of the female population (almost 100% unilingual then) could not be accurate. This is so because 1) traditional mores could not have permitted census takers to assess the females, 2) the numbers of the young girls must have been purposely underreported in order to allow for the possibility of their marriages below legal age. Basset's second objection concerns the classification of the bilinguals - the majority of whom are males - in these census. They

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are counted as Arab speakers, even though Berber is the language spoken at home. In sharp contrast with the census takers, Basset correctly states: '...comme il n'y a guère d'arabophone pour apprendre le berbère, tout "bilingue" est en réalité un berbérophone' (1952 p. 4). Thus, any bilingual must be Berber, since Arab speakers seldom learn Berber. Basset's estimate (1952) is that Berber speakers make up half the Moslem population of Morocco, a third of that of Algeria; elsewhere, and excluding the nomadic Twaregs, the numbers dwindle down to tens of thousands and thousands per Berber speaking 'island.'

As a language, Berber remains largely a spoken language with a surprisingly slow rate of regression despite great odds. This regression is expected to increase with the spread of public schooling with only Arabic - and to a lesser degree French - as the medium of instruction. By fiat, Arabic has been established as the only official language in all the countries of North Africa. Moreover, with the departure of the French, the teaching of Berber which was done in few schools, such as this writer's alma mater 'le Collège berbère d'Azrou', was dropped indefinitely in Morocco. The study of Berber is not offered, even as an elective course, at the University level, in Morocco. At the University of Algiers, where a 'chaire de berbère'was left behind by the French, Berber studies has been recently suspended (1975) with the enactment of a new directive reorganizing the programs. (Cf. Agraw Imazighen, 1975, Bulletin,43,p.4) Thus, as the situation stands presently the Berber language faces an uncertain future.

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Encouraging new signs for a continued preservation of Berber exists, however, due to attitudinal changes toward the teaching of indigenous languages and new trends in the behavior of Berber speakers. With the help of UNESCO, the Twareg Berbers, though a minority in Niger and Mali, are allowed to have their language taught in schools, to have a newspaper written in Berber, and to manage their own radio programs. In the North, the increased literacy due to the public schooling of Berber children may in the long run help preserve Berber. Already more and more young Berbers are taking pride in corresponding in Berber, using the much suited Arabic alphabet, among themselves and with the Berber section of the national radio in Morocco. In addition, the advances registered in the electronic media are helping to preserve Berber the folklore of which is appreciated by Arabs and Berbers alike. In 1972, a group of exiled Iqbayliyn (Kabyle) have founded, in Paris,what they call 'l'Academie berbère' (the Berber Academy). However, their decision to print Berber materials in Tifinag, the old Berber script adopted from the punic alphabet, is hampering their efforts to reach a significant number of Berbers. The Tifinag script is known only to the Twaregs who have preserved it over the centuries.

1.3 Previous scholarship: The study of Berber languages/dialects began shortly after France invaded Algeria (1830). Published materials include grammatical sketches, manuals on individual dialects, and with the exception of the monumental dictionary on Twareg by De Foucauld, short to medium size dictionaries. Thus, published materials on Berber languages are not lacking. However, with few exceptions to which

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we will return directly, the studies undertaken up to the mid nineteen sixties are of limited scholarly value. For one thing, the aim of the authors - most of whom were career officers with some linguistic inclination - was a pragmatic one. It consisted mainly of writing grammatical sketches with a heavy emphasis on glossed dialogs describing situations pertinent to the interaction between the Europeans and Berbers. Another observation regarding the scholarship value of the majority of these studies is that they follow the most rudimentary methodology of traditional grammar. The pattern followed is that set by Hanoteau (1885): a phonetic chart of the segments, some brief comments regarding the pronunciation, a fairly detailed morphology and word syntax, some sample texts with translation. Attempts to provide generalizations about underlying structures of Berber were not made.

Studies from this period with significant contributions to Berber linguistics are those of Laoust(1918, 1936), Destaing (1920) Loubignac (1924), André Basset (1929) and Renisio (1932). To these works, we should add some of Basset's contributions to linguistic journals and conference proceedings. Their significance lies in the fact that the cataloguing and organization of the processes along with illustrative data is very useful in understanding how these processes work. To be sure, even these studies can be misleading in many cases. To take an example, the sensitivity of both Laoust and Basset to surface phenomena - e.g. the surface shape of the verbs - has led them to posit more verb groups than is necessary, and to make some inaccurate statements regarding Berber morphology. In the

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so-called vowel - less verb roots, a neutral vowel, schwa (represented here for typographical reasons with e) can occur in different positions depending on the phonological shape of the roots; viz: krez 'to plow', ers 'to land', der 'to descend', beddel 'to change', kers 'to tie'. Because of the different consonantal arrangements, these roots are grouped differently in the basic form of the verbs, the imperative singular. The generalization that is missed is that krez behaves exactly like kers in the perfect and imperfect/progressive conjugation, viz: Perfect: kerzex 'I plowed', kersex 'I tied'; Imperfect: lla kerrzex 'I am plowing', lla kerrsex 'I am tying'. The same is true of ers and der; viz: Perfect: rsex 'I landed', drex 'I descended'; Imperfect: lla rrasx 'I am landing', lla ddarx 'I am descending.' Because of these facts, Laoust, Basset and others are forced to state that verbs belonging to different types in the basic form, behave similarly in other conjugations. This, in essence, vitiates their posited typology. The present study provides rules for the occurrence of schwas in these stems. A similar point is also made in Abdel Massih (1971), though, as will be seen below, Abdel Massih's rules for predicting the occurrence of schwas are needlessly complicated and yield incorrect outputs in many cases. And in a recent paper, Diakonoff (1975:33) criticizes the proliferation of verb types - 'five hundred types', according to him - in Basset's classification of Berber verb stems (1929). Such an approach, Diakonoff points out, has the harmful effect of hampering efforts to compare the Berber verb system to that of other members of the Afro-Asiatic family. Another deficiency in these studies is that

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they mention dialect differences with respect to certain processes (e.g. spirantization) without specifying in a systematic way 1) what changes go with what dialects or subdialects, and 2) the environments for these changes. Nonetheless, though in some cases disparate facts are lumped together and confusing statements are made, some of these works are comprehensive enough as to permit a well-informed analyst to capture significant generalizations about Berber.

A summary of what is known about Berber up to the early fifties is given in Basset (1952). Basset's monograph, though sketchy, and not easy to follow for a non-Berberist, is a significant one in the development of Berber linguistics. It gives the results of the work completed by that time and indicates areas with unresolved problems: phonology, historical, and comparative dialectology. However, despite Basset's appeal for further research very little has been contributed. A case in point is phonology, where, to the best of my knowledge, no comprehensive study is available so far. To date, with the exception of two studies - Harries (1966), formerly Johnson, for syntax, and Abdel Massih (1971) for morpho-phonology - no attempt has been made from the transformational-generative framework. Even Abdel Massih's approach in his study of Tamazight verb structure is not to be considered a generative one, in spite of what its subtitle claims. For, if the author attempts to formulate rules for certain processes, the formalism utilized is not that ordinarily found in generative works. Moreover, a great deal of ad-hocness results from a number of the author's decisions and procedures. For a detailed review of Abdel Massih's study see Harries (1974:189-195), and Schuh (1974:452-

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53). Some studies worth mentioning undertaken from a non-generative point of view are: Penchoen's syntactic study of Ayt Frah (1973), and Prasse's three volume study on Twareg-Tahaggart (1973). However, though a significant part of Prasse's first volume is devoted to phonology, the perspective is mainly historical and the hypotheses offered are for the most part speculative. Moreover Prasse's presentation of the facts, often lacking illustrative examples and/or glosses, and his disjointed treatment of them, do not allow for the statement of general rules in Twareg. Thus, the present study fills a gap since it investigates the phonological system - mostly of Tamazight - utilizing the insights of the T-G framework.

1.4 The Scope of the Study: As stated above, the present study deals primarily with the major aspects of the phonology of the Tamazight 'dialect' (or language) of Berber. The areas of the phonology of Tamazight investigated are: the nature of underlying representation; spirantization; gemination; schwa epenthesis; vowel reduction and vowel syncope. Rules for the intensive formation of the verbs, the causative and reciprocal formations are also provided.

The analysis presented here are based primarily on an in-depth investigation of this author's own dialect of Berber, the Ayt Ndhir dialect of Tamizight. Thus, the solutions arrived at are primarily for the major phonological processes of Berber as they appear in the Ayt Ndhir dialect, which is taken here as the focal dialect. However, my exposure to (and acquaintance with) the other dialects (or languages) of Berber have contributed a great deal to the formulation of the analyses. In fact, with few adjustments,

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some of the analyses will obtain for other Tamazight dialects as well as for an even wider area in the Berber domain. A case in point is the statements on spirantization (Chapter 4). These statements would hold true not only for dialects of Tamizight neighboring the focal Ayt Ndhir dialect such as Ayt Wallal, Igerwan, Imejjad, Ayt Mguild, but also to geographically distant dialects such as Ayt Youssi, the sub-group of Ayt Ayyache located south of Fes and west of Sefrou, the Ayt Sadden, the Icheqqiren and Ayt Yaḥya of Tounfit (about 114 miles south of El-Hajeb, the current administrative capital of the Ayt Ndhir). Another example is the discussion of the problem of schwa (cf. Chapter 5) which, so far as can be determined, holds true, again with few adjustments, to all Berber languages (or dialects), save Twareg. Twareg does have underlying schwas, as it exhibits a contrast between schwas and other vowels. Moreover, if the occurrence of schwas is predictible in non-Twareg Berber languages, it is not so in Twareg. A third example attesting to the generality of some of the analyses presented in this study is afforded by the treatment of geminates in Berber, which are analyzed as consonantal sequences. Again, so far as can be determined, it will hold true for all Berber languages/or dialects.

It should be pointed out, however, that the fact that some of the analyses enjoy a large degree of generality, in no way subsumes that the Berber language as a whole - i.e. throughout the vast and often discontinuous domain in which it is spoken - forms a homogeneous language area. Nor does it assume that Berber as a whole is to be considered a homogeneous linguistic unit of analysis meeting

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is in situations where some form of sequential variation exists between otherwise mutually intelligible dialects. An example of such a situation is afforded by the way spirantization is treated in mutually intelligible dialects of Tamazight, which are the subject of this study. This spirantization process which is found to be pervasive in my dialect, Ayt Ndhir, is not found to be so in others. As will be clear in Chapter 4, varying degrees of generality of spirantization exist from one dialect to another. These varying degrees concern the number of the consonants in the segmental inventory which are affected by spirantization: some dialects have spirantization of velars and uvulars only , others that of the unique bi-labial obstruent /b/ and the velars and uvulars; still others will have spirantization of the dentals and the bilabials, but not that of the back consonants (e.g. some subdialects of Iziyyan, also referred to as Zayyan). Variation in either minor or major details exist for other processes as well.

In situations such as outlined above, it is difficult to tell whether one is dealing with 'dialects' of the same 'language' or different 'languages'. In other words, one finds it difficult to dodge - as is often done - the question as to what constitutes a 'language' as opposed to 'dialect'. Yet, a clearer idea about dialect subdivisions would be helpful in delineating the language area studied. It would also serve to determine the scope of the study and the extent of the applicability of the analyses.

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1.5 Berber dialectology: dialect subdivisions: language areas:

The purpose of this section is to provide some preliminary notions regarding dialect subdivisions, language areas, and, inasmuch as such a question can be answered, some idea as to which Berber idioms can be considered languages.

Traditionally, Berber is subdivided into the following major groupings (cf. map, p. 13).

1) In Morocco: Tachelhiyt (South West); Tamazight (Central and South East); Tirifiyt (North and North East).

2) In Algeria: Taqbayliyt (= Kabyle, spoken in the North along the Mediterranean coast); the Zenatia Mzabian (in the Mzab region, south of Tachawit (= Chawia, spoken in the Aures Mountains).

3) In the Sahara, the Twareg group, also referred to as Tamashaq or Tamahaq, which is cognate with the noun Tamazight. (Geographical location and mutual intelligibility have played the dominant role in the establishment of these groupings.)

An equally established tradition in Berber studies is the widespread use of the term 'dialect' to refer to the Berber idioms; though occasionally one encounters titles such as: 'Etude sur la langue berbère: dialecte de ...'. It should be emphasized at this point that the assignment of the labels 'dialect' or 'language' or 'parler' to Berber idioms is not in itself of any importance. That is whether Tamazight, for instance, is referred to as a 'dialect' or a 'language' is immaterial. What is important here, however, is the

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implications embodied in such designations with respect to the uniformity (or congruence) of the phonological systems of the Berber 'dialects',or to their divergence. Issues connected with the underlying segmental inventory and with its correct representation, crucially depend on how the individual Berber idioms, or 'lects', to use a neutral term first introduced by Bailey (1968),are considered. We return to this question in Chapter 4.

Turning now to the implications of the use of the term 'dialect' for Berber idioms, we find that one basic assumption underlies such a general use of the term by Berberists. This assumption is that the particular Berber Lects - be they Tamazight, Taqbayliyt, Siwi, or subdivisions of these - are but a variety of one language, the Berber language, not languages on their own. Diachronically, the term 'dialect' is quite adequate, given the unquestionable genetic relationship between the Berber Lects, and the great morphological and lexical similarity exhibited by these Lects throughout the Berber domain. The position taken in this study, however, is that, synchronically, the term dialect will not do. Despite the morphological similarity between the major groupings, the linguistic distance between them, based on other criteria (e.g. mutual intelligibility) is so great that they should be considered as constituting separate languages. Such does not seem to be the view of the leading Berberist, André Basset, who, overly impressed by the morphological similarities, is against considering any of the Berber Lects - even major ones - as related but distinct languages. It is my contention that Basset's position, which has been unquestionably subscribed

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to, is objectionable on a number of grounds. At issue are 1) his views regarding whether the major groupings listed above, constitute 'dialects' or 'languages', and 2) his views on linguistic variation and linguistic change in Berber. Thus, underlying such a seemingly trivial question concerning labels to be used for Berber, are substantive issues connected with assumptions on linguistic change which must be brought under scrutiny in the light of recent advances in dialectology.

Basset's views are expressed in a series of articles and notes - some published posthumously (1959) - where this question 'dialect' versus 'language' is discussed. The author, who was a student of Meillet and the only Berberist to seriously engage in dialect comparison and dialect geography, reaches his conclusion on the basis of a number of observations which can be summarized as follows:

1) The analysis of few sentences in Berber dating back to the Twelfth century found in the text of the historian Al Baydaq, seems to indicate that the language, in this case, Tachelḥiyt, has remained largely unchanged during the eight century span separating the two stages.
2) Yet, when one compares the present day dialects, one finds 'a swarming of variation' ('fourmillement de variations') which results from linguistic splitting of the Berber language. The speech of a group of a thousand individuals, sometimes less, forms a 'parler', and two 'parlers' never superpose upon one another in every respect.

In seeking to reconcile these two conflicting observations,

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Basset adopts the view that the aforementioned variation between the 'lects', even major ones, remains superficial: 'Mais ces divergences pour un linguiste restent toujours superficielles.' (p. 26) His reasoning is that 1) the variation concerns mainly the lexicon and 2) the phonetic/phonological variation is always 'elementaire' (i.e. superficial), or according to the distinction introduced above, an inconsequential one. Thus, Basset's conclusion is that, throughout the Berber domain, two contradictory forces enter into play. On the one hand, there is dialect particularism which pushes towards variation (Basset's 'deversification'); on the other, there is dialect conservatism which ensures stability (p. 27). According to Basset, it is conservatism which plays the most important role.

Perhaps the clearest statement made by Basset concerning the question of whether major Berber 'lects' may be considered as separate languages, is the following:

> "On parle parfois de langue touarègue, soit qu'on ait conscience de son intégration au berbère, soit qu'on l'ignore ou l'oublie. Si, dans le deuxième cas, il y a erreur manifeste,dans le premier, il y a exagération. Les particularités du touareg ne sont pas si importantes, en effet, qu'il y ait lieu de le dissocier aussi fortement. Le fonds commun grammatical, pour nous en tenir à cet aspect essentiel, est si prédominant et si souvent absolument identique de bout en bout du domaine, qu'il n'y a jamais lieu de parler de plusieurs langues,

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mais d'une langue seulement," (My emphasis J.S.)

(1955: 36 (1948)).

My view concerning this question, is that Basset is correct in pointing out that the delimitation of dialect groupings to which some Berberists applied themselves depends on the weight each individual author is willing to assign to a particular criterion (or criteria) usually utilized in such endeavor. The arbitrariness which plagues the selection of such criterion (or criteria) need not be demonstrated. However, the existence of intersecting isoglosses which exceed purported dialectal limits, which Basset uses as an argument against dialect subgrouping, in no way should render the endeavor futile, as is implied in Basset's statements. It should not necessarily diminish the importance of the contribution of such work. Moreover, Basset himself, falls prey to the arbitrariness with which he charges other authors. His selection of the morphological (or grammatical) criterion over other criteria as the deciding one, is equally questionable. The same criticism can be levelled against Basset's playing down of the role of the phonological criterion, which is just as essential in determining a speech community and the linguistic communicability among its members. As was pointed out above, phonological variation can be of the consequential type and, as such, it is not merely superficial as Basset would have us believe.

Further arguments can be brought forth against Basset's conception of variation and of Berber dialectology. First, by giving too much weight to the morphological criterion, Basset emphasizes

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what is highly similar between the Berber lects at the expense of what is dissimilar. Second, too much power is given to conservative tendencies (i.e. the forces of inertia) within each of the lects as opposed to the forces of change. Third, Basset seems to reduce the motivation for linguistic change to merely a desire to establish and preserve tribal particularism.

Such a view of linguistic diversification and linguistic change is at best simplistic, in view of what is known, even in Basset's time, about language change. Moreover, one consideration which played a major role in Basset's thinking concerns the oral, and hence non- 'langue de culture', nature of the Berber dialects. A dialect cannot be ruled out as a language simply because it has no alphabet and hence no written records. In the languages of the world, thousands of idioms are strictly oral, yet linguistically they have the status of a language.

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Footnotes to Chapter 1.

1. Actually, Wartburg may be merely echoing a more notorious critic of Saussure's rigid dichotomy, Jespersen (1916). I owe this observation to Professor Carlos Otero.

2. A number of informed Berbers do not view this lacuna as accidental. Indeed, this is one of the issues in the on-going debate regarding the demand by Berber nationalists that Berber languages be preserved alongside Arabic. The justification given for the official policy of playing down the linguistic and ethnic differences between Berbers and Arabs is the preservation of national unity. In the past such differences were exploited by the French colonialists. For a clear and comprehensive presentation of the arguments pro and con, see the article by Rejala M'Barek in Les Temps Modernes, June 1973.

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Chapter 2

OUTLINE OF SEGMENTALS

2.0. Introduction. In this chapter, the segmental phonemes of Tamazight Berber are presented, and their phonetic realizations, where they are relevant to the understanding of the phonological processes, are also discussed. In addition, the chapter is concerned with "segment structure conditions" (SSC's) as well as "sequence structure conditions" (Seq SC's) (cf. Stanley 1967 and others) which apply in Tamazight.

2.1. The consonants of Tamazight-Ayt Ndhir. The focal dialect, Tamazight-Ayt-Ndhir, has the following non-geminate phonetic segments: [b, ɓ, f, m, t, ṭ, θ, d, ɗ, ḍ, s, z, ṣ, ẓ, š̌, ž̌, n, l, r, č̌, ǰ̌, y, k, k^w, ç, $ç^w$, g, g^w, ǰ, $ǰ^w$, ɣ, x, q, q^w, w, ḥ, h, ʕ]. The phonetic symbols used are for the most part those of the International Phonetic Association (I.P.A.). However, a few require comment: ç and ǰ are the spirant (i.e. fricative) counterparts of k and g, respectively; ɓ, ɗ, ḍ, ɣ, all spirants, symbolize the sounds represented by the I.P.A. as [β, ð, ẓ, ɣ]. A dot beneath a segment indicates that it is pharyngeal or pharyngealized; and a superposed w indicates labialization.

Not all these surface segments are native to Berber. A number of them found their way into the Berber inventory due to extensive borrowing from Arabic. (We return to the distinction between native versus non-native below.)

A number of these phonetic segments do not occur as contrasting phonemes but are derived by regular phonological rules. The contrasting phonemic segments of Ayt Ndhir are listed in (1) according to their place of articulation. The segments which occur only in lexical mor-

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phemes specified as [-native] are not included. (For a partial list of these, see (2) below.)

(1) a. Labials: b, f, m

b. Dentals: θ, ḍ, ẓ, s, z, ṣ, š, ž[1], n, l, r

c. Palatals: č, ǰ, y

d. Velars: ǰ, ç, ǰ^{w}, ç^{w}

e. Uvulars: g, x, (q), (q^{w})[2]

f. Labio-velar: w

g. Glottal: h

There are a number of interesting facts about this inventory. First, with the exception of the nasals and q, all the consonants which occur in non-geminate form are continuants. Second, in native Tamazight morphemes, the voiced labio-dental v does not occur. In fact, in most Berber dialects, neither the voiceless bilabial stop p, nor the voiced labio-dental continuant v occurs. (An exception to this statement is found in a group of Taqbayliyt dialects spoken in Algeria, which will be discussed below.) Third, though the distribution of /h/ is restricted, its status as a native segment is not doubtful since it appears in basic grammatical categories such as the demonstrative, e.g. hun 'there'. Fourth, while voiced /ḍ/ and /z/ have pharyngealized counterparts, viz. /ẓ/ and /ṣ/ respectively, no such counterparts are found in native morphemes for /θ/ and /s/. The remaining contrasting single consonants found in Tamazight, but primarily in non-native morphemes, are given in (2) (see also the complete list of segments given at the outset of this section):

(2) /b. t, ṭ, d, ḍ, ṣ, k, g, k^{w}, g^{w}, q, q^{w}, ḥ, /

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The consonants listed in (1) and (2) have geminate counterparts. In (3) minimal pairs of native words are given. In (3') the examples show the relationship between single and geminate consonants. The single consonants are given in the Zero Form of verbs (i.e. the verb in the imperative singular); the geminate counterparts are found in the Intensive Form of the verbs (i.e. the Imperfective/Progressive/Habitual aspects) which is derived by regular rules from the Zero Form.

(3)				
	θafa	'so that'	θaffa	'hay stack'
	i-usa	'he arrived'	i-ussa	'he tied'
	θimi	'small mouth'	θimmi	'eyebrow'
	ilef	'boar'	i-llef	'he divorced'
	θabratt	'letter'	θabbratt	'small button'

(3')	Zero Form (Z.F.)	Intensive Form (I.F.)	Gloss
a.	θfeṣ[3]	θeffeṣ	'to fold'
	fser	fesser	'to spread'
	rẓem	rezẓem	'to open'
b.	fθel	fettel	'to roll couscous'
	nḍer	nedder	'to roar'
	bḍu	beṭṭu	'to divide'
	mǰer	megger	'to harvest'
c.	ʒmez	ʒemmez	'to scratch'
	fley	felley	'to tear'
	mrey	merrey	'to rub'
	bnu	bennu	'to build'

The important thing to note with respect to the gemination process illustrated in (3') is the following: while the geminates

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corresponding to lax strident obstruents (3a) are likewise stridents, those corresponding to non-strident ones (3b) are stops. (We will return to this question in Chapter 4.)

Another important contrast concerning the consonantal inventory is that between pharyngealized and non-pharyngealized versions of a segment. In the native inventory of consonants given in (1), this concerns only ḍ and z which, as is exemplified in (4), contrast with ḍ̣ and ẓ:

(4) nḍu 'to cross' : nḍu 'to become buttermilk'

θiẓi 'pubic hair' : θizi 'mountain pass'

As is evident in (2), the distinction between pharyngeal and non-pharyngealized is widespread among segments of non-native origin which are from Arabic. At the systematic phonetic level, of course, both sets of segments (i.e. (1) and (2)) appear in present day Tamazight-Ayt-Ndhir.

2.2. The vowels. The contrasting vowel segments and glides of Berber are: /i, a, u/ and /w, y/. The vowel phonemes have a number of phonetic variants depending on the environments in which they appear. Another influencing factor is the style of the speaker--that is, careful versus casual, slow versus fast speech. This results in a great deal of variation. Thus, most statements regarding allophonic variations are more like variable rules (or approximations) rather than categorical rules.

The following statements can be made with some certainty, however: (i) high vowels /i, u/ are lowered in the neighborhood of /r/, uvulars and pharyngealized segments, e.g. θugrifθ [θogrifθ] 'bread', θiruθ [θeruθ] 'width', θigira [θegera] 'residue', ḅḍu [ḅḍo] 'to divide', iẓil [eẓel] 'it is good'; (ii) the only low vowel phoneme in Berber, /a/, which is frequently pronounced as [æ], e.g. θæmæzigθ, is realized as [a]

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word finally and in the neighborhood of back or pharyngealized consonants, e.g. iša [iša] 'he gave', θaggatt [θạggạṭṭ] 'goat'; (iii) all vowels are pharyngealized in the vicinity of pharyngealized segments.[5] This statement can be formalized as follows:

(5) a. $$\begin{bmatrix}+\text{voc}\\+\text{high}\end{bmatrix} \rightarrow \begin{bmatrix}\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}\\ \langle+\text{phar}\rangle\end{bmatrix} \Big/ \left\{\begin{matrix}\begin{bmatrix}+\text{liq}\\-\text{lat}\end{bmatrix}\\ \begin{bmatrix}+\text{back}\\-\text{low}\end{bmatrix}\\ \left\langle\begin{bmatrix}+\text{cons}\\+\text{phar}\end{bmatrix}\right\rangle\end{matrix}\right\}$$

b. $$\begin{bmatrix}+\text{voc}\\-\text{low}\end{bmatrix} \rightarrow \begin{bmatrix}+\text{back}\\ \langle+\text{phar}\rangle\end{bmatrix} \Big/ \left\{\begin{matrix}\_\_\ \#\\ \left\langle\begin{bmatrix}+\text{cons}\\+\text{phar}\end{bmatrix}\right\rangle\end{matrix}\right\}$$

(where liq = liquid and phar = pharyngealized)

In addition to the vowels listed above and their variants there exists a neutral vowel, schwa, represented here with [e]. Its status is discussed in Chapter 5. Unless they have some bearing on the discussion, these positional variants will not appear in the transcription of the forms cited in this study.

2.3. Native versus non-native. In sections 2.1 and 2.2. above, a distinction between native and non-native (or foreign) segments was made. In this section, a justification for the feature [±native] as a feature specification of lexical representations is provided.

The sources for non-native morphemes in Berber, and hence non-native segments, are Arabic (since the VIIIth century A.D.), French, and Spanish (since the 1920's). The linguistic effect of Latin on Berber was minimal, and the few lexical items of recognizable Latin origin

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such as afullus 'chicken' (Latin pullus), urθu 'orchard' (Lat. hortus), asnus 'donkey' (Lat. asinus) and others, have long since been nativized.

Two of the reasons which motivate the distinction between native and non-native morphemes are: 1) The indiscriminate incorporation into the Berber data investigated of loan words which follow non-native morphological and phonological patterns would obscure native processes and complicate the statement of the rules for them; 2) The addition of segments contained in such non-native morphemes may give rise to otherwise non-existant contrasts and alternations. This could complicate the statements of segment structure as well as morpheme structure conditions.

To illustrate the first point, consider the loan word fhem 'to understand'; cf. Moroccan Arabic fhem, and Classical Arabic fahima (or /fhm/ under the 'consonantal stem only' hypothesis). Because of its shape, this verb would be--in fact is incorporated into the native class of $C_1C_2C_3$ verb stems. As a member of this class, fhem behaves exactly as do native verbs with respect to the preterit (positive and negative) conjugation, as shown in (6):

(6) [+native]

Pret.Pos.:	i-rẓem	'he opened'
Pret.Neg.:	ur i-rẓim	'he didn't open'

[-native]

Pret.Pos.:	i-fhem	'he understood'
Pret.Neg.:	ur i-fhim	'he didn't understand'

However, in the Intensive Form (cf. (3) above), this similarity in behavior ends, as shown in (7):

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(7) [+native] [-native]

lla i-rez̤z̤em 'he opens' lla i-tt-fham 'he understands'

(where lla is a particle indicating the I.F. of the verb)

(7) shows that native $C_1C_2C_3$ verb stems form their I.F. via gemination of the second radical consonant. This can be accounted for by a simple rule. However, if loan words such as fhem were not marked as [-native], it would not be possible to state in an explanatory way how the I.F. of $C_1C_2C_3$ stems are formed in Berber, since the gemination rule would not apply generally to all such stems. The native pattern would be obscured and it would appear that there was no regularity present. As is seen in (7), non-native verbs such as fhem form their I.F. via prefixation of /tt/ and insertion of /a/ before the final radical consonant. This too is a general rule which should be stated as applying to stems specified as [-native]. Without this diacritic feature neither generalization could be stated.

The second reason stated above for including the feature [±native] can be illustrated by two examples. The first example concerns those non-native words in which simple, non-geminate stops occur, i.e. the stops listed under (2) above. If one considers these stops as part of the regular inventory of Tamazight-Ayt Ndhir (cf. Abes 1924, Bisson 1950), the spirantization process which applies regularly to native stems, but does not apply regularly to non-native stems, would appear to be overly complex (cf. Chapter 4). In Tamazight-Ayt Ndhir, as well as in other Northern Berber lects, simple stops are spirantized. This natural native process would be "opaque" if the above distinction were not specified. In addition, an otherwise non-existant three-way con-

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trast would result between simple spirants, simple stops, and geminate stops, viz. θ, t, tt. This contrast does not occur in native or nativized words. The second example concerns pharyngealization. This process, if it was active at the Proto-Berber stage, affected only a few segments of the inventory. Twareg, a Berber language where borrowing from Arabic has been limited, has only ḍ, ẓ and (q) in the native vocabulary, as does Tamazight-Ayt Ndhir, and no ḥ, ʕ, ġ,[6] ṣ. In Twareg dialects, save that of Igellad and that of Ghat, Arabic ṣ, ʕ, ḥ, are borrowed as s, g and z respectively (Prasse 1973, vol.1-3: 19). Thus, the existence of wide-spread pharyngealization in Northern Berber lects can be attributed only to the influence of Arabic loans, not to an active native pharyngealization process. Moreover, to consider ṭ and ṣ as native segments would obscure the fact that in native Berber pharyngealized consonants are voiced when they are lax or non-geminate, e.g. Z.F. ḅḍu, I.F. beṭṭu 'to divide' (cf. (3') above).

The above general fact also rules out lax q, the status of which, as stated above, needs to be determined. This segment has always presented a problem to Berberists. Some have analyzed it as a lax pharyngealized /ḳ/ (Johnson-Harries 1966), others as simply a lax uvular. However, its status as a lax native segment can be questioned. Even though under one pronunciation of native words such as aqmu 'mouth', aqermim 'thigh ', q seems to occur as lax, a more careful pronunciation of these words is with a tense qq. Moreover, tense qq is the regular morphophonemic alternate of /g/ (cf. (3') above). Even without going into historical and comparative details, it can be concluded that the occurrence of q as a lax segment can be considered as the result of a

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reduction of tense qq. This reduction occurs, for example, in casual speech, and can be explained as due to performance factors. It often results from a conscious effort on the part of speakers to simplify certain geminates; i.e. not unlike the case of netta → enta 'he'.

Two problems remain, however, concerning the category of non-native morphemes. First, it is difficult in the absence of written documents to subdivide with certainty the huge amount of Arabic loan words into early versus late borrowings. Semantic categories such as religious or administrative terminology, and distinctions such as core versus non-core vocabulary, do not provide us with adequate and reliable clues. Essential concepts such as 'death', 'to work', 'old', or 'fire' and 'animals' (generic) are expressed in Tamazight with loan words from Arabic. Second, a clear continuum exists in the process of nativization (or integration) of loan words in Berber. Some, such as xdem 'to work', hšem 'to govern', θaẓallitt 'prayer' appear to be completely nativized, as evidenced by their undergoing the native processes of spirantization and voicing of lax pharyngealized segments (i.e. d → ḍ, k → š, ṣ → ẓ). Others, such as θaktatbiyθ 'secretary' (f), are simply affixed according to the native rules but remain intact stem-internally. Still others, for example lešθab 'book', lqaḍi 'Koranic judge', while not taking native affixes do undergo spirantization. Finally, loan words such as lḥakem 'civil judge', lḥayk 'large shawl', came into the language unchanged. Despite these problems, however, the gains which result from the utilization of the distinction native versus non-native far outweigh the effects of the above problems. In particular, it reveals the co-existence of two phonological systems. Thus, the feature

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[±native] is a diacritic feature revealing the existence of these two morphological and phonologial systems rather than specifying the origin of lexical stems.

2.4. Morpheme Structure Conditions. Before presenting the segment and sequence structure conditions (SSC's and Seq SC's, respectively), which exist in Tamazight-Ayt Ndhir, a description of this dialect's segments in terms of distinctive features will be provided. These features are chosen from the universal set of distinctive features in works such as Jakobson et al (1952 and 1956) and Chomsky and Halle (1968). For the most part the features used in this study are those contained in this latter work, with the proviso that such a use in no way means that Chomsky and Halle's system is the only possible one. Since 1968, new features have been added, others replaced, and arguments have been put forth for reinstating previously discarded features. (8) gives the list of the distinctive features (16 in all) which will be used in this study.

(8)

1. Cons(onantal)	9. Nas(al)
2. Syll(abic)	10. Strid(ent)
3. Ant(erior)	11. Round
4. Cor(onal)	12. Low
5. High	13. Del(ayed) Rel(eased)
6. Back	14. Phar(yngealized)
7. Cont(inuant)	15. Tense
8. Voiced	16. Son(orant)

Tables 1 and 2 give fully specified distinctive feature matrices for the native consonant segments given in (1) and (3).

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	ɓ	b:	f	f:	m	m:	θ	t:	ɗ	d:	ɖ	t:	s	s:	z	z:	ʒ	z:	ɳ	n:	l	l:	r	r:
cons	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
syll	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
son	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	-
ant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
cor	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
high	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
back	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cont	+	-	+	+	-	-	+	-	+	-	+	-	+	+	+	+	+	+	+	-	+	-	-	-
voice	+	+	-	-	+	+	-	-	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+
nas	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
strid	-	-	+	+	-	-	-	-	-	-	-	-	+	+	+	+	+	+	-	-	-	-	-	-
round	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
del rel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pharyn	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+	-	-	-	-	-	-
tense	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+

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	š	š:	ž	ž:	ç	ɟ	y	y:	ɟ	g:	ç	k:	ɟʷ	gʷ:	g	q:	x	x:	(q)	w	w:	h	h:
cons	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
syll	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
son	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cor	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
high	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-
back	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-
low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
cont	+	+	+	+	+	+	+	+	+	-	+	-	+	-	+	-	+	+	-	+	+	+	+
voice	-	-	+	+	-	+	+	+	+	+	-	-	+	+	+	-	-	-	-	+	+	+	+
nas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
strid	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
round	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+	-	-
del rel	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pharyn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-
tense	-	+	-	+	-	-	-	+	-	+	-	+	-	+	-	+	-	+	-	-	+	-	+

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The features necessary for the description of the underlying vowels of Tamazight are given in the following table:

TABLE 2	front	central	back
high	i		u
low		a	

Most of the selected features are straightforward and need not be discussed here. For their definitions and functions, see SPE (Chapter VII). There are a few departures from the Chomsky and Halle system, however, which require some comment. Language specific considerations have led us to analyze certain segments differently from the way this is done in SPE. For instance, /y/, w/ and /h/ are considered to be true consonants and not glides. This is so because they act as consonants in the verb system. Stems such as fley 'to tear' (cf. (3')) form their I.F. exactly as do $C_1C_2C_3$ stems. Yet, glides /y/ and /w/ are also recognized for the language under investigation. The feature pharyngealized is used in this study to handle the so-called emphatic segments which are represented with the diacritic /C̣/ or /Ṿ/ (where C = consonant, and V= vowel). This is because the Chomsky and Halle feature complex [-high, +back, +low] proposed to handle these segments is inadequate.[7] Table 3 shows how pharyngealized dentals and pharyngeals are specified in SPE:

TABLE 3	ant	cor	high	back	low
Pharyngealized Dentals	+	+	-	-	+
Pharyngeals	-	-	-	+	+

As can be seen in Table 3, the most important feature used to describe emphatics within the SPE system is the feature [±low]. The inadequacy of

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the feature complex given above is particularly evident in the statement of rules of pharyngealization for both consonants and vowels. The presence of a pharyngealized segment in a word causes the spreading of pharyngealization sometimes to the entire word. Given this fact, the possibility may arise whereby high segments, viz. s̬, z̬, ç̬, j̬, kk, gg, i, u, would be affected. Some examples with pharyngealized high segments are [s̬ra̬d̬] 'three', [a̬j̬ni̬d̬] 'palmetto heart', [egg̬i̬d̬] 'by night', [ab̬u̬d̬] 'bottom'. In a case such as this, these segments would have to be specified as [+low]. Yet, the original feature [+high] would be preserved for the consonants. As for the vowels i, u, they would become [-high]. This results in a contradictory specification [+high, +low] for the consonants, and [-high, +low] for the vowels. But a pharyngealized V is not simply an [a] which is [-high, +low]. /i/ and /u/ can be both lowered and pharyngealized which would make them [-high, +low]. If rounding can distinguish a lowered /u/ from /a/, it cannot do so for a lowered /i/. Furthermore, the feature [+low], or even [+lowered], does not describe fully what is taking place. During the production of pharyngeal or pharyngealized segments, changes in the width of the pharynx occur. This appears to be what gives rise to the resonance which is heard during the production of these segments, but whose acoustic parameters have not as yet been determined by phoneticians (P. Ladefoged, personal communication). Since the feature [+low] refers only to the height of the root of the tongue, the extra resonance required for the production of the emphatics is not accounted for. Finally, there exist low segments (e.g. /h/) which are not pharyngeal. For these reasons, the feature [±pharyngealized] will be used for the "emphatic" segments.

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2.4.1. Segment Structure Conditions. The Segment Structure Conditions (SSC's) presented below for the underlying native consonantal segments are given to reveal the regularities which exist concerning distinctive (phonemic) segments. That is, they provide constraints on possible phonemic segments, thus providing information about the phonological system of native lexical items. All the conditions given below should include the feature specification [+native]. This is omitted for convenience.

SSC 1. If [+son]
⇓
Then [+voiced]

This condition indicates that there are no voiceless vowels in Berber. In fact, the language has no voiceless nasals or liquids at the systematic phonemic level. The specification "systematic phonemic level" is made necessary by the fact that /l/ has a phonetically voiceless variant which occurs sporadically in Ayt Ndhir. Some words which are pronounced with a clear voiceless l [l̥] are the following: alθu [ə l̥u] 'again', and ulθ#ma [ul̥ma] 'sister'. But, because of the complexity of this sound, these words are also pronounced with a geminate l, viz. [allu], and [ullma], respectively.

SSC 2. If [-son, -tense]
⇓
Then [+cont]

This accounts for the fact that there are no lax simple stops in the native inventory of Ayt Ndhir; that is, no: b, t, d, k, g. This is true both phonemically and phonetically. The case of q has been dis-

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cussed above.

SSC 3. If $\begin{bmatrix} -son \\ +ant \\ -cor \\ \alpha strid \end{bmatrix}$

$\Downarrow$

Then [αvoiced]; where α = + or -

This conditions reveals the non-existence of p or $\overline{\Phi}$, and v in Berber. [p] occurs only in the word for 'bread' in baby talk: pappa.[8] However, some Berber dialects, notably in the Taqbayliyt language area, are in the process of adding p and v to their inventories. During interviews with some Iqbayliyn, clear p's and v's occurred in words such as θapɔrt 'door' (from French 'la porte'), avernus 'cape' and θahvivi θ 'sweetheart' (from Arabic leḥbiba). Normally French /p/'s are rendered in Berber as [b] and native or Arabic /b/'s as [ƀ]. What is interesting about this is that if the addition of [p] can be attributed to the influence of French, such an explanation would not hold in the case of [v]. A more plausible explanation is that Taqbayliyt speakers are substituting a more natural and less complex sound [v] for the "unnatural" and complex [ƀ]. In any event, as SSC 3 states, all other Berber lects continue to lack [p] and [v].

SSC 4. If [+cons]

$\Downarrow$

Then [-syll]

That is, in Ayt Ndhir there are no phonemic syllabic liquids (l̩, r̩) or nasals (m̩, n̩). These segments do occur phonetically however, especially word-finally, viz. adr̩ for aḍer 'to lower', uḍm̩ for uḍem 'face'.

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SSC 5. If [-syll, +nas]

⇓

Then [+ant]

SSC 5 states that /m/ and /n/ are the only nasal segments in Ayt Ndhir. Thus, /ñ/ and /ŋ/ do not exist as underlying segments.

SSC 6. If [-syll, +phar, -tense]

⇓

Then [+voice]

This condition accounts for the fact that lax pharyngealized consonants in Berber occur only as voiced segments, viz. ḍ, ẓ. This is true phonetically as well.

SSC 7. If [-son, +phar, -strid, +tense]

⇓

Then [-voiced]

This states that tense non-strident pharyngealized segments are voiceless in Ayt Ndhir Berber, viz.: *ḍ:, *ḡ:; but ṭ:, q:.

SSC 8. If [-son, +high, -back]

⇓

Then [+del rel]

This condition indicates that no segments other than the high non-back ones, viz. č, ǰ, can be delayed release.

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SSC 9. If $\begin{bmatrix}-\text{syll}\\+\text{round}\end{bmatrix}$

$\Downarrow$

Then $\begin{bmatrix}+\text{high}\\+\text{back}\end{bmatrix}$

SSC 9 captures the fact that labialization is a feature for velars in Ayt Ndhir, viz. ɕ^{w}, ʒ^{w} and k:^{w}, g:^{w}. (Recall that ɕ and ʒ are the continuant counterparts of *k and *g, respectively.) In other lects such as Tachelḥiyt, labialization extends to uvulars as well.

SSC 10. If $\begin{bmatrix}-\text{son}\\+\text{low}\end{bmatrix}$

$\Downarrow$

Then [-phar]

This condition indicates that no low consonant (viz. h) can be pharyngeal in the native inventory. q is a pharyngealized consonant, but it is specified as [-low] in the Chomsky and Halle framework.

SSC 11. If $\left[\begin{array}{l}+\text{syll}\\ \left\{\begin{bmatrix}+\text{high}\\-\text{back}\end{bmatrix}\right\}\\ [+\text{low}]\end{array}\right]$

$\Downarrow$

Then [-round]

SSC 11 states that roundness is not a feature of high front (i.e. /i/) or low (i.e. /a/) vowels in Berber.

2.4.2. Sequential constraints in Tamazight-Ayt Ndhir. As stated by Stanley (1967), "it has long been observed that the existence of phonological redundancy is due to the fact that each language exhibits systematic constraints on its phoneme sequences so that not all sequences of phonemes form possible morphemes of the language". In order to reveal

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these "systematic constraints" Stanley suggests that a grammar of a language include a set of Morpheme Structure Conditions (i.e. both segment and sequence structure conditions) at the lexical (or systematic phonemic) level. The segmental redundancies in Tamazight were discussed above. Clearly, Tamazight, like all languages, shows sequential redundancies as well, which must be accounted for in the grammar. A number of questions arise, however, concerning these Sequence Structure Conditions (Seq SC's): 1) the level of representation at which they are to be stated, i.e. phonemic or phonetic; and 2) the units to which they obtain, i.e. morpheme, word, syllable, etc.

Shibatani (1973) suggests that Stanley's proposal fails to reveal the phonetic redundancies, or, to be more correct, reveals these only indirectly "by means of abstract morpheme structure conditions together with the effects of phonological rules" (p.87). He suggests instead a set of "Surface Phonetic Constraints" (SPC's), in addition to the MSC's, proposing that "constraints that hold only at the morphophonemic level are stated as SPC's. But SPC's which are also true at the morphophonemic level are marked 'M/SPC', indicating that the constraint is also applicable at that level" (p.90). The reasons why the phonetic redundancies are only revealed indirectly in the Stanley framework is that it is often the case that a number of P-rules combine to determine the phonetic output. The final phonetic constraints must in some way reflect a speaker's knowledge of what is or is not a possible sequence in the language. The theoretical status of such SPC's may be questionable, but as a descriptive apparatus, the phonetic redundancies stated in this way can explicate the role of the P-rule in the phonological component.

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In fact, there seems to be little justification for a set of MSC's describing the sequences at the morphophonemic/lexical level in Berber. For example, a number of consonant clusters occur morpheme-initially and finally at the phonemic level, but never at the phonetic level, as seen in (9):

(9)

	Underlying level		Phonetic level	
a.	/bḍu/	'to divide'	*[bḍu]	[ebḍu]
	/gzif/	'to be tall'	*[gzif]	[egzif]
	/fsus/	'to be light'	*[fsus]	[efsus]
b.	/sal-nθ/	'they (f) asked'	*[salnθ]	[salenθ]
	/θ-amẓ-mθ/	'you (f) held'	*[θumẓmθ]	[θumẓemθ]
	/afs-x/	'I inserted'	*[ufsx]	[ufsex]

(where the change /a/ $\longrightarrow$ [u] in the form for 'you (f) held' in (9b) is part of the preterit formation)

The question thus remains as to the level on which constraints on consonant sequences should be stated in Berber. Generative grammarians have stated that one aim of the grammar is to reveal all and only the linguistically significant generalizations. In Berber, MSC's stated for morphemes would reveal little about allowable sequences. Yet there are important constraints on allowable sequences in the word which need stating. Many of these would traditionally be handled in a discussion of morphology. The SPE model provides no separate morphologial component, a recognized weakness in the model (cf. Halle 1973). Some of the most interesting constraints in Berber pertain to the differences between morphological categories, and subcategories. Only MSC's (or WSC's) stated at the surface level and in terms of the word can reveal these.

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Hooper (1973) suggests, alternatively, that sequential constraints be stated in terms of syllables. In order to do this, it is necessary to be able to determine with certainty where syllable boundaries occur. This is not always possible. Even though native speakers of Berber can generally give the number of syllables in a word or an utterance, they are unable to specify where the syllable breaks occur. For such a task, hesitancy and inconsistency are the norm since they recognize a number of possibilities. For example, words such as argaz 'man' and agrum 'bread' can be segmented in terms of syllables as arg-az or ar-gaz and as ag-rum and a-grum, respectively. Another problem with Hooper's proposal concerns the strength she assigns to the initial and final position in the syllable. Specifically, her claim (p.112) that the syllable initial position is the strongest is contradicted by the Berber data. As will be seen in Chapter 4, weakening processes affect segments in Berber in this position, as is evident from word initial consonants (which clearly are syllable initial). Because of the problems which arise if MSC's are stated in terms of the morpheme or the syllable, and because word morphology is of utmost importance in Berber, the sequential constraints will be given in reference to the word. Unless stated otherwise, these statements which are based on Tamazight hold for Northern Berber languages.

Berber words can consist of up to four syllables, e.g. ar 'to be empty', fa 'to yawn'; rara 'to return'; amazir 'campground', tamazirt 'land'; θazerkellatt 'quail'. However, a statistical count would reveal that 1) unaugmented (i.e. bare stems) quadrisyllabic morphemes are very rare (2 or 3 items at the most) and 2) monosyllabic ones are limited in

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number. Note that the length of the word is dependent for the most part on the number of morphemes that are combined to form it. In Berber, the phonological shape of nouns and verbs differ. Nouns are divided into two gender classes, masculine and feminine. All native and nativized masculine singular nouns begin with a vowel. a, i, and u can occur stem initially but a is the most frequent initial masculine singular stem vowel, e.g. amazir 'campground', izem 'lion', ul 'heart'.[9] Feminine nouns include a prefix t- (θ for spirantizing dialects) and, normally, a suffix -t. (This is true even for feminine nouns for which there is no masculine counterpart.) A morphological rule can thus be stated as follows: Feminine → t + masculine stem + t. This is illustrated in (10):

(10)

masculine		feminine	
amazir	'campground'	tamazirt	'land, country'
*isen		tisent	'salt'
*afuk		tafukt	'sun'

The verbal 'word' is illustrated by the following paradigm.

(11) The verb fafa 'to wake up' (past)

1.	fafa+x	'I woke up'	1.	n+fafa	'we woke up'
2.	θ+fafa+d	'you woke up'	2.	θ+fafa+m	'you (m.pl.)'
3.	i+fafa	'he woke up'		θ+fafa+mθ	'you (f.pl.)'
	θ+fafa	'she woke up'	3.	fafa+n	'they (m.)'
				fafa+nθ	'they (f.)'

(where (m) = masculine and (f) = feminine)

Verbal stems of Tamazight, unlike the noun, may begin with a consonant or one of the three vowels found initially in masculine noun

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stems. However, verb stems with an initial consonant represent the overwhelming majority: of the 450 stems listed by Abdel Massiḥ, only 46 (or 10.22%) exhibit a vowel stem initially. In fact, in Abdel Massiḥ's list which includes many loan words from Arabic, the so-called vowel-less stems represent 54.66% of the total number of verb stems, e.g. $C_1C_2C_3$: sfḍ 'to wipe', rẓm 'to open'; C_1C_2: ḍr 'to go down', rs 'to land'; C_1: g 'to do', š 'to give', kk 'to pass by'. Another fact worthy of mention concerning the native subset among these vowel-less stems is that, with very few exceptions, they contain at least one sonorant consonant. (The significance of this fact will become clear in Chapter 5.)

General phonetic sequential constraints. Some of the constraints which apply generally at the surface level in Tamazight Berber words are discussed below. They are stated as Negative or If-Then Conditions (Stanley 1967):

(1) No word can begin with consonant clusters, including geminates. This constraint, which applies especially in careful speech, can be stated formally as a negative condition:

Seq SC 1. Neg. C: $\sim$ #CC(C)

As illustrated in (9) above, sequences of two consonants can occur initially at the systematic phonemic level.

(2) Three or more single consonants cannot occur sequentially in any Berber word.

Seq SC 2. Neg. C: $\sim$ $C_1C_2C_3$ (where $C_1 \neq C_2 \neq C_3$)

Under a totally abstract analysis (see Chapter 5) such sequences may occur at the systematic phonemic level in the so-called vowel-less subset

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of the verb stems, viz.: /zdm/ 'to collect wood', /fθl/ 'to roll cous-cous'.

(3) Clusters of three consonants can occur, however, if the first two C's are geminates. Even here, however, such clusters occur most frequently intermorphemically. The + boundary does not appear in the statement of the constraints since, by convention (cf. SPE, convention 105, p.364), if a rule applies without the + boundary, it also applies with it. There are a few cases where this type of sequence occurs within one morpheme. The constraint can be stated as follows:

Seq SC 3. If: C C C
[αF's] [- F's]
Then: [αF's]

Seq SC is motivated by the existence of the sequences exemplified in (12). Though the forms are phonetic, they are segmented so as to indicate the inflectional morphemes.

(12) a. θ+imsexxr+in 'a kind of shoes' (cf. sg. θamsexxerθ)
θ+imneqqs+in 'women's shoes' (cf. sg. θamneqqesθ)
iluqqz+an 'blocks of butter' (cf. sg. aleqquz)

b. lla xeddmex 'I am working' (cf. /lla#xddm-x/)
lla ttekksen 'they take off' (cf. /lla#tt-kks-n/)
lla ttgimax 'I sit' (cf. /lla#tt-qqim-a-x/)

c. annli 'brain'
θiqqlitt 'echo'
θaddratt 'ear of corn'

(where -in and -an in (lla) are plural siffuxes, and -x and -n in (llb) = 'I' and 'they (masc)' respectively. lla is a

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particle indicating the intensive form, and tt- the prefix used with certain verbs in this form).

(4) In the verb, following the initial vowel, a, i or u, the sequence of geminate clusters followed by a consonant is not permitted.

Seq SC 4. Neg. C: $\sim$ $_{Vb}[\#VC_1C_1C_2]$

(where C_1=C_1; V=a, i or u but not schwa; Vb = verb)

Note that this condition does not hold for certain nouns (cf. (11c) above), though they are very limited in number. In these nouns not only does a sequence of geminate followed by a consonant occur after an initial vowel, it does so intramorphemically as well. This type of sequence occurs in verbs only under strict conditions. These conditions are 1) the initial vowel is a schwa; and 2) its occurrence is dependent on the addition of suffixes as seen in (13):

(13) a. ekksen 'they (m.) took off/away'
egg^{w}zen 'they (m.) came down'
ellfen 'they (m.) repudiated'

b. nekkes 'we took off/away'
negg^{w}ez 'we came down'
nellef 'we repudiated'

This constraint holds true for both the verbs and the nouns though instances of $C_1C_1C_2\#$ are found in a few nouns. These are very limited in number, in fact only two as far as I can determine, e.g.: θiss̆s̆θ 'small horn', θabariqqθ 'applause'. Even in these instances the $C_1C_1C_2\#$ sequence occurs only intermorphemically: θ is the feminine singular suffix.

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To prevent the sequences disallowed by the conditions 1-5 given above, schwa insertion rules are posited in the phonological component of Tamazight. These rules break up consonant clusters and yield correct surface outputs. One might suggest that the constraints presented above act as a "conspiracy" in the Kisseberth sense (Kisseberth 1970, 1971).

(6) Non-sonorant consonants with the same point of articulation and the same value for stridency do not form clusters unless their feature matrices agree in every respect, i.e. unless they are geminates. This is true intra and inter-morphemically and thus can be stated, following Shibatani, as an M/SPC--that is, a morpheme structure condition which functions as an "everywhere" rule. The condition, exemplified in (14) may be stated as follows:

Seq SC 6. If $\begin{bmatrix} C \\ +\text{Place} \\ \text{Strid} \end{bmatrix} \quad \begin{bmatrix} C \\ +\text{Place} \\ \text{Strid} \\ \alpha F's \end{bmatrix}$

$\Downarrow$

Then $[\alpha F's]$

(where the feature [Place] is a cover feature for all points or places of articulation; and α and β may be + or -)

(14)

/θ+ittedi+θ/	⟶	[θiddit̤t̤]	'leech'
/θ+d̤er/	⟶	[edd̤er]	'she descended'
/θ+afud+θ/	⟶	[θafutt]	'small knee'
/imiz̤ar+n/	⟶	[imiz̤arr]	'blankets'
/imlal+n/	⟶	[imlall]	'gazelles'
/qqed#θ/	⟶	[eqqett]	'burn it/him'
/sfed̤#θ/	⟶	[es̤fet̤t̤]	'wipe it'

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(where the underlined i in the plural forms for 'blankets' and 'gazelles' are the result of an a to i ablaut which is part of the plural formation. For more details see Chapter 6 and the Appendix).

When Seq SC 6 is stated as a condition on intra-morphemic sequences no feature change is involved. Rather, it is simply a redundancy statement. When applied across morpheme boundaries, the first consonant in the sequence normally changes its voicing feature value to agree with that of the following consonant. Seq SC 6 provides for the occurrence of strident and non-strident geminates. The feature [±strident] is made necessary by the fact that, as stated above (Section 2.1), Tamazight-Ayt Ndhir exhibits in its native inventory simple non-strident fricatives (e.g. θ) instead of simple stops (e.g. t). Seq SC 6 holds also for non-spirantizing dialects since stops are non-stridents. Another condition is needed for spirantizing dialects such as Ayt Ndhir. This condition (cf. Seq SC 7 below) concerns the feature [continuant] for sequences of identical non-strident fricatives.

(7) In Tamazight (Ayt Ndhir) as well as in all other spirantizing Berber languages, a sequence of non-strident consonants with the same place of articulation must be stops (cf. Chapter 3).

Seq SC 7. If $\begin{bmatrix} C \\ -strid \\ \alpha place \end{bmatrix}$ $\begin{bmatrix} C \\ -strid \\ \alpha place \end{bmatrix}$

Then [-cont] [-cont]

This condition also functions as an "everywhere" rule. As stated above the feature [place] is a cover feature for all places of articulation.

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Some exceptions to Seq SC 7 are: xx, and gg, e.g. ixxa 'he is bad', aggu 'milk'.

(8) Seq SC 6 above does not deal with the possibility of there being sequences of non-strident and strident consonants in Ayt Ndhir (e.g. θs, sθ etc.). These sequences do occur. The following redundancy statements apply to them: In a sequence of non-strident and strident coronal consonants, the non-strident becomes a stop if it is the first member of the cluster. Agreement in voicing is also required.

Seq SC 8. If $\begin{bmatrix} C \\ -strid \\ +cor \end{bmatrix}$ $\begin{bmatrix} C \\ +strid \\ +cor \\ voice \end{bmatrix}$

Then $\begin{bmatrix} -cont \\ voice \end{bmatrix}$

As seen in (15), Seq SC 8 applies both intra- and inter-morphemically.

(15)	/θ+sal/	→	[etsal]	'she asked'
	/θ+ẓil/	→	[eḍẓil]	'she is good/pretty'
	/i-wweθ#s̬/	→	[iwwets̬]	'he hit you (m)'
	/i-qqeḍ#s̬/	→	[iqqets̬]	'he burned you'

Note that, stated in this way, the change from the [+cont] to [-cont] is not given as it would be in a phonological rule.

Non-strident coronal consonants also become stops inter-morphemically at the end of the word after non-high coronal stridents. This is particularly true in fast speech.

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Seq SC 9. If $\begin{bmatrix} C \\ +\text{strid} \\ +\text{cor} \\ -\text{high} \end{bmatrix} + \begin{bmatrix} C \\ -\text{strid} \\ +\text{cor} \end{bmatrix}$

$\Downarrow$

Then [-cont]

(16) a. /θ+afus+θ/ —> [θafust] 'small hand'

/θ+ummiẓ+θ/ —> [θummiẓt] 'a handful'

b. /θ+afus+θ/ —> [θafusθ], not [θafust] 'sun'

/θ+iẓ̌ẓ̌iẓ̌+θ/ —> [θiẓ̌ẓ̌iẓ̌θ], not [θiẓ̌ẓ̌iẓ̌t] 'down'

c. [esθey] not [estey] 'to filter'

[esɗiɗ] not [esdiɗ] 'to be thin'

[ešθey] not [eštey] 'to remember'

The problem of stating phonetic constraints by means of Seq SC's becomes apparent in the last two cases. The problem as shown here is that the occurrence of a coronal non-strident continuant after a coronal strident continuant is possible phonetically. Thus what is possible on the phonetic level is determined by boundary; i.e. morphological factors. This is similar to the a/an alternation in English. a (e.g. [ə]) can occur before a vowel if the [ə] does not represent the indefinite article (e.g. America is). Similarly, [ən] can occur before a consonant (e.g. Roman Court).

(10) Velars and uvulars do not co-occur in a sequence--that is, sequences such as kx, xk, etc. are disallowed.

Seq SC 10. If $\begin{bmatrix} C \\ -\text{son} \\ +\text{back} \\ \text{high} \end{bmatrix} \quad \begin{bmatrix} C \\ -\text{son} \\ +\text{back} \\ -\text{low} \end{bmatrix}$

$\Downarrow$

Then [- high]

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The constraints applying to sequences of sonorants are as follows:

(11) Sequences of vowels do not occur, even across morpheme boundaries.

Seq SC 11. Neg. C: V (#) V

To prevent sequences of vowels from occuring, a glide y is inserted to break the hiatus. This is illustrated in (17):

(17) /i-nna#as/ → [innayas] 'he told him'

/i-nna#i/ → [innayi] 'he told me'

/ddu#aθ/ → [edduyaθ] 'go (imper-pl.)'

Note that a Seq SC (even a SPC) is insufficient. A P-rule (Ø → y / V __ V is required.

(12) Sequences of nasals where C_1 is not coronal and C_2 is, do not occur intra-morphemically in Tamazight. That is, n followed by m within a morpheme cannot occur. However, the reverse is true both intra- and inter-morphemically.

Seq SC 12. If C_1 [+nas] C_2 [+nas, -cor]

Then [-cor]

Sequences of n+m occur <u>inter</u>morphemically by virtue of the fact that n is the prefix indicating the first person plural. Sequences m+n also occur, since n is the widely used masculine plural suffix. This is illustrated in (18):

(18) a. /n+mun/ → [enmun] 'we went together'

b. /idam+n/ → [idamn] 'blood'

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/i+xam+n/ —> [ixamn] 'tents'

/amnay/ —> [amnay] 'horseman'

/amnaṣaf/ —> [amnaṣaf] 'half'

Sequences of sonorants with the same place of articulation, except if they are geminates, are ruled out by Seq SC 6. This is true even of inter-morphemic sequences of n+r and n+l in the verb paradigm, e.g. /n+ra/ —> [erra] 'we want', /n+lula/ —> [ellula] 'we were born'. Sequences of liquids + nasals, and nasals + liquids with different points of articulation do occur.

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Footnotes to Chapter 2.

1. For some unknown reason, ž is not a frequently occurring segment in Tamazight-Ayt Ndhir. However, its occurrence is high in those dialects such as Ayt Seghrouchen, Ayt Lyas (a fraction of Ayt Mguild), Ayt Sgougou and Ayt Warayn, where *g $\longrightarrow$ ž and hence /ž/.

2. The status of q as a native phoneme is discussed below (sect. 2.3).

3. The forms presented in all the examples in (3) are given in broad phonetic transcription. A narrower transcription of 'to open', for example, would be [ʕ̣ṛẓʕ̣m̤] with an initial epenthetic vowel and pharyngealization spreading to the entire word. (For a full discussion of the intensive form derivation, see the appendix.)

4. This runs contrary to the practice of previous Berberists who include often without qualification, the series of pharyngealized C's comprised in the non-native inventory given in (2).

5. In Berber as well as in Moroccan Arabic, notably the dialect of Marrakech (Saib, unpublished observation), the presence of a pharyngealized or a voiced pharyngeal consonant in a word causes a spread of the prosodic feature "pharyngealization" to the entire word (cf. fn. 3). Henceforth, "dark" vowels will be transcribed with a dot beneath them.

6. Though [ḥ] and [ʕ] occur in some native morphemes such as aḥizun 'lame', θiḥellal 'lies', aḥyuḍ 'crazy', aḥidus 'dance', and raʕa 'see', aʕerrim 'adolescent', they should not be considered native. For one thing, they do not occur in native verb stems. For another, they do not enter into alternations such as exemplified in (3). Finally, they are lacking in Twareg.

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7. Following Jakobson et al, the Berberists Johnson-Harries (1966) and Abdel Massiḥ (1971) have used the feature Flat for these segments. In fact Abdel Massiḥ used this feature for labialized segments as well. This extended use of the feature Flat derives from Jakobson et al's contention that no language will have a contrast between labialized, velarized, or pharyngealized segments. The inadequacies of, and complication which result from the use of the feature Flat have been demonstrated by McCawley (1972:522-28) using Arabic. For a summary of McCawley's arguments, as well as a good discussion on distinctive features, see Hyman (1975, chapter 2).

8. In fact, more lax stops occur in baby talk, even though Ayt Ndhir is a fully spirantizing dialect, e.g. duddu 'water', titti 'sit down', taʕetta 'back', kukkur 'sugar', etc.

9. In the case of Twareg, other vowels may occur stem-initially since this language has more than three lexical vowels.

10. The other major lexical category, the adjectives, pattern with the nouns, viz. sing. axatar 'the big one' → t+axatar+t 'the big one' (f). The same is true of the plural of the adjectives, e.g. t+amazig+t → t+imazig+in 'Berber women'; t+axatar+t → t+ixatar+in 'the big ones (f)'. Thus the adjective phrase in Berber is as follows: sing. tamazigt taxatart 'the big Berber woman'; plur. timazigin tixatarin 'the big Berber women'.

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CHAPTER 3

THE TREATMENT OF GEMINATES IN BERBER

3.0 Introduction. In Chapter 2 above, examples were brought forth to illustrate the fact that a phonemic distinction is made in Berber between simple and geminate consonants (cf. Chapter 2, examples (3) and (3')). In this chapter the question of how geminates are to be treated in a phonological analysis of Berber is considered. Implications for the treatment of geminates in general are also drawn.

Regarding geminate consonants in general, a longstanding problem is that within a single language, they can function sometimes as sequences of two like-segments, or as unit segments. Phoneticians and phonologists alike have engaged in lengthy debates over how these segments should be represented. The debate among phoneticians centers around the question of whether the production of geminates involves two phases (i.e. rearticulation of the segment) or one phase.[1] Among phonologists, the debate revolves around the issue of whether geminates, when contrasted with single consonants, are to be analyzed as a sequence of two like-segments, (i.e. CC versus C), or as one segment with a feature specification [+long] or [+tense].[2] Despite these debates, however, much confusion still surrounds this issue. Thus, the discovery of a language where compelling arguments can be made for defending one of these approaches is of major consequence. It is with this in mind that this investigation of Berber geminates is undertaken.

In this chapter, it is argued that, in order to adequately explain a number of phonological facts in Berber, geminates must be treated as

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sequences of two identical consonants. At the same time, however, in order to explain other facts of the language, a general convention for interpreting each of the two identical consonants in the sequences as redundantly [+tense] is introduced and defended.

3.1 Geminates in Berber. The approach to be argued in this paper applies equally well to lexical (or underlying) geminates, as seen in (1):

(1) /ass/ [ass] 'to tie' (cf. /as/ [as] 'to fit')

/aff/ [aff] 'to be full' (cf. /af/ [af] 'to find')

as well as to geminates derived by rule, as in (2):[3]

(2) a. sg. /afus/ [afus] pl. [ifassen] 'hands'

sg. /afud/ [afud] pl. [ifadden] 'knees'

b. /ad + d # ddu + x/ [addeddux] 'that I will

FUT DIR come I come over here'

c. /ad # t + ddu/ [atteddu] 'she will go'

FUT she go

(where FUT stands for future, and DIR for directional particle).

In (2a) the geminate consonants in the plural forms arise through a rule of derivational morphology. In (2b), the geminate consonants are the result of two identical consonants coming together across a grammatical boundary. Finally, in (2c), the geminate consonants result from a complete assimilation of one consonant to another. The fact that certain phonetic geminates derive from a sequence of segments raises the question of whether all phonetic geminates should be similarly derived.

3.2 Approaches to Geminates. Two possible analyses suggest themselves. Under one analysis, which I will call the feature analysis, geminates

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would be assigned a feature [+long] or [+tense].[4] Under the other analysis, which I will call the sequential analysis, the geminates are analyzed as a sequence of two identical consonants.

Given these two possible approaches, three logical claims can be made about the nature of the underlying representation of geminates. They are given in (3) - (5):

(3) Strong Claim: only one of these analyses is correct and all geminates must be treated as such in all languages, i.e. one of these analyses is universally disallowed.

(4) Modest Claim: both analyses are available, but only one can be used in a given language.

(5) Weak Claim: both analyses are available to languages and can co-occur in a single language. (This is in accordance with a convention originally proposed by Harms (1968:36).)

At the outset it is clear from the linguistic literature that the strong claim is too strong. Therefore, I will first address myself to the modest claim. Given this constraint, which of the two approaches (the feature analysis or the sequential analysis) would be correct for Berber? The claim inherent in the feature analysis is that geminate consonants function like single consonants in Berber; the claim inherent in the sequential analysis is that geminate consonants function like sequences of two consonants in Berber. I shall now present evidence that the feature analysis cannot account in a non-ad hoc way for certain aspects of Berber phonology.

3.3. Evidence for the Sequential Analysis: The first piece of evidence is afforded by the feminine/diminutive formation of nouns. Examples

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are provided in (6):

(6)

	masculine	feminine/diminutive
a.	/axam/ [axam] 'tent'	/t-axam-t/ [taxamt] 'small tent'
b.	/aḥrṛat/ [aḥerṛat][5] 'plower'	/t-aḥrṛat-t/ [taḥerṛatṭ] 'plowing'
c.	/afud/ [afud] 'knee'	/t-afud-t/ [tafutt] 'small knee'
d.	/abuḍ/ [abuḍ] 'bottom'	/t-abuḍ-t/ [tabuṭṭ] 'small bottom'

In (6a) we see that feminine/diminutive formation of nouns is achieved by prefixation and suffixation of a t. When two t's come together, as in (6b), the result is a geminate. Note that there is a phonetic contrast between t in the masculine and tt (or t:) in the feminine. Similarly, when nonidentical dental stops come together, as in (6c), regressive assimilation takes place, and the end result is a geminate. It is clear from these examples that at least some phonetic geminates must be derived from a sequence. Otherwise, the masculine and feminine form would have to be listed separately in the lexicon, which would obscure the regular relationship between them.

A second piece of evidence is provided by the data in (7), taken from the Ntifa and Zayan dialects of Tamazight (cf. Laoust 1918:129, 130; Loubignac 1924:206), which illustrate a process of degemination by vowel insertion:

(7)

Zero Form	Intensive Form
/fẓẓ/ [feẓẓ] 'to chew'	/tt-fẓẓ/ [ettefẓaẓ]
/gẓẓ/ [geẓẓ] 'to gnaw'	/tt-gẓẓ/ [ettegẓaẓ]
/bdd/ [bedd] 'to stand up'	/tt-bdd/ [ettebdad]

The insertion of a, along with the prefixation of tt is in line

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with the intensive form derivation of the so-called vowelless stems with a lexically geminate second radical; e.g. /$C_1C_2C_2C_3$/: /bddl/ 'to change' [beddel]. Put differently, the verbs in (7) pattern along the lines of verbs such as /bddl/, which form their intensive form with prefixation of tt and insertion of a before the last radical consonant: /tt-bddl/ -> [ettbeddal]. Since in the case of verbs such as those in (7), the second root consonant is a geminate, it is broken up for the purpose of a insertion, required by the intensive form derivation.

While this type of degemination rule is only a minor rule in Berber phonology, and while it is motivated by the intensive form derivation, another motivation for it could be the simplification of consonant clusters. In a sense, the a insertion might also serve as an epenthesis rule in the intensive form of these stems. As has been shown in Chapter 2, Section 2.4.2, there is, in Berber, a phonetic constraint against three or more consonants in a row. (For the insertion of a schwa in [ettbeddal] 'to change', before the geminate tt instead of between the two t's, see the explanation given below in footnotes 8 and 9).

Returning to the main discussion, we find that, not only is the [+tense] analysis unable to satisfactorily account for the insertion of /a/ between the geminate consonants in (7), but that it also cannot explain the motivation of this process; since, according to the feature analysis, a sequence of a consonant followed by a geminate would be viewed as only two consonants in a row. One could, of course, consider a sequence of a non-tense C and a tense C to function as a three consonant sequence, but this is just what a 'geminate' solution is stating.

A third piece of evidence pointing to the necessity of the sequen-

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tial analysis is drawn from a productive process of schwa insertion[6], illustated in (8):

(8) /bdu/ -> [ebdu] 'to start'
/gnu/ -> [egnu] 'to sew'
/rzu/ -> [erzu] 'to look for'

The rule in (9) states that a schwa is inserted before two consonants followed by a vowel:

(9) Ø -> e / __ CCV

As seen in the examples in (10), this same rule applies when a geminate is followed by a vowel:

(10) /kku/ -> [ekku] 'to mow'
/ddu/ -> [eddu] 'to go'
/rru/ -> [erru] 'to add'

Thus, in order for rule (9) to apply to the forms in (10), it is necessary to interpret these latter forms as beginning with <u>two</u> consonants--which in this case happen to be identical. If these geminates were interpreted as single consonants, then there would be no schwa insertion, as indicated in (11):

(11) a. [fa] 'to yawn' (no schwa insertion)
[su] 'to drink' " " "
b. *[kku] 'to mow'
*[ddu] 'to go'

Hence, if we were to view geminates as single consonants, we would expect the schwaless forms in (11b). Since these do not occur, there is strong evidence for analyzing geminates as double consonants. One could also state the rule as (9a):

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(9a) $\emptyset \rightarrow e \; / \; \_\_ \; \begin{Bmatrix} CC \\ C: \end{Bmatrix} \; V$

But this again makes C: equivalent to CC and makes a simple rule complex by stating two environments instead of one.

There is a second rule of schwa insertion operating in Berber, which is stated in (12):

(12) $\emptyset \rightarrow e \; / \; CC \; \_\_ \; C\#$ [7]

In verb stems consisting of three underlying consonants (and no phonological vowel), a schwa is inserted to separate the last consonant from the two preceding consonants. As seen in the derivation in (13), this rule feeds into rule (9):

(13) Underlying form: /xdm/
By rule (12): xdem
By rule (9): exdem
Phonetic form: [exdem] 'to work'
cf. [egmes] 'to cover'
[erẓem] 'to open'

What is important is that words which consist of a geminate consonant followed by another consonant follow exactly the same two rules, as illustrated in (14):

(14) Underlying form: /kks/
By rule (12): kkes
By rule (9): ekkes
Phonetic form: [ekkes] 'to take off'
cf. [ellef] 'to repudiate'
[eqqen] 'to close'

As seen in the forms in (15), when a word consists of two underlying

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consonants, a schwa is inserted either before or between the two consonants.

(15) /ng/ → [eng] or [neg] 'to kill'

/ns/ → [ens] or [nes] 'to spend the night'

Thus, if the underlying geminates in (16a) were analyzed as single consonants, we would expect to find the phonetic forms in (16b):

(16a)		(b)	
/kks/	'to take off'	*[ekks]	or *[kkes]
/llf/	'to repudiate'	*[ellf]	or *[llef]
/qqn/	'to close'	*[eqqn]	or *[qqen]

Since none of the forms in (16b) are found, (at least as citation forms; cf. footnotes 6 and 8, however), it is obvious that these geminates must be analyzed as sequences of two identical consonants. The one exception is when the schwa placement rule would insert a schwa between the two geminate consonants (e.g., during the conjugation of the verbs in those persons indicated by suffixes, such as -x 'I', etc.) This would, for instance, create such starred forms as *[keksex] (<*/kks-x/* 'I took off') instead of the correct [ekksex]. A general constraint on the schwa rule will have to indicate that if a schwa would occur between two geminates, it automatically moves one place to the left, occurring before them. This is, however, <u>not</u> an argument for saying that geminate consonants should be treated as one segment. If this were to be seriously argued, it would mean that geminates would be counted as one segment, just in case the schwa rule would not give the desired output, and would therefore be completely circular. Since I have given examples of where geminates must be counted as two segments for the same schwa insertion rule, this would amount to saying that you

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have to look ahead to the phonetic output and then decide accordingly whether you want to call a geminate consonant one or two segments. It is much sounder to start with one representation of geminates as a consonant sequence and have a condition on the schwa insertion rule which forbids the schwa from occurring between the like consonants. This condition is in itself well-motivated by the mutual effect that the two consonants have on one another, i.e., mutual strengthening.[8]

In summary, it should be clear from the above arguments that treating Berber geminates under the sequential analysis leads to a more general and explanatory account of Berber phonology.

3.4 Evidence for the Feature Analysis. Despite the evidence given above, the feature analysis does appear to be better suited to handle other aspects of Berber phonology.

One such aspect involves the morphologically conditioned rule by which the intensive form of verbs is derived from the zero form. The examples in (17) illustrate that one way this is achieved is by geminating one consonant of the stem, in this case the second consonant:

(17)

Zero Form	Intensive Form
/xdm/	/xddm/ → [xeddem] 'to work'
/gms/	/gmms/ → [egmmes] 'to cover'
/rẓm/	/rẓẓm/ → [rezzem] 'to open'

What is of interest here is that for those verbs which have underlying geminates in their zero forms, a prefix /tt/ is used to derive the intensive form, as seen in (18):

(18)

Zero Form	Intensive Form
/kks/	[ettekkes][9] 'to take off'

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Zero Form	Intensive Form
/llf/	[ettellef] 'to repudiate'
/qqn/	[etteqqen] 'to close'

In order to determine how the facts in (17) and (18) can best be explained, let us examine roughly how the intensive rule is written under the two analyses. Under the feature analysis the data in (17) are accounted for by the informal rule in (19):

(19) . . . [-tense] . . . → [+tense] / morphological information
C

Notice that the rule in (19) correctly predicts that in forms with underlying geminates, which are represented as single tense consonants, we will not obtain forms such as those in (20):

(20) *kekkes (from /kks/ 'to take off')

*lellef (from /llf/ 'to repudiate')

*qeqqen (from /qqn/ 'to close')

Since (19) converts a nontense consonant to a tense one, it applies vacuously to such inputs as in the zero forms of (18).

On the other hand, under the sequential analysis the data of (17) are accounted for by the informal rule in (21):

(21) . . . C_x . . . → C_x C_x / morphological information

In this conceptualization, the intensive form is seen to be derived from the zero form by means of a repudiation of a stem consonant of the verb. However, if (21) represents the correct approach to this derivation, then its prediction is that one of the geminate consonants should be able to undergo a second gemination as in (22):

(22) . . . C_x C_x . . . → C_x C_x C_x / morphological information

However, as already seen in (20), this prediction is not born out by

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the data.

Thus, one argument for the feature analysis is that it correctly predicts the inability of underlying geminates to further geminate in the derivation of the intensive forms of verbs. The only way sequential analysis can be made to provide the same prediction is by adding a constraint in rule (21), reproduced now as (21'):

(21') $\ldots C_x \ldots \rightarrow C_x\ C_x$ / Y (& morphological information)

where $Y \neq C_x$

The rule now states that this derivational process can reduplicate a consonant from the zero form of the verb, unless that consonant is preceded or followed by an identical consonant (using Bach's neighborhood convention).

Although this condition accounts for the data, it should be noted that under the feature analysis no such condition is needed, since it is already built into the rule of (19) by using the feature specification [-tense] in the structural description.

A similar argument can be made concerning the phonological process of spirantization in Berber, which will now be considered from a historical perspective (cf. the discussion of spirantization in Biblical Hebrew reported by Sampson 1973).[10] In many Berber dialects, including my own, all non-geminate stops have been converted to spirants, as seen in the data in (23a):

(23a)	Non-Spirantizing Dialects	Spirantizing Dialects
	[tarikt] 'saddle'	[θariš^{v}θ]
	[ender] 'to roar'	[enḍer]
	[tatbirt]'pigeon (f.)'	[θaθbirθ]

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(23b) [afettal] 'couscous' [afe<u>tt</u>al]

[asebbab] 'trader' [aseb<u>bab</u>]

[taddart] 'house' [θa<u>ddar</u>θ]

However, the geminate stops in (23b) are not affected by this rule in the spirantizing dialects.

Under the feature analysis we can assume the historical change in (24):

(24) $[-\text{tense}] \xrightarrow[C]{} [+\text{cont}]$

Under the sequential analysis the historical change is stated as in (25):

(25) $C_x \rightarrow [+\text{cont}] \;/\; Y$, where $Y \neq C_x$

The condition in (25) is needed to ensure that a geminate consonant, which is here analyzed as a sequence of identical consonants, will not undergo spirantization to become the unacceptable forms in (26):

(26) *[afeθθal] 'couscous'

*[asebbab] 'trader'

*[θaddarθ] 'house'

Thus, just as in the formation of the intensive form of verbs, it is the feature analysis which makes the correct prediction.

3.5 <u>Conclusion</u>. In conclusion, we can say that both analyses provide important insights into Berber phonology. Each analysis handles some aspects of phonological or morphological rules dealing with geminates, but each analysis seems inadequate with respect to other aspects. It would thus appear necessary to abandon even the modest claim made above in (4). In order to state the phonological properties of Berber, we find it necessary to refer to geminates both as sequences of identical

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consonants and also as [+tense] consonants. In this case, we may find it necessary to use Harms' convention which would permit us to refer to the same phonetic entity either as a single consonant (for some rules) and as a sequence of two identical consonants (for other rules) (cf. also the treatment of Lithuanian vowel length by Kenstowicz 1970). This position, represented as the weak claim in (5), would unfortunately not place any constraints on the phonological representation of geminates in languages.

There is, however, a way out which should be considered. The importance of the arguments presented for the feature analysis in the preceding discussion is that we need to refer to geminates sometimes as [+tense]. No arguments were found, however, that these geminates had to be treated as single consonants. Thus, I propose the following convention in (27):

(27) $C_x \Rightarrow [+\text{tense}] \quad C_x \Rightarrow [+\text{tense}]$

In Berber, all geminates will be analyzed as sequences of two identical consonants. However, they will be redundantly specified as [+tense]. In fact, (27) will reapply any time geminates are created. Thus, a single /t/, taken here as representing any single consonant, is [-tense], but when one /t/ abuts with another /t/, the two fortify one another and automatically become [+tense]. Since underlying /tt/ is now viewed as two consonants, both of which are specified [+tense], we can not only account for all of the data presented in favor of the sequential analysis, but also for all of the data handled by the feature analysis. Thus,

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the reason why geminates do not become intensified in the intensive form of verbs is that each of the geminate consonants is already redundantly specified [+tense]. Similarly, since each /t/ of /tt/ is specified [+tense], neither spirantizes to [θ].

3.6 Some Implications of Convention (27). In the above conclusion, convention (27) is proposed to further motivate the sequential analysis argued for in the main body of the paper for Berber geminates. It is also presented to solve the almost endemic problem of indeterminacy concerning the representation of geminates faced by analysts. The question before us now is whether (27) is a language specific device, devised for Berber, or whether it has a universal application?

In the foregoing sections, we have seen, first, that geminates must be treated as consonant sequences in Berber; but, second, that they have characteristics of their own. In particular, having a sequence of two like-consonants is likely to produce a phonetically motivated strengthening of the articulation, so that /tt/ may differ from /t/ not only in duration but also in fortition.[11] Convention (27) is but a reflection of this phonetic fact.

As we have seen, one result can be that geminates may be exempt from weakening processes (e.g. spirantization) which other consonant sequences undergo. This is explained by convention (27). In fact, with its demonstrably solid phonetic basis, (27) may prove to be a linguistic universal, (especially with respect to spirantization). Indeed, data from languages other than Berber, viz. Biblical Hebrew (Sampson (1973)), Old Romance languages (Pope (1934)), provide support for attributing universal status to (27). In both languages, as is the case for

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Berber, spirantization affects single consonants but not geminates. The only difference with Berber, is that statable environments can be found for the weakening rule. An illustration is given in (28) and (29):

(28) Biblical Hebrew (Sampson p. 101)[12]

/gaadal/ [gaaḏal] 'he became great'

but:

/giddeel/ [giddeel] 'he became great'

(29) Romance (Old French) (Pope 1937. p. 262)[13]

Late Latin	Old French
gratu	gre [gre] 'liking'
but:	but:
*totta	tote̯ > tute̯ tut 'all (fem)'

It appears, thus, that there is, indeed, something universal about geminate consonants not weakening into a sequence of identical spirants, viz. tt -/-> θθ. This can be explained by the mutual strengthening effect of the two elements of the geminates captured by convention (27). If this claim withstands the test in other languages, it would represent an important constraint on geminates.

A second claim, which in effect is a corollary of the first, is also implicit in convention (27): geminates will reduce (degeminate) first, before undergoing spirantization (or other weakening processes). Thus, there is always going to be a time lag between reduction of geminates and spirantization. This predictive power of (27) explains certain seemingly odd alternations between geminates and their corresponding spirants in Berber, as exemplified in (30).[14]

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(30a)

sing.	plur.	
aṡeḍḍur	iṡeḍran	'flap(s) of a cape'
asekkur	iseɣwran	'partridge(s)'

(30b)

Z.F.	I.F.	
qqim	ttǧima	'to sit'
ggall	ttǰalla	'to swear'

This second claim implicit in convention (27) is further supported by changes which took place during the development of Modern French from Latin (Pope 1934), as illustrated in (31):

(31)

LL	OFII	Mid F	Mod F		
tottu	tot tut	tu(t)	tu	'tout'	'all'
bassu	bas	ba(s, z)	ba	'bas'	'low'

In (31) it can be seen that Late Latin geminates tt and ss reduce in Old French II, before undergoing, first, optional and then obligatory deletion in Middle French and Modern French, respectively.

A final piece of corroborating evidence for (27) is the existence of strengthening processes which only geminates undergo. Thus in a number of Berber dialects, among which is Taqbayliyt (=Kabyle), spoken in Algeria, ss>ts (symbolized as [cc]), but s>s. This is illustrated in (32):

(32) Taqbayliyt (At-Mangellat; Data from De Vincennes and Dallet)[15]

Z.F.	I.F.	
fsey	fecci	'to melt'
xsey	xecci	'to be extinguished'
rsu	reccu	'to drive in (a stick)'

Supportive data illustrating the particular strengthening of the geminates can be drawn from languages other than Berber. In Spanish

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for example, Latin /ll/'s palatalize into [ll^{y}], while Latin /l/'s do not; viz. caballu [kaball^{y}o] 'horse', malu [malo] 'bad'.

Since we have argued that the two elements of a geminate cluster are redundantly [+tense], while other consonants are [-tense], the processes illustrated by the data presented in this section are best explained by a theory incorporating concention (27).

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Footnotes to Chapter 3.

1. A summary of the debate and references for the two opposing viewpoints can be found in Lehiste 1973: 131-32.

2. cf. Swadesh 1937, Martinet 1959: 223-27, and the contributions to the volume, Studies in Linguistic Analysis, 1957.

3. The changes in the quality of the vowels are ignored, since they are not crucial to the discussion. Since the present discussion applies to Berber in general, single consonants are represented as stops, not as spirants (cf. Chapter 2 above). Only when spirantization is crucial to the discussion (cf. section 3.4) are they represented as spirants.

4. The feature [± tense] is explicitly proposed for geminate consonants in Berber by Mitchell 1957, Galand 1975, Harries 1966, Abdel-Massih 1968. Of these authors, Mitchell arrived at this conclusion after some phonetic experiments, mainly with palatograms and kymographs.

5. Masculine singular nouns with t as the final radical are very rare in present day Berber dialects/languages. A t reappears in the plural of a number of nouns (e.g. arba 'toy' arbaten 'boys'), which suggests that 'boy' was probably */arbat/ to which the regular plural suffix /-n/ is added. Nonetheless, a sequence of t(#)t --> [tt] (e.g. /ww#t/ 'hit him' [ewwett]).

6. For the sake of clarity, the rules of schwa epenthesis proposed here are stated so as to apply mainly to the verb stems in their simplest forms (i.e. Zero Form and Intensive Form without the affixes).

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Certain clusterings involving geminates and a single consonant do arise during the conjugation. However, they do not pose any problems as stated in footnote 8 below. Certain Berberists have claimed (Laoust 1918), that in the particular dialect they were investigating, there is a clustering different from that occurring in my dialect, viz. [gers] 'to slaughter' instead of [egres]. It should be pointed out that this state of affairs is understandable given that, with very few exceptions, Berber verbs have at least one sonorant consonant. It is a well known fact across languages that more clustering possibilities arise when sequences of consonants contain sonorants. For a complete investigation of the problem of schwa in Berber, see Chapter 5.

7. It might be pointed out that, as stated, rule (12) would not yield the correct output for the citation form of the verbs in (7) above. Indeed, surface forms such as *[efzez] 'to chew' would result, if the final radical consonant is analyzed as a geminate cluster, as is argued here. This suggests that the rule must be reformulated so as to handle these verbs. While the machinery, for example, angle brackets, is availabe to us to do so, we do not see any gain in unduly complicating the statement of the rule. Such forms are easily accounted for by the general constraint stated in footnote 8, below. Hence, all that would be needed is to add a condition on the schwa rule (12) saying that it cannot break up geminate consonants.

8. In fact, what the Berber data suggests is the following general constraint: an epenthetic rule would not normally break up a geminate cluster. The generality of this constraint is supported by the fact that it is found to be operative in a number of Arabic dialects. In

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Moroccan Arabic (Saib 1975), as in the case in Berber, the schwa insertion rules break up clusters of unlike consonants, viz. /ktb/ → [ekteb] 'write', but not geminate clusters, viz. /fkk/ → *[fkek], i.e. [fekk] 'untie'. See also Brame's discussion of this phenomenon in the Mukabbir dialect of Arabic (1971: 569-70), where an epenthetic ɨ can break up all clusters except geminates, viz. yɨ+ktb+u → [yɨkɨtbu] 'they write', but radd → *radɨd 'he returned'.

9. The phonetic forms in (18) are derived by rules (12) and (9). The schwa before the prefix tt is obtained by a reapplication of rule (9), since its structural description is met. In cases where the first stem consonant is non-geminate and is followed by a vowel, the intensive prefix tt reduces to t in fast speech, and a schwa is then inserted before it; e.g. /tt-fafa/ 'to wake up' → [etfafa]. It should be pointed out, however, that the existence of the careful pronunciation [ettfafa] does not constitute a problem for the analysis of schwa epenthesis proposed here. It is accounted for by the principled constraint proposed in footnote 8. Previous writers do not insert a schwa in this position, thereby implying that there exists none. (Laoust 1918, Galand 1975, Abdel-Massih 1968, Penchoen 1973). In fact Galand (1975), went as far as calling them 'voyelles centrales imaginaires'. However, an experiment which Jean-Marie Hombert and I ran at the UCLA Phonetics Laboratory clearly showed the existence of schwas word internally and reduced schwas word initially. I would like to thank Jean-Marie for his help.

10. The spirantization rule in Biblical Hebrew is similar to that operating in Berber except that in Biblical Hebrew a statable phonolog-

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ical environment for it exists. According to Sampson, it applies to single consonants post-vocalically, but not to geminates. In his squib, he argues for a feature analysis on the basis of the difficulty one would have in formulating the aforementioned spirantization rule in Biblical Hebrew. However, in a reply to Sampson, Barkai (1974: 456-59), refutes Sampson's contention and convincingly argues for a sequential analysis. For a detailed study on spirantization in Berber, cf. Saib (1974), and Chapter 4.

11. This fact is documented by phonetic studies on geminates in languages belonging to different language families, cf. Delattre (1971), Lehiste (1973), and the references cited there.

12. So as to be consistent with the way geminates are represented throughout this study, Sampson's representation of these segments is not followed here. Moreover, VV is substituted for Sampson's V: for long vowels.

13. Pope's other examples (p. 262) seem to suggest that the t in gratu, first weakens to d, then to đ in Gallo-Roman. The loss of the ending leaves đ in final position, hence the devoicing into θ, before complete disappearance in Middle and Modern French, viz. 'gre' [gRe]. Notice that the geminates in *totta, while not undergoing spirantization, can undergo reduction, a fact also accounted for by (27); see below. The asterisk before *totta indicates that it is a reconstructed form, while the small zero under the e indicates that e is reduced to schwa.

14. According to Loubignac (1924: 39), some subdialects of Zayyan,

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where spirantization is not as pronounced as in Tamazight (Ayt Ndhir) represented in (30), exhibit reduction but not yet spirantization.

15. In fact, in this dialect of Taqbayliyt (Kabyle), the intensive form prefix, tt, cf. (7) above, is an affricative transcribed here as cc (=tts). So is the lexical geminate tt in the following cognate forms:

Tamazight	At-Mangellat
netta	necca 'he/him'
ttu-x	ccu-g 'I forgot'

Furthermore, in Tirifiyt (Northern Morocco), geminate ll are rendered as ǰǰ; viz. Tamazight [ellef] 'to repudiate' = Tirifiyt: [eǰǰef].

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CHAPTER 4

GEMINATION AND SPIRANTIZATION[1]

4.0 Introduction. Northern Berber languages, save Tachelḥiyt (see below, however), are characterized by the presence at the surface level of a markedly large series of spirants (both strident and non-strident) in their consonantal system. In addition, these languages exhibit a morphophonemic alternation not only between simple and geminate consonants as do Tachelḥiyt and Twareg, but within this alternation, one between non-strident spirants (e.g. θ and ç), and geminate stops (e.g. tt and kk). These facts were mentioned above in Chapters 2 and 3 , but only in passing. The first mention is in conjunction with the presentation of the consonantal system of Tamazight Berber (examples (1) and (3')). The second mention of this alternation is in connection with the exemption of geminates (but not simple consonants) from undergoing spirantization (cf. Chapter 3). In this chapter, the process of spirantization is treated in detail from both the diachronic and synchronic points of view. A number of questions are considered here. In the diachronic account, questions concerning the cause of this weakening process, the degree of its spread within the inventory of segments as well as its spread throughout the Northern Berber domain are considered.[2] In the synchronic account, questions pertaining to the representation of segments of Tamazight-Ayt Ndhir, especially the representation of simple/geminate consonant alternations and the stop/spirant alternations are discussed. Finally, implications for Berber phonology, Berber dialectology, and the phonological theory

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in general are drawn.

4.1 The data. The simple consonant/geminate alternations are illustrated in (1) and (2) below. The data for Tamazight are drawn for the most part from the focal dialect of Ayt Ndhir.[3]

		Zero Form	Intensive Form	Gloss
(1)	Tamazight	eɕmez	ɕemmez	'to scratch'
		egmes	gemmes	'to cover'
		eǰnu	ǰennu	'to sew'
		eƀnu	ƀennu	'to build'
		efley	felley	'to tear'
		emrey	merrey	'to rub'
		erẓem	reẓẓem	'to open'
		ens	nessa	'to wear'
(2)	Tachelḥiyt	bez	ebbez	'to peel'
		eftel	fettel	'to roll couscous'
		ebdu	beddu	'to start'
		enzu	nezza	'to be sold'
		enker	nekker	'to get up'

The examples under (1) and (2) are merely illustrative of the fact that this alternation is pervasive throughout the dialects. Other examples could be cited to show that all consonants (except for the voiceless bilabial stop p;cf. below) are affected. Recall that the 'zero forms' in the above examples represent the shape of the verb that is used in the imperative (2nd person singular). It is the simplest form in that it is the most morphologically unmarked. The 'intensive form' is the imperfect (or continuous and habitual) aspect, and as seen in

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the examples, is a morphologically 'marked'form.

In the Southern dialects (Tachelhiyt and Twareg, see map on p. 13) the only apparent exceptions to the alternations between simple consonants and identical geminates are the alternations ḍ : ṭṭ and g : qq as shown in (3):[4]

(3)

Tachelḥiyt	Z.F.	I.F.	Gloss
	ebḍu	beṭṭu	'to divide'
	ekḍu	keṭṭu	'to smell'
	neg	neqqa	'to kill'
	reg	reqqa	'to be warm'

These cases are actually the result of a very general rule applying to simple and geminate pharyngealized consonants; the simple pharyngeals are voiced and the geminates always voiceless. That the simple pharyngeals must be voiced in Berber can be seen in the following nativized forms in Tamazight borrowed from Arabic: azum 'to fast' (Ar. ṣa:m), ϑazallitt 'prayer' (Ar. eṣṣala:) etc. The consonants symbolized as g and q can be considered as pharyngealized velars (or uvulars). The rule is simple (assume for now that the underlying segment is non-geminate, an assumption which will be justified below):

(4) $\begin{bmatrix} +\text{consonantal} \\ +\text{pharyngealized} \end{bmatrix} \rightarrow [+\text{voiced}] /\ X$: where $X \neq$ identical C

Using Bach's neighborhood convention (cf. Bach 1968), this rule states that a pharyngealized consonant is voiced when the preceding or following segment is not identical to it.

One problem, then, to be accounted for in synchronic grammars of Berber dialects is this occurrence of C/CC alternations. A second prob-

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lem arises when the Central and Northern Berber dialects of Morocco are examined. These dialects have, instead of all of the above alternations, a series of non-strident spirants alternating with geminate stops. That is, instead of the t : tt alternation, we find Θ : tt. This may be illustrated by examples from the Ayt Ndhir dialect of Tamazight where spirantization is particularly widespread.

(5)	Z.F.		I.F.	Gloss
f : ff	enfeḍ	:	neffeḍ	'to throb'
	erfes	:	reffes	'to dip'
ƀ : bb	enƀeš̌	:	nebbeš̌	'to be nosy'
	erƀel	:	rebbel	'to ramble'
Θ : tt	efΘel	:	fettel	'to roll couscous'
	enΘel	:	nettel	'to hide'
ḋ : dd	eƀḋu	:	ƀeddu	'to start'
	enḋu	:	neddu	'to become buttermilk'
ḍ : ṭṭ	erḍel	:	reṭṭel	'to loan'
	eƀḍu	:	ƀeṭṭu	'to divide'
ǰ : gg	ǰen	:	eggan	'to sleep'
	erǰem	:	reggem	'to insult'
ǧ : qq	neǧ	:	neqqa	'to kill'
	reǧ	:	reqqa	'to be warm'

Some additional facts should be noted prior to a discussion of the historical processes which gave rise to these alternations and dialect differences and to the discussion of how best to account for these facts in Berber synchronic grammars. Of particular interest is the fact that Berber lacks p or pp (some exceptions to this are: the

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baby talk pappa 'bread' and some loanwords from French in Taqbayliyt; cf. Chapter 2). This non-occurrence of the voiceless bilabial stop is also true of other languages in the area (Arabic, Hausa, Somali, etc.) where only a two-way labial obstruent contrast is found, usually between b and f ; neither p nor v occurs. In addition, as noted above, the non-geminate pharyngealized consonants are automatically voiced. Furthermore, they are spirantized in Northern dialects as shown in (6):

(6) Tamazight (Ayt Ndhir)

Z.F.		I.F.	Gloss
enḍel	:	neṭṭel	'to bury'

(See also examples in (5))

Finally, the spirant alternants of the geminates kk and gg are normally palatals, ç and ǰ respectively in the spirantizing dialects, as seen in (7) (however, see (13), (14), (15b) below):

(7) Tamazight (Near Demnate)

Z.F.		I.F.	Gloss
erçel	:	rekkel	'to kick'
erçem	:	rekkem	'to boil'
erǰem	:	reggem	'to insult'
emǰer	:	megger	'to harvest'

This fronting may be due to the need for 'maximal differentiation' between velars and uvulars.

The question of the systematic phonemic representation of the verbs in the Ayt Ndhir dialect will be considered here. Specifically the paper will attempt to resolve the problem of whether underlying forms have geminates, simple stops, or spirants. The solution to the

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problem has direct bearing on phonological theory. An historical account of the development of these dialect differences is relevant to the discussion and will hopefully also contribute to our understanding of historical change in general.

4.2 Diachronic account. It is generally accepted that historically the Berber spirants derived from stops (cf. Laoust 1918 and 1939 ; Loubignac 1924 ; Renisio 1932 ; Basset 1952). This process illustrates the historical 'weakening' found in many languages. In the dialect under discussion as well as in other dialects, there appears to be no conditioning factor other than that the stop undergoing spirantization is non-geminate. Ayt Ndhir is one of the least conservative dialects with respect to spirantization. Other dialects show varying degrees of spirantization. Thus, for example, while the Ayt Izdeg dialect of Tamazight exhibits a number of instances of *k -> ç (and even *k -> š), and *g -> ǰ , it exhibits only a few instances of *t -> θ and *d -> ḍ. This is illustrated in (8) (cf. Mercier's lexicon 1937):

(8)

	Tamazight (Ayt Izdeg)		Gloss
a.	açez	< /akez/	'to recognize'
	arǰam	< /argam/	'insult'
	ašal	< /akal/	'earth'
b.	iθri	< /itri/	'star'
	amaḍel	< /amadel/	'side'

Other dialects of Tamazight such as Ayt Merghad, Ayt Ben Yacoub, Ayt Aṭṭa, Ayt Ayyache etc, have spirantization of the velars, viz. *k -> ç and *g -> ǰ , but not that of the dentals. Unfortunately, the

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published description of many of the dialects (see references above) are so sketchy that the reader is unable to determine what sound changes are posited for which dialect. Thus, it is not possible at this time to illustrate or analyze all the inter-dependencies. What is clear is that all dialects have spirantized *p to f.[5]

The relationship between the *p -> f spirantization and the other cases of spirantization is not clear-cut. This *p -> f change characterizes most of the vast Afro-Asiatic family, including Arabic, Hausa, Somali and also Berber. (A similar change characterizes Japanese, though the resultant f is further modified to h, Ultan 1970.) This change may have triggered the chain of subsequent spirantizations that characterize many Berber dialects. But, it is clear that this change is separated from the other spirantizations by a considerable period of time.[6]

Also, it should be noted that the other Afro-Asiatic languages do not spirantize as does Berber. Furthermore, in Berber, the *p -> f change is unlike the other changes in that it affects the geminates as well as the non-geminates; there is no Berber dialect where single f alternates with pf which might be assumed as an intermediate step. Thus, all Berber dialects reflect the historical contex-free rule (9):

(9) *p > f

Moreover, the spirantizing dialects reflect additional historical rules resulting in the alternations: C^1_f : C^2_s (where C^2_s = a single spirant and C^2_s = a geminate stop).

Other than the voiceless labial spirantization, the only spirantization attested in <u>all</u> the Berber languages I have investigated

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concerns the uvulars: all dialects appear to have a simple g which alternates with qq.[7] Berber languages such as Tachelhiyt and Twareg, then, have only two cases of spirantization: f : ff and g : qq ,[8] as shown in (10).

(10)

Tachelhiyt			Twareg[9]			
Z.F.		I.F.	Z.F.		I.F.	
neg	:	neqqa	eng	:	neqq (naqq)	'to kill'
reg	:	reqqa	erg	:	reqq (raqq)	'to be warm'
esfed	:	seffed	sfed	:	seffed	'to wipe'

Since the *p was presumably lost at an earlier period, possibly when this occurred in other Afro-Asiatic languages, and since at one stage speakers would hear only f and ff , this spirantization does not provide a viable model for stop/spirant alternations. We can hypothesize that the first spirantization in the later chain of historical development is an uvular pair. It is this pair, then, which may have triggered the rest, if triggering did indeed occur. It is, of course, possible that each spirantization took place independently of the others when it was 'due' on the strength scale.

Another indication that the labial change had little influence on subsequent spirantization is the relatively rare occurrence of ƀ in Berber. There are some dialects that show an alternation between ƀ and bb , but in many dialects the picture is one of general spirantization of single stops except for the labial *b . Thus, in addition to the spirantization problem, there is a labial problem. That is, whereas other places of articulation permit a four-way contrast (e.g. alveolar obstruents t , d , s and z) the labial position seems

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to permit only a two-way obstruent contrast between f and b . There appears to be some force in the language that strives to maintain this pattern. However, if the trends observed in the Taqbayliyt dialects with some surface p's and v's were to continue, the pattern would not be maintained in these dialects since the newly acquired segments would be lexicalized in due time.

A final case of historical change to be considered here is that of the fronting of the velars k and g . The spirantized realizations of these segments pose several questions. First of all, the expected spirants are ɕ and ʝ , which are, in fact, widely attested in present day Berber dialect. The segments ɕ and ʝ are the only velar spirants exhibited by Berber dialects (e.g. Tachelḥiyt-Iḥaḥan and Ida Outanante etc.) in which simple stops have begun to be affected by spirantization. Some fully spirantizing dialects, however, have further modified the velar spirants to š and ž , respectively. This is illustrated in (11) with data from Ayt Aṭṭa, a dialect in transition, and Ayt Seghrouchen. Both are dialects of Tamazight.[10]

(11)	Ayt Aṭṭa	Ayt Seghrouchen	Gloss
	aɕuz	ašuz (or šuz),*aɕuz	'weevil'
	aɕabar	ašabar,*aɕabar	'caravan'
	eɕrez	ešrez,*eɕrez	'to plow'
	ʝen	žen,*ʝen	'to sleep'
	taʝmart	θažmarθ,*θaʝmarθ	'mare'
	aʝellid	ažellid,*aʝellid	'king'

(Note that Ayt Atta does not have spirantization of the dentals and labials. The asterisk, in this case, means non-occurring.)

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The further change from ç and ʒ to š and ž respectively, which is hypothesized for Ayt Seghrouchen, is not surprising. It has often been noted that [-back, -coronal] lingual continuants often become [+ strident, + coronal], (cf. German ich which dialectically becomes iš). Chomsky and Halle (1968), claiming that š and ž are less marked than ç and ʒ , posit 'linking rules' to account for this 'natural process'.

In Berber, however, both ç and š and ʒ and ž occur in single dialects without any apparent conditioning factor. In (12) forms from Tachelhiyt and Tamazight- Ayt Ndhir are compared, in which it is seen that Tachelhiyt k corresponds to Tamazight ç .

(12)	Tachelḥiyt	Tamazight	Gloss
	aksum	açsum	'meat'
	azukenni	azuçenni	'thyme'
	akuz	açuz	'weevil'
	akz	açz	'to remember'
	ašekša	ašeçša	'chick'
	uṣka	uṣça	'hound'

In (13), however, Tachelhiyt k corresponds to Tamazight š :

(13)	Tachelḥiyt	Tamazight	Gloss
	akal	ašal	'earth'
	akabar	ašabar	'caravan'
	akanif	ašanif	'grill'
	tarikt	θarišθ	'saddle'
	tanekra	θanešra	'awakening'
	tiškert	θiššerθ	'garlic'

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We can see that it is not simply the case that in some dialects *k and *g have become ç and ǰ, respectively, but that in others, the process is extended further to yield š and ž. These dialects appear to represent "language change in progress" (Labov 1972). In addition we also find the modification of *g to the glide y.

The above statement would apply even to the Ayt Seghrouchen dialect of Tamazight where, as illustrated in (11) above, most *k's and *g's have become s's and z's respectively. This is so because some *k's and *g's have become y's instead; as seen in (14).

(14)

Tachelḥiyt	Ayt Seghrouchen
amek̲sa	amey̲sa, *amešsa 'shepherd'
ag̲užil	ayužil, *ažužil 'orphan'

Regarding the variation in the spirantization of underlying k's in spirantization dialects, Penchoen (personal communication and 1973: 26) offers the following suggestion concerning possible conditioning factors for the changes k to ç and k to š in Tamazight: k weakens to ç 1) when followed by an u (e.g. takurt -> θaçurθ 'ball'); 2) in words containing s, z, š, ž whether adjacent to k or not (e.g. aksum -> açsum 'meat': cf., however, my proto-Berber form for 'meat' in (15); ekrez -> eçrez 'to plow'); 3) in verbs preceded by the causative prefix ss (e.g. kned 'to burn' [+intrans.] -> sseçneḍ 'to burn' [+trans.]). Apart from these cases, k weakens to š.

Penchoen's suggestion, which appears to be observationally adequate for Tamazight- Ayt Ndhir, does not obtain for other Berber lects. Some Tirifiyt dialects spoken near Nador, for instance, have weakened k's into š's in words containing sibilants (e.g. ašuz 'weevil'). Even

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within the Tamazight domain, the weakening of k's is not governed by the conditioning factors mentioned above. As seen in (11), Ayt Seghrouchen weakens k's to s's even when a sibilant is present. In addition, Ayt Izdeg (cf. Mercier 1937), a dialect in transition (i.e. not totally spirantizing), exhibits the following facts: 1) Some k's do not go to c's when followed by an u (e.g. afešku 'utensil', not *afešču; akuz 'weevil', not *açuz). 2) Some k's go to ç's before (or after) any other vowel (e.g. açabar 'caravan' < akabar ; açniw 'twin' < akniw; içfer 'turtle' < ikfer). 3) k's go to ç's in words containing consonants other than s, z, š, ž, (e.g. açtay 'remembrance' < aktay; imçra 'tenants' <imkra ; eçti 'to remember' < ekti). 4) Ayt Izdeg has alternative pronunciations for some morphemes (e.g. tafuçt and tafušt 'sun'; areçtu and areštu 'dough') as well as instances of just š < k (e.g. ašal 'earth' <akal; ašer 'to steal' < aker; šraḍ 'three' < kraḍ).

These are but a few facts which indicate that the weakening of k to ç and to š does not seem to be conditioned in Tamazight (Ayt Izdeg). This is particularly interesting in that, if there were conditioning, one would expect to find it to be operative in a dialect in transition such as Ayt Izdeg and not in one of the most advanced spirantizing dialects, Ayt Ndhir, on which Penchoen's observation was apparently based. It should be noted that, even the Ayt Ndhir dialect exhibits some instances of k -> š before u (e.g. adašu 'shoe' < adaku) and k -> š in words containing š for instance (e.g. ašriš 'associate' <ašrik). Finally, a solution to this problem would be incomplete unless the other velar, g, is included. For, if the weakening of k is conditioned, one would expect a similar conditioning to obtain for g as well, since g

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sometimes weakens to ǰ, other times to ž, and still other times to y. As for the other stops there is, so far as I know, no conditioning factor for their spirantization in Tamazight other than the one repeatedly mentioned above, namely, that they must be non-geminate.[11]

The seven different realizations of Proto-Berber *agsum 'meat' as given in (15), show the changes which have occurred. These changes are all attested in different dialects.

(15) *agsum (Proto-Berber)

a. agsum (no change)

b. aksum (devoicing)

c. aɕsum (devoicing and spirantization)

d. aššum (devoic., spir., palataliz.)

e. aǰsum (spirantization)

f. aysum (spirantiz., glide-creation)

g. ažsum (spirantiz., palatalization)

Not only do we find inconsistent historical reflexes in a single dialect, but, in addition, we find the same inconsistencies in borrowings from Arabic, where Arabic k is sometimes realized as ɕ and sometimes as š, again with apparently no statable conditioning factor(s):

(16)[12]

	Arabic	Tamazight	Gloss
a.	sellek	selleɕ	'to be lenient'
	esken	esɕen	'to live'
	enker	enɕer	'to deny'
	erkel	erɕel	'to kick'
	ekra	iɕra	'he rented'

(Arabic k → Tamazight ɕ)

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b.	ehkem	ehšem	'to rule'
	ekrem	ešrem	'to be dry'
	kemmel	šemmel	'to finish'
	lekta:b	lešta:b	'book'
	lehka:m	lehša:m	'judgment'

(Arabic k -> Tamazight š)

There are some borrowings from Arabic which, to further complicate the problem, show phonetic k:

(17)	Arabic	Berber	Gloss
	lektatbii	aktatbi	'secretary'
	elhakem	alhakem	'judge'

Given the above discussion, we can now summarize the historical changes which have occurred.

(18) a. p -> f

b. q -> ɢ

c. k -> ç -> š, y

ɡ -> ɟ -> ž, y

d. t -> θ

d -> ð

e. t -> ɖ

f. b -> ɓ

The complex and often confusing linguistic situation with respect to spirantization described above is caused, we believe, by intensive dialect mixture. While linguistic records which would support such an explanation are lacking, historical accounts of the social and political past of the various Tamazight tribes - also known under the ethnic

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epithet Senhaja - provide a great deal of evidence for it. A brief discussion of a few relevant facts drawn from the history of the Senhaja tribes of Central Morocco and their migrations is, therefore, worthwhile.

The confinement of each tribe to a relatively well defined area, (cf. see accompanying maps), is a recent development brought about by the colonial French administration from the 1920's onward. Prior to the 1920's, tribal warfare over grazing land and water sources, and revolt against Moroccan monarchs were so frequent that many areas in the Berber domain changed hands a number of times. A case in point is the area around the present village of Tounfite. From the XVIth century onward, it was controlled, in turn, by the Imejjaḍ, the Ayt Ndhir, the Ayt Youmour, the Ayt Mguild, the Ayt Izdeg, the Ayt Iḥand, and finally the Ayt Yaḥya (cf. La Chapelle 1931: 7-64). This change in control is also in line with the historically documented push by the nomadic Senhaja towards the rich plains of the North and Northwest (Bignon et al 1967:57). The push, which began in the late XIIIth century and which was in the form of a chain reaction (i.e. one tribe pushing another), finally stopped in the beginning of the XXth century (Bignon et al 1967: 260-62). During this in-fighting among the Tamazight tribes, there were formed, dissolved and re-formed federations and confederations of tribes, viz. Ayt Aṭṭa, Ayt Yafelmane, Ayt Oumalou, and Ayt Idrassen. Membership in these groupings saw many changes as individual tribes or even fractions of tribes went their separate ways to join other federations. In addition, voluntary or forcible relocation of tribes or fractions of tribes occurred. To take an example, most of this investiga-

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tor's original tribe, the Ayt Youmour (incorrectly spelled Ayt Imour), has been moved from more than one area, the last move being in 1824 from North of Meknes to the Haouz region, near Marrakech. However, a fraction of Ayt Youmour was allowed to remain and is now part of the Ayt Ndhir. The Ayt Wallal, now a fraction of the Ayt Ndhir, is originally a sub-group of the Ayt Aṭṭa, the Southernmost Tamazight tribe in Morocco. While as seen in (11) above Ayt Aṭṭa has spirantization of velars only, Ayt Wallal, as a sub-dialect of Ayt Ndhir, is fully spirantizing.

Another dialect which, arguably, acquired certain features because of dialect mixture, is the sub-dialect of Ayt Seghrouchen spoken in and around Immouzzer-Kendar. Geographically, this dialect is virtually cut off from the main body of Ayt Seghrouchen by the Ayt Youssi, Ayt Mguild, and Ayt Ayyache dialect areas. While it retained most of the features typical of Ayt Seghrouchen such as the u/a alternation in the preterit instead of i/a, this Immouzzer-Kendar dialect has clear spirantization of dentals.

A more interesting example of dialect mixture is provided by Ayt Lyas, a sub-dialect of Ayt Mguild spoken in the Zad valley (about 85km. south of Azrou), and in Tagounit, near Ain Leuh. In Ayt Lyas more k's and g's weaken into š and ž respectively, a feature typical of Ayt Seghrouchen. Yet, its other features are those found in Ayt Mguild. It is not impossible that the Ayt Lyas people belonged in the past to a tribe other than the Ayt Mguild tribe, or that they had contact with the Ayt Seghrouchen. More such examples can be cited. The important thing to note, however, is that the above-mentioned historical events,

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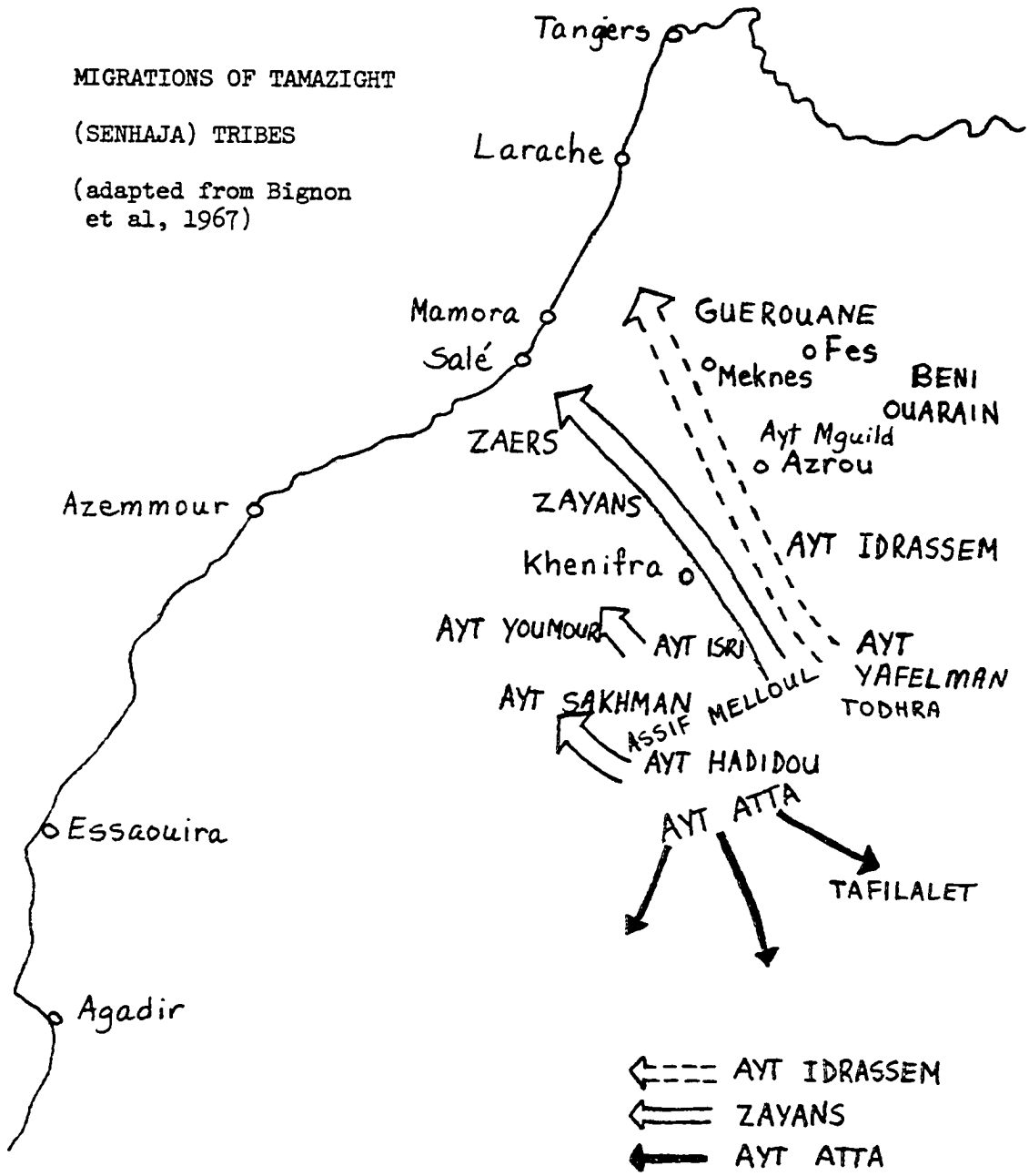
while they shed some light on the linguistic situation, are one of the major causes of its complexity.



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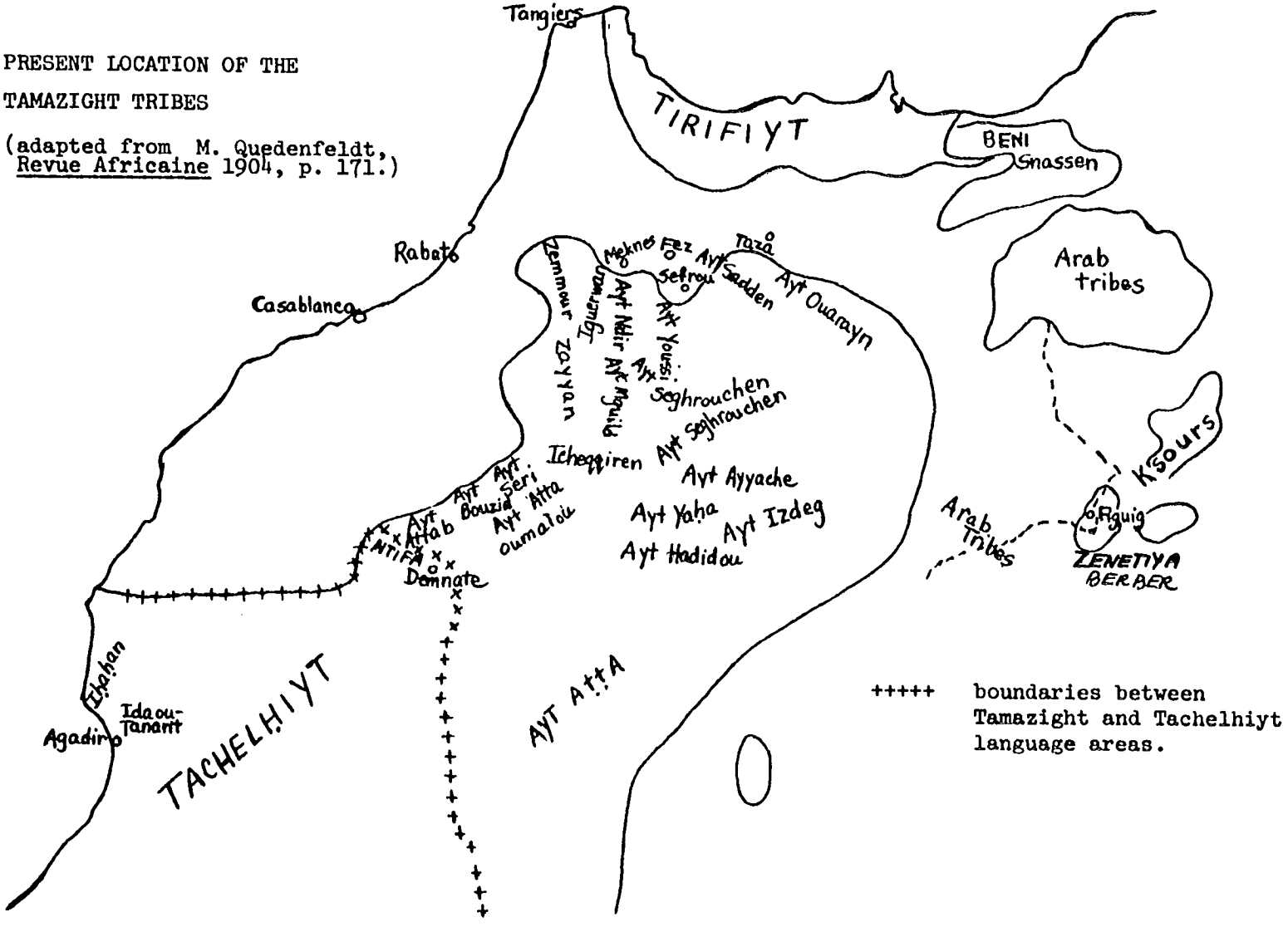
PRESENT LOCATION OF THE

TAMAZIGHT TRIBES

(adapted from M. Quedenfeldt, Revue Africaine 1904, p. 171.)



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4.3 Synchronic account. While the summary of the historical changes reveals the differences observed in Berber dialects and explains the alternations that now occur, the problem of how to account for the present situation is not necessarily resolved by the diachronic account.

The two major questions here which must be resolved concern the representation of the simple/geminate consonant alternations, and the stop/spirant alternations.

The examples given above (cf. (1), (2), (3) and (5)) show the alternations between simple and geminate consonants in the Zero and Intensive Forms of the verb, respectively. Clearly, if this is a predictable regularity it can best be accounted for by positing a single phonological representation of the stems and a rule (or rules) for the alternant phonetic forms. This possibility has been denied by previous writers like Bisson (1940) who stated: "Il faut connaître la forme d'habitude (i.e. Intensive Form) de chaque verbe, car il est impossible de la construire (emphasis mine, J.S.)." Despite this claim, such rules exist and can be stated so as to reveal the generalizations. For convenience, examples of the alternations are reproduced in (19) (cf. also (1), (2), (3) and (5) above).

(19) Tamazight (Ayt Ndhir)

	Z.F.	I.F.	Gloss
a.	efθel	fettel	'to roll couscous'
	erzem	rezzem	'to open'
b.	neg	neqqa	'to kill'
	ens	nessa	'to spend the night'

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c.	seg	ssag	'to buy'
	ger	ggar	'to call'
d.	ebdu	beddu	'to start'
	erzu	rezzu	'to look for'
e.	negger	ttneggar	'to shake off'
	ferreg	ttferrag	'to pour'

The data in (19) show that Berber verbs behave differently with respect to the process of gemination (or lengthening) which takes place in the formation of the I.F. One pattern which emerges (from looking at the data) is that the selection of the consonant to be geminated (or lengthened) is dependent on the number of consonants in the stem of the Z.F. which is assumed here as the underlying stem. However, this leaves us with the problem of explaining the different behavior of the verbs in (19). These verbs geminate (or lengthen) the first stem consonant instead of the second (cf. (19a, b, d).[13] This points to a difficulty of the Berber verb system, a difficulty which may be resolved by the establishment of verb classes and the utilization of a diacritic feature $[-G_2]$ (where G_2 = gemination of second consonant) on the verbs in (19c). This diacritic feature would prevent the gemination of the second consonant and permit gemination of C_1.

The data in (19) are handled by a set of rules which stipulates that a simple C of the Z.F. becomes CC in the I.F., as well as other internal changes, such as vowel alternation, that sometimes occur. This is assuming that the direction of the derivation is: Z.F. $\rightarrow$ I.F. (i.e. the Z.F. is the underlying form).

Conceivably, one might want to take another position. On the basis

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of the data given in (19) one could argue that it is just as reasonable to derive the Z.F. from the I.F. All that is taking place, according to this alternative analysis, is the loss of gemination (or length), and some vowel alternations or deletion. There are other considerations, however, which make the derivation Z.F. --> I.F. not only more motivated or more economical, but intuitively more satisfying.

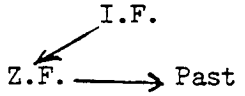
A number of arguments can be brought forth against this alternative analysis (and hence, for the Z.F. to I.F. analysis). This is in addition to the fact that the Z.F. is the citation form, as well as the least morphologically marked one. First, the predicting power of the I.F. to Z.F. analysis is not as great as that of the Z.F. to I.F. analysis. This is illustrated in (20) which shows that the Past and the Z.F. have the same consonant structure.

(20) Tamazight (Ayt Ndhir)

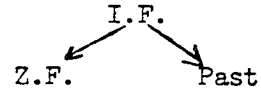
Z.F.	Past	I.F.	Gloss
efθel	-efθel-	fettel	'to roll couscous'
neg	-neg-	neqqa	'to kill'
ebḍu	-ebḍ-	bettu	'to divide'

Notice that if one starts from the I.F. one possibility of deriving the Past, given the generalization illustrated in (20), is via the Z.F., as indicated by the diagram in (21a).

(21) a.



b.



This is so because certain vowel alternations (viz. ∅ -> i/a, and a -> u) which take place in the Past can be predicted in a motivated way only if the Z.F. is taken as the base form. (For some examples

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of these alternations, see the Appendix). The other possibility of deriving the Z.F. and the Past from the Z.F. is represented in (21b). If such an approach is taken, it would lead one to miss the above stated generalization - that the Past and the Z.F. have the same consonant structure. Furthermore, it would mean that separate, yet identical, degemination rules should be written for the Z.F. and the Past. In addition, the I.F. to Z.F. approach would be at a loss to explain the alternations exemplified in (22).

(22) Tamazight (Ayt Ndhir)

Z.F.	I.F.[14]	Past	Gloss
ggall	ttǰalla	-ggull-	'to swear'
gganney	ttǰannay	-ggunney-	'to wait'
qqim	ttǧima	-qqim-	'to sit'
qqar	ttǧara	-qqur-	'to be dry'
ǰiwen	ttǧawan	-ǰiwen -	'to be full'
ec	ttetta	-ec-	'to eat'

If we start from the I.F., then we would have to say that what is taking place here is degemination of a stem consonant. Moreover, we would have to mark a great many verbs with lexical geminate with a [-Rule X] in the lexicon so as to insure that they do not undergo the degemination rule. Finally, the forms ǰiwen 'to be full' and ec 'to eat', would be very hard to derive from /tt-ǰawan/ and /tt-tta/, respectively, since affrication is also involved. Thus, we can see that the I.F. to Z.F. analysis makes the wrong predictions, leads to further complications, and proves to be very costly. No such complications result if the Z.F. to I.F. analysis is chosen.[15]

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Another alternative solution would be to regard each case of alternation between a simple consonant and a geminate consonant as suppletive (not unlike English go: went) in which case we would be forced to recognize both C and CC for each morpheme. This does not exclude the possibility that where there are no alternating forms, surface CC's derive from underlying geminates. This is illustrated in (23).

(23) Tamazight (Ayt Ndhir)

Z.F.		I.F.	Gloss
effeg	:	tteffeg	'to go out'
ekkes	:	ttekkes	'to take off'
eqqen	:	tteqqen	'to lock'

In these instances, to posit simple C's would strongly violate the naturalness condition. Such a solution would in actuality be a case of absolute neutralization where the morphemes would have to be marked by some diacritic to permit them to be operated on by a context-free C -- CC rule, since all single C's in these morphemes would have to become geminate. Moreover, the contrast between simple and geminate consonants is a very basic one in Berber, as seen in (24). (See also Chapters 2 and 3).

(24) Tamazight (Ayt Ndhir)

ass	'to tie'	as	'to fit'
aff	'to be full'	af	'to find'
suddem	'to drip'	s-udem	'to the face'
uzzal	'iron'	uzal	'hot period of the day'

16

The conclusion then is to represent the alternating C/CC forms with

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a simple C and to represent non-alternating CC as derived from CC.

The second problem to be solved concerns those dialects like my own, in which simple stops have become spirants (cf. examples given in (5) for instance). Since these spirants alternate with geminate stops it is necessary to decide in some principled way whether the underlying segment is a stop or a spirant. This problem does not apply to Berber languages such as Twareg (and to a certain extent Tachelhiyt) where spirantization has had little effect and where the only alternation of this kind is that between g and qq, which, as stated above, is handled by a different rule.

(25) $\begin{bmatrix}+\text{pharyngealized}\\+\text{back}\end{bmatrix} \rightarrow \begin{bmatrix}+\text{voiced}\\+\text{cont.}\end{bmatrix}$ /X: where X ≠ identical C

The alternation between f:ff presents no problem in this regard except for those phonologists who would totally violate the naturalness condition (cf. Postal 1968) and posit an underlying p for the reason that a language with an f and no p would be considered 'unnatural'. This solution would require an absolute neutralization rule such that in all cases p → f and seems so unmotivated that one cannot really consider it seriously (cf. Kiparsky 1968 and others).

There are also cases, though sporadic, in which b alternates with f as shown by the following examples:[17]

(26) Tirifiyt (cf. Renisio 1932)

Senhaja	sg. θasebbafθ	'flute'
	pl. θisebbabin	
Touzine	sg. θaž̌aʕbufθ	'cover, case'
	pl. θiž̌aʕbab	

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This presents no problem if we posit an underlying b which undergoes the regular voicing assimilation rule found generally in Berber and which in some cases is optional.

(27) Tamazight (Ayt Ndhir)

/ađ#θ+ddu/ -- [atteddu]

Fut. -she-go 'she will go'

Since in these dialects ƀ does not occur, clearly the underlying segment must be the stop b, which when non-geminate and devoiced becomes the only permitted voiceless labial f.

It may be noted that voicing assimilation is general throughout the Berber dialects, and that the spirantization of b to f occurs even in dialects where manner assimilation does not occur. In Tachelhiyt, for example, we find the sequence ft in ifta 'he left'. The rule should, therefore, not include voicing and spirantization assimilation as one process. Since there is no dialect in which a p occurs, a segment structure condition for labials would be included. This constraint would reapply whenever applicable (cf. Stanley 1967; Kisseberth 1970; Shibatani 1973). To include a segment structure condition in the grammar of Berber such as

(28)

$$\text{IF: } \begin{bmatrix} +\text{anterior} \\ -\text{coronal} \\ -\text{voiced} \end{bmatrix}$$

$$\text{THEN: } \Downarrow \; [+\text{continuant}]$$

would reveal the historical spirantization of *p to f which has special status in the history of Berber. This is so because the *p to f spirantization has the following characteristics:

(i) It is also found in non-Berber Afro-Asiatic languages.

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(ii) It has taken place in all Berber dialects.

(iii) It is true of the geminates as well as the single consonants. (In the I.F. of the verbs, for instance, ff occurs rather than pp which is not the case for other C/CC alternations.)

The representation of the labial consonants is thus straightforward; we posit underlying b and f.

Let us now return to the focal dialect (the Ayt Ndhir dialect of Tamazight) where, as shown in (12) and (13), all simple stops are spirantized. Moreover, in the verb paradigm, instead of an alternation of simple/identical geminate stops, as in Tachelhiyt (cf. (2) and (3)), the alternation exhibited by this dialect is one between non-strident spirants and geminate stops (cf. (5) above). Forms with lexical geminate stops like the ones given in (19e) and (23) do not alternate and are not affected by spirantization.

Since we have already concluded that the geminates in alternating forms should be derived from non-geminate consonants, the problem, then, is to decide whether the underlying segments should be spirants or stops. If stops are posited as the underlying segments, the grammar must include a spirantization rule that would be identical to the diachronic rule. That is, it may be concluded that the diachronic rule is still operative, i.e. has been incorporated into the synchronic grammar of the Ayt Ndhir dialect. With this rule in the grammar one would claim that certain Arabic loan words are phonemically represented in Berber unchanged with the Arabic stops occurring in the lexical forms as shown in (29):

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(29)

Arabic	Tamazight (Ayt Ndhir)	Gloss
letnayn	/letnayn/ --> [leθnayn]	'Monday'
lekta:b	/lekta:b/ --> [lesθa:b]	'book'
	(via the rule: [-cont.] -- [+cont.] / X: where X ≠ geminate)	

Since the rule would not apply to underlying geminates, Arabic loan words with such geminates would not be affected, as shown in (30):

(30)

Arabic	Tamazight (Ayt Ndhir)	
ettaman	/ettaman/ --> [ettaman]	'price'
elʕekk^{w}az	/aʕekk^{w}az/ --> [aʕekk^{w}a:z]	'cane'

This solution is observationally adequate and is also supported by concepts of markedness and implicational universals.

The proposed theory of markedness (Chomsky & Halle 1968) suggests that the non-strident spirants are more complex than the corresponding stops. Thus, θ is more complex than the corresponding stops. Thus, θ is more complex than s which is more complex than t. The segment s must occur phonemically because of such alternations as in (31):

(31) Tamazight (Ayt Ndhir)

Z.F.		I.F.	Gloss
efs<u>e</u>r	:	fe<u>ss</u>er	'to spread'
efs<u>e</u>y	:	fe<u>ss</u>ey	'to melt'
exs<u>e</u>y	:	xe<u>ss</u>ey	'to be extinguished'

The proposed solution then would be to have as systematic phonemes /t/ as well as /s/ which would be a more 'natural system' than one in which /s/ and /θ/ occur to the exclusions of /t/.

Further support for this solution may be drawn from the proposed implicational universals of Jakobson (1941, 1968). Jackobson states:

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> "The acquisition of fricatives presupposes the acquisition of stops in child language; and in the linguistic system of the world the former cannot exist unless the latter exists as well." (1968;51)

Thus, the Ayt Ndhir dialect, where spirantization is general, would be an obvious exception to this apparently well-established universal unless underlying stops are assumed for certain spirants. The fact that in non-alternating forms underlying geminates would occur phonemically would not help 'restore' a natural system since a language with geminates and no simple stops would also violate implicational universals.

There appears, then, to be strong evidence for positing underlying single stops and deriving the non-strident spirants (and geminates) from these segments. There is, however, counter-evidence which must be considered.

Since on the phonetic level no simple stops occur in this dialect, the solution posited above is a strong violation of the naturalness condition, and absolute neutralization results to some extent. That is, although some context is stated for the change from stop to spirant (i.e. the stop in question must be non-geminate), the stop will 'surface' as a spirant in all cases.

Furthermore, the spirants occur in the morphologically least marked category, the Z.F.; whereas phonetic stops, existing only as geminates, are found in the marked category, the I.F. One could argue that the spirants must be basic to the synchronic grammar, which is interesting in that such a solution would represent a further case of rule inver-

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sion (Vennemann 1972). That is, at one stage in the history of the language a rule existed whereby the spirants were derived from stops; at present the rule would derive the stops from spirants.

Native speakers of this dialect never hear simple stops, except in Arabic and French loan words. Nor do they have access to the history of the language, or to the comparative evidence which might lead to the positing of simple underlying stops. To argue for underlying simple stops because of markedness and implicational universals would be forcing the language to fit the theory rather than using language data to test theoretical hypotheses. It should be noted, in addition, that other solutions attempting to arrive at a unique grammar using markedness conventions to determine the underlying representation of segments have been questioned. (See, for example, Schane's discussion of the underlying representations for French vendre 'to sell', and for German und 'and', which have been rightly criticized by Hyman 1970).

The argument in favor of underlying non-strident spirants is not basically one of simplicity: although the spirantization rule would not be necessary, a rule which changes these spirants, when geminates, would have to be included; (See also Seq S C 7, in Chapter 2).

(32) SD: $[-\text{ strident}, +\text{ cont.}]_1$ (#) $[-\text{ strident}, +\text{ cont.}]_2$

SC: $[-\text{ cont.}]_1$ $[-\text{ cont.}]_2$

(where 1=2)

(For justification of transformational rules in phonology, see Chomsky & Halle 1968). The parenthesized word boundary is required since two sequential spirants agreeing in point of articulation become geminate stops across morpheme and word boundaries as illustrated in (33):

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(33) Tamazight (Ayt Ndhir)

a. /#θ+axam+θ##θ+axaθar+θ#/ -> [θaxamttaxaθarθ]

'tent' 'big' 'the big tent'

(θ##θ = tt)

b. /#ad+d##i+awed##muha#/ -> [add yawed muha][18]

fut. dir. arrive Muha 'Muha will arrive over here.'

Moreover, the examples given in (17) above, illustrating the fact that some Arabic loan words occur with phonetic non-geminate stops, indicates that the spirantization rule, if posited, is no longer an obligatory synchronic rule. If words with a phonetic spirant are represented with a stop, one would no longer have to treat these loan words as exceptions or marked as [+foreign] or [+late loans]. If these words are marked as [+foreign] and the other Arabic loans are not so marked the diacritic would merely be another way of stating [-rule X] and would falsely differentiate between the loans in the language. If, instead, the [+late loan] feature were used as the diacritic, this would also be a false representation since there is no justification for determining the relative dating of such loans, given that there are no written documents to support such a classification. Furthermore, speakers learning the language would certainly not have access to such knowledge. What they do have access to is the phonetic pronunciation of these forms. The solution with underlying spirants, then, permits us to account for the loan words which do not undergo spirantization in a simple way; whenever a word in the lexicon includes a simple stop in its matrix it must be a loan word from Arabic or French.

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The solution whereby non-strident geminates occur phonemically in non-alternating forms also suggests a possible direction for changes which may occur in the language. There is already a trend in some dialects to reduce the geminates. Thus, the stressed form of the third person pronoun netta 'he', which has a geminate stop, is more and more being pronounced as enta . This is also observed in the feminine nouns ending with geminate tt , for example, θahanutt vs. θahanut 'shop' and θaxbutt vs. θaxbut 'little hole'. One may hypothesize that the next step for Berber is to simplify geminates into simple stops. Thus, instead of a surface contrast between θ and tt, which in some cases would both be derived from /θ/. the new contrast between θ and t would simplify the alternation rules and, possibly in the future, lead to a rephonemicization whereby there would be a contrast between /θ/ and /t/.

One might speculate further that an inverse rule inversion will take place whereby the spirants are once more derived from the simple stops. Using Vennemann's notion of rule inversion (Vennemann 1972), we can describe the Berber situation as in (34), where t is taken to represent stops.

(34) Stage I : /t/ /tt/

(no rule)

Stage II : /t/ /tt/

(rule: /t/ --> [θ], if non-geminate)

Stage III : /θ/ /tt/

(rule: /θ/ --> [tt] in the I.F.)

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Stage IV : /θ/ /tt/

(no rule)

Between Stage III and the predicted Stage IV there is likely to be a stage where the rule is θ -> [t] in Intensives, etc., due to degemination. So the rule loss would actually affect this rule, rather than the original inverse rule.[19]

Similar conversions of contrast have been observed in numerous languages; they are the historical basis of 'consonant gradation' (as in Finnish) and have been called 'drag chains' (Martinet 1955; King 1970). We are therefore justified in expecting such a conversion of contrast in Berber, i.e. in predicting degemination and rephonemicization.

4.4 Conclusion. The standard theory of generative phonology (Chomsky and Halle 1968) does not provide the basis for a choice between the two solutions outlined above. The evaluation metric, even if we knew how to apply it in all cases (e.g. in choosing between rewrite and transformational rules), would not necessarily choose the solution with stops over that with spirants, although the second solution would be to some extent simpler, in that loan words would not have to be marked as exceptions to a spirantization rule. Dependence on the theory of markedness or putative implication universals should only be resorted to when the solution so based is more predictive and more in keeping with the language data. The more concrete solution (such as would be required by constraints similar to those proposed by Vennemann 1972 and 1973) seems to meet the criteria of descriptive ade-

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quacy better than does the solution positing underlying single stops. It seems clear that the theory must be strengthened (made more explanatory) by weakening it, i.e. by including constraints which force us to 'hug the phonetic ground' when a choice is to be made between 'non-unique' solutions.

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Footnotes to Chapter 4.

1. This chapter reproduces with a few changes my discussion of gemination and spirantization in Berber, which appeared as an article in Studies in African Linguistics, vol. 5, nber. 1, March 1974, pp. 1-26.

2. The following discussion focuses mainly on the Berber languages spoken in Morocco; that is Tamazight, Tachelhiyt and Tirifiyt. Some reference is made to Taqbayliyt.

3. The forms present in all the examples are given in a broad phonetic transcription, though it is broader than the one used by Penchoen (1973).

4. Though this paper deals also with underlying representation, I will not concern myself with the question of whether neg 'to kill', for instance, is underlyingly /neg/ or /eng/ or /ng/. Rather, I will give all the examples in their broad phonetic transcription.

5. This is assuming that Proto-Berber indeed had a *p.

6. Borrowings with p from Latin are rendered with f, even in Tachelhiyt, a non-spirantizing dialect, e.g. Latin pullus→ Tachelḥiyt afullus 'chicken'. Yet, just as in native Tachelhiyt morphemes, other stops remain unchanged in loan-words from Latin, e.g. Latin hortus→ Tachelhiyt urtu 'garden'. The Romans established their direct rule over Eastern North Africa shortly after the third Punic War. Parts of Morocco were colonized by the Romans from around 42 A.D. until the Arab invasions (end of the seventh century, A.D.).

7. There are few instances of gg, however, e.g. aggu 'buttermilk',

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taggatt 'goat' etc., in Ayt Ndhir.

8. Actually, the picture is not as clear-cut as the previous authors would like us to believe (cf. Laoust 1918, Loubignac 1924, Basset 1952). According to these authors, spirantization stops at the town of Demnate and does not go below the imaginary line Demnate-Mogador (now Es-Saouira, see the maps above). This is incorrect. In 1971, I personally observed spirantization of velars in the speech of a Berber from around Demnate. This was confirmed by field work undertaken in Morocco (1974). In fact, speakers from Talghemt, a small village about 30 kms. west of Demnate, spirantize all single stops, though the velars weaken only to c and j. Spirantization of at least the velars has been observed in the Tachelhiyt language area, specifically Ihahan, and Ida Outanante, (Hatt, personal communication, Saib, 1974, unpublished observation). The Tachelhiyt language area is claimed to lack spirantization. The above observations strongly indicate that spirantization is spreading southwards and that linguistic change in progress (Labov 1972) is involved.

9. The Twareg data, taken from Basset (1929), are reproduced here in their original transcription.

10. Another Tamazight dialect where more k's and g's weaken into š and ž is the Ayt Lyas, a subdialect of Ayt Mguild. The same obtains for theTirifiyt dialects spoken in and around the town of Nador.

11. One environment where t and d do not appear to spirantize in Ayt Ndhir, is after sibilants (cf. Chapter 2, Section 2.4.2). However, this takes place only in fast speech, and inter-morphically. In Tirifiyt,

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and Taqbaylıyt t and d do not weaken if they are preceded by n.

12. The Tamazight forms in (16a) would be representative of dialects in transition such as Ayt Atta and the dialects spoken near Demnate. (cf. fn. 8).

13. In Twareg, which is regarded by Berberists as the most conservative Berber dialect, the tensing of the first consonant is not the exception but the norm for verbs with two consonants.

14. The prefixation of a tt is another means of forming the I.F. It is selected by verbs with lexical geminates and verbs with underlying plain vowels.

15. Moreover, data from Taqbaylıyt - At Megellat (Dallet 1953) indicate that what is taking place is strengthening, not weakening, e.g. Z.F. efsu / I.F. feccu 'to untangle', (cf. Chapter 3, Section 3.6). The same trend is indicated by data from Tamazight - Bou Hsousen: Z.F. exsey / I.F. xeccey 'to be extinguished'. It is a well known fact that affrication, like gemination, is a strengthening process.

16. uzal is in the 'construct state'. The noun is in this state when it is the post-posed subject of a verb or the complement of a preposition. In the 'free state' the noun is azal (for more details, see Chapter 6). s-udem 'to the face' is from s + udem where s = 'to'.

17. In Tamazight (Ayt Ndhir) some Arabic loan words with b are rendered with f in the speech of country people: Arabic elbettix 'melon' Tamazight afettix; Arabic lebsel 'onion' Tamazight žefsež, etc. In this speech, l ---> ž, or something very close to ž.

18. Dir = directional particle. It is used with verbs of motion to

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indicate the direction of the movement. It can be translated as 'over here' or 'towards here'.

19. The rule in Stage III is what Vennemann would call a 'partial inverse rule'. Indeed, it is the 'partial inverse rule' of the rule given in Stage II. This mechanism of grammar change, for which Vennemann coined the term 'rule inversion', has been shown convincingly to obtain in Chadic in an article by Schuh (1972).

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Chapter 5

SCHWA INSERTION IN BERBER: UN PROBLEME DE CHOIX[1]

5.0 Introduction. One of the most interesting problems in Berber phonology concerns the status and behavior of the schwa vowel. This problem was discussed briefly above in relation to geminates. In this chapter, the problem will be examined in greater detail. In keeping with the main aim of this study, the main concern will be to explicate the facts of the language. But this is dependent on one's particular solution, as shall be seen in the discussion which follows.

5.1 The data. As seen in (1), Northern Berber languages have a simple underlying vowel system.

(1) i, a, u

However, on the surface, the following vowels occur: i, e, a, ae, o, u and schwa.[2] In Chapter 2 (Section 2.2), it was shown that e, ae, and o are positional variants of i, a, and u, respectively. Rules determining their occurrence were also provided. The vowel schwa, which is not a positional variant of i, a, or u, occurs with great frequency. In fact, an important class of verbs, examples of which are given in (2), have only schwas.

(2)	a.	[exdem]	'to work'	b. [ens]	'to wear'
		[ezdeg]	'to dwell'	[ḍer]	'to go down'
		[beddel]	'to change'	[ekk]	'to pass'

In dealing with these stems, generations of Berberists (Laoust 1918, Basset 1929 and 1952, Abdel Massih 1971, Penchoen 1973) simply adopted

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the Semitists' tradition of regarding the consonants as the 'truss', or the supporting structure of the stems. As Basset put it (1952:11) 'un groupement exclusif de consonnes constitue le radical et, partant, l'armature sémantique du mot.' According to this view, then, it is the consonants alone which carry the semantic load for verb stems which appear on the surface with schwas. Thus, the forms in (2) can consist simply of consonants, as seen in (3):

(3) /xəm/ 'to work' /ns/ 'to wear'
/zəg/ 'to dwell' /ḍr/ 'to descend'
/bddl/ 'to change' /kk/ 'to pass'

As for the schwas, they are said to be epenthetic in that their only function is to break up consonant clusters exhibited by forms such as those in (3), so as to facilitate pronunciation. In a section on syllable structure in the Ntifa dialect, Laoust (1918:34-44) outlines an approach for predicting the occurrence of schwas. The insertion of schwas is dependent on consonant clustering, which is in turn based on the nature of the consonants involved. Thus, in /C_1C_2/ verb stems, for instance, the following clusterings are observed: if C_1 is [-son] and C_2 is [+son], clustering is prohibited in Ntifa and a schwa is inserted between the two consonants; e.g. /ḍr/ 'to go down' is realized as [ḍer], not *[eḍr]. If on the other hand, C_1 is [+son] and C_2 is not, clustering is allowed and the schwa occurs before the two consonants, e.g. /ls/ 'to wear' is pronounced [els], not *[les]. (Note that Ntifa l corresponds to Ayt Ndhir n in the form for 'to wear' and that dentals are not spirantized). Abdel Massiḥ's approach to the schwa problem (1971:25-26) is similar to Laoust's in that it relies heavily on the nature of

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consonants. (These approaches are evaluated along with the Abstract Analysis A in the next section).

Returning now to the question of the difference between the schwa and the other vowels, we note that schwa differs from them in that its occurrence is both restricted and predictible. As shown in (4), the other vowels occur in both closed and open syllables, while schwa occurs only in closed syllables in Northern Berber.

(4) Closed syllable

a.	[aš]	'to you'	b.	[eš]	'to give'
	[irs]	'tongue'		[ers]	'to land'
	[umlil]	'white'		[emlul]	'to be white'

Open syllable

c.	[ša]	'something'	d.	*[še]
	[ini]	'to say'		*[eni], *[ine], *[ene]
	[eddu]	'to go'		*[edde]

It should be noted, however, that this constraint does not apply to Twareg, which, according to Foucauld (1920) and Prasse (1960) permits instances of CeCV, e.g. awlelu 'bracelet'; tehunt 'big rock'; egen 'to squat'. The few instances of schwa occurring in open syllables in Northern Berber languages (e.g. xemmem+en --> [xemmemen] 'they reflected on') are not really counter-examples to the proposed restriction. I have a principled explanation for them; the second schwa of the stem, which should have been deleted since it occurs in an open syllable, is maintained in careful speech to keep the m's apart. In Ayt Ndhir, deletion of this schwa takes place in fast speech, and the result is the absorption of the third m by the geminate, yielding [xemmen] with a

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strong geminate m.

As for the predictibility of schwas, it can be shown that a schwa occurs either before a word final consonant or before two consonants (or a geminate, cf. Chapter 3). This is stated in (5):

(5) / ___C#

/____CC

Given the above facts, it seems logical then, that an approach to the problem of schwa was adopted, modeled on the one used for verb stems in Semitic languages.

5.2 The problem. The question which confronts us is whether this traditional approach is the correct one. As we shall see below, it is indeed possible to include in the lexicon morphemes which are composed only of consonants. P-rules can be written which will insert schwas such that the correct phonetic forms will be derived.

There is almost no end to the number of solutions one can arrive at to achieve observational adequacy. The ability to correctly derive the phonetic forms is necessary but not sufficient.

Zwicky (1975:129-185) discusses this problem. He states: "It happens again and again in doing linguistic analysis that some perfectly simple hypothesis about a specific language resists solution and leads to a series of alternative analyses, attempts at justifying or rejecting one or another of these hypotheses, and intense examinations of fundamental assumptions about both the language in question and the linguistic theory in which the analysis is to be framed..." (p.129). He continues: "In phonological analysis, the tough nuts turn up when we ask what the underlying form for some morphemes should be,..."

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This is the problem regarding schwas in Berber. Zwicky lists and discusses the various principles which have been posited for selecting basic forms when alternative analyses present themselves. He also shows that one linguist's principle may contradict another's. Unfortunately, phonological theory has not developed to the point where there is agreement on basic principles. A look at another 'tough nut', to quote Zwicky, this one being the schwa in Berber, may help contribute to the on-going discussion on what constitutes a good solution, or the best solution when a number of analyses present themselves. I shall therefore consider three possible solutions to see the advantages and disadvantages of each.

Two of the solutions discussed below I shall call 'abstract solutions' in that they depend on positing underlying forms which never surface phonetically, i.e. forms without schwas. The third analysis, I will call the 'concrete solution' since the lexical representation is identical with at least one phonetic realization.

5.3 Abstract Analysis A. This solution to the schwa problem would posit underlying forms such as those given in (3) for verb stems which appear on the surface with schwas only, exemplified in (2). In order to derive the forms in (2) from those in (3), the rule as given in (6) is required.

(6) $\emptyset \rightarrow e \;/\; \{\#, C\} \_\_\_\_ C\begin{Bmatrix} \# \\ C \end{Bmatrix}\begin{matrix}(i)\\(ii)\end{matrix}$

(Condition: directionality of application is right-to-left[3], counting segments.)

The expansion of the rule and a sample derivation (taking as an example the verb /xəm/ 'to work') are given in (7).

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(7) a. # ___C# NA (i.e. not applicable)

b. C ___C# #xəem#

c. # ___CC #exəem#

d. C ___CC NA

Note that the extrinsic ordering, and the directionality of application of the conflated rules in (6) are crucial in order to derive the correct forms, as shown in (8).

(8) a. Wrong ordering, correct directionality:

/#x ə m#/

xəəm (by 6ii)

xəem (by 6i)

*[xəem]

b. Right ordering, wrong directionality:

/#x ə m#/

exəm (by 6ii, 6i NA)

exəm (by 6ii)

exəem (by 6i)

*[exəem]

In (8a) an incorrect output is obtained because the subparts of the rule are applied in the wrong order but with the correct directionality. In (8b) the subparts of the rules are applied in the right order but with the wrong directionality. Again the output is incorrect.

We see that this solution not only posits abstract, non-occurring (and unpronounceable) forms such as those in (3), but a rule which is complicated by its need for extrinsic ordering and directional application. There are more serious complications to which we turn directly.

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One complication is revealed by the Z.F. derivation of bi-radical verb stems, i.e. C_1C_2 stems. As seen in (2b) above, some of these stems (e.g. [der] 'to go down') have a schwa occurring between the two root consonants, others (e.g. [ens] 'to wear' and [ekk] 'to pass') have a schwa occurring before them. In addition, some C_1C_2 stems not exemplified in (2b) have alternative pronunciations, viz. [eng] or [neg] 'to kill', with the schwa occurring between or before the two root consonants. It appears that, with respect to the schwa insertion rule in the Z.F., C_1C_1 verb stems can be subdivided into three types. The question, then, is whether rule (6) can yield the correct output for all these types.

As it is stated, rule (6) would yield the correct output only for verbs of the first type (i.e. [der]) and for one pronunciation of the third type (i.e. [neg] but not [eng]). Rule (6), then, does not yield the correct surface forms for the Z.F. of verbs such as [ens] and [ekk]. Verbs with the same consonant structure as [ekk], i.e. with geminate, are handled by the principled constraint, proposed in Chapter 3, whereby geminates cannot be broken up by an epenthetic rule, which rule (6) is. Given this constraint, only [ekk] can be yielded, not *[kek]. Thus, rule (6) is safe with respect to verbs such as [ekk]. This is not so for verbs like [ens]. In order to get the correct output for the Z.F. of these verbs, a number of alternatives suggest themselves.

One alternative would be to let (6i) apply yielding *[nes], and have a schwa movement (or hopping) rule apply after (6i) to move the vowel to the position before the two root consonants. All bi-consonantal verb stems which do not require that a schwa occur word initially

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would be marked as not undergoing this later rule. Alternatively, verbs such as [ens] can be marked as not undergoing (6i), with the exception feature [-Rule 6i]. However, a special provision would have to be made in order to derive them via (6ii).

Note that whatever alternative is chosen it will still be ad hoc. This is so because the only motivation for these devices - i.e. addition of a movement rule, or the use of exception features - is to 'fix up' the output of rule (6), or to prevent it from applying to a number of forms.

A third alternative would consist of making - as does Laoust (1918) - the schwa insertion rule(s) sensitive to the nature of the consonants. Laoust's approach, outlined in Section 5.1 above, yields the correct output for verbs such as [ens] and [der]. However, it fails to explain why /ng/ 'to kill' has two equally acceptable pronunciations. According to Laoust, only [eng] would be possible, since in a C_1C_2 sequence, where C_1 is [+son] and C_2 is [-son], schwa cannot be inserted between the two consonants. Similarly, this approach would not be able to explain the existence of two pronunciations, hence two surface forms, for triconsonantal verb stems such as /gns/ 'to drape, to wear', viz. [gnes] and [gens].

A second complication is revealed by the occurrence of the schwas in different positions in the Past and Intensive conjugations of the verbs. The positions in which the schwas occur are dependent on the personal affixes added. The personal affixes in Ayt Ndhir, given in Chapter 2 (Section 2.4.2), are reproduced in (9). They are listed here without boundaries so as not to prejudice the issues discussed

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below.

(9)

Singular	Plural
1. ____x	1. n____
2. θ___ḋ	2m.θ____m
3m.i____	2f.θ____mθ
3f.θ____	3m._____n
	3f._____nθ

(Where m = masculine and f. = feminine).

Note two things with respect to the personal affixes. First, with the exception of the affix for the 3rd person masculine singular, they are all consonants. Second, the prefix /θ-/ in 3f. singular and the element /θ/ in the suffixes for the second and third person plural is a feminine marker. It is not unlike the θ in the feminine formation, viz. amazig 'Berber man', θ-amazig-θ 'Berber woman' (cf. also Chapter 2, Section 2.4.2).

For ease of reference, the full conjugation of the verb /xḋm/ 'to work' in the Past is given in (10). The forms are phonetic.

(10)

Singular	Plural
1. xeḋmex	1. nexḋem
2. θexḋemḋ	2m. eθxeḋmem
3m. ixḋem	2f. eθxeḋmemθ
3f. θexḋem	3m. xeḋmen
	3f. xeḋmenθ

Rule (6) can derive the correct surface forms for all the forms in (10) save three. These are: the forms for the second person singular, the second person feminine plural and the third person feminine plural.

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The only way rule (6) will work for these three forms is if we posit different boundary units (i.e. + or #) depending on the particular suffix added. The effect of having # before a suffix is to prevent rule (6) from inserting a schwa before that suffix. The need for the different boundary units for the suffixes is demonstrated in the derivations given in (11) - (17).

As seen in (11), the + boundary has no effect on the application of rule (6):

(11) /#x ɗm+ x#/ 'I worked'
x ɗm e x (by 6i)
xeɗm e x (by 6ii)
[xeɗmex]

While the correct form for the first person singular is obtained in (11), an incorrect output is observed in most dialects for the second person singular, as seen in (12).

(12) /#ɵ+x ɗm+ ɗ#/ 'you (sing) worked' (wrong boundary)
ɵ x ɗm eɗ (by 6i)
ɵ xeɗm eɗ (by 6ii)
eɵ xeɗm eɗ (by 6ii)
*[eɵxeɗmeɗ]

In order to obtain the correct output, a stronger boundary (i.e. #) is required before the suffix /ɗ/, and an even stronger boundary, ##, after it. (For a justification of having ##, see fn. 4).

(13) /#ɵ+xɗ m#ɗ##/ 'you (sing.) worked' (correct boundaries)
ɵ+xɗem#ɗ## (by 6i)
ɵ xɗem#ɗ## (by 6ii)

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[θexdemd]

Other suffixes which, likewise, require an internal word boundary and the stronger boundary ## are the second and third person feminine plural. Their derivation is given in (14) - (17).

(14) /# θ+x dm+ m#θ##/[4] 'you (fem. plur.) worked'

θ+x dm+em#θ## (by 6i)

θ+xedm e #θ## (by 6ii)

eθ+xedm e #θ## (by 6ii)

[eθxedmemθ]

(15) /#x dm+ n#θ##/ 'They (fem.) worked'

x dm+en#θ## (by 6i)

xedm en#θ## (by 6ii)

xedm en#θ## (by 6ii)

[xedmenθ]

Again, if a + boundary is posited instead of an internal word boundary, the wrong output is obtained as seen in (16) and (17):

(16) /#θ +xd m+m+ θ#/ 'you (fem. plur.) worked'

θ +xd m+m+eθ (by 6i)

θ +xdem+m+eθ (by 6ii)

θe+xdem+m+eθ (by 6ii)

*[θexdemmeθ]

(17) /#xd m+n+ θ#/ 'They (fem.) worked'

xd m+n eθ (by 6i)

xdem+n eθ (by 6ii)

exdem+n eθ (by 6ii)

*[exdemneθ]

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There seems to be no principled reason for distinguishing these suffixes, which different boundaries would imply. Moreover, the use of different boundary units is not required for the prefixes, as seen in (12), (13), (14) and (16). Thus, this solution is immediately suspect. But, note that, if we do posit different boundaries for the suffixes, it <u>will</u> work. Here is a case where workability is clearly not a sufficient condition for 'correctness'.

Since the problematic suffixes involved are [ḍ] and [θ], one way of avoiding the problem posed by the requirement of two boundary units is by stating the environment of rule (6) so as to exclude these segments. This can be achieved by using the phonological features [+ant, +cor, +cont, -strid] which adequately specify [ḍ] and [θ]. The last part of the environment for the rule would then be stated as in (18).

(18) / _____ $+^{C}_{F's}$ $\left\{ \begin{matrix} \# \\ +\left[\begin{matrix} C \\ F's \end{matrix} \right] \end{matrix} \right\}$ $\begin{matrix} i \\ ii \end{matrix}$

(Where F stands for the four features mentioned above).

Note that, even here, a further restriction using the + boundary is required since Berber has verb stems ending in /ḍ/ and /θ/, viz. [essengeḍ] 'to pulverize and [ewweθ] 'to hit'.

To sum up, the Abstract Analysis A, if it can be made to account for the data, does so only through the use of ad hoc devices. These devices consist of the addition of 'corrective' rules, the use of exception features, and the postulation of different boundary units. While the use of the last device has been shown to be motivated in a number of languages (e.g. /lɔng+er/ versus /sɪ̈ng#er/ in English), its only motivation here is to make the rule work. Finally, if workabili-

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ty is the only (or principal) measure for the correctness of an analysis, an equally abstract alternative, this time without the extrinsic ordering constraint or directionality, can be made to account for the data. That such an analysis is possible is particularly interesting as this suggests that, at least in some cases, the No-Extrinsic Ordering Hypothesis, currently advocated by some phonologists (Vennemann 1972, Hooper 1973, Koutsoudas et al 1974), can be a viable alternative.

5.4. Abstract Analysis B. In this analysis, the subparts of the rule of schwa insertion given in (6) above can apply randomly (i.e. can be unordered) provided there is, in addition, a rule of schwa deletion such as stated in (19):

(19) e --- Ø / ___CV

As seen in (20), the same underlying form posited above, uniquely yields the correct output by application of rules (6) and (19) in any order and in any direction:

(20) a. /#ϴ+x ɗm+ m#ϴ##/ 'You (fem plur.) worked'

ϴ+x ɗm+em#ϴ## (by 6i)

eϴ+x ɗm+em#ϴ## (by 6ii)

eϴ+xeɗm+em#ϴ## (by 6ii)

[eϴxeɗmemϴ]

(In (20a.), the rules are applied first to the suffix, then to the prefix, then to the stem.)

(20) b. /#ϴ +x ɗ m+ m#ϴ##/

ϴ +x ɗem+ m#ϴ## (by 6ii)

ϴe+x ɗem+ m#ϴ## (by 6ii)

ϴe+x ɗem+em#ϴ## (by 6i)

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θe+x ə m+em#θ##	(by 19)
θe+xəm+em#θ##	(by 6ii)
θ +xəm+em#θ##	(by 19)
eθ +xəm+em#θ##	(by 6ii)
[eθxəmemθ]	

(In (20b.), the rules are applied to the stem, then to the prefix, then to the suffix).

It should be pointed out that the rule stated in (19), which might be mistakenly considered a 'corrective rule', is actually not an ad hoc one. It simply takes advantage of the general constraint on the restricted occurrence of schwas exemplified in (4). It guarantees that no schwas will occur in an open syllable, a phenomenon typical of Northern Berber.

But this alternative analysis, though it does not require extrinsic rule ordering, still suffers from the other pitfalls of the abstract analysis A, namely the abstractness of the underlying forms and the ad hoc use of boundaries. This brings us to another alternative analysis, this time a 'totally concrete' one.

5.5. The Concrete Analysis. The abstract analyses A and B presented above, can be said to be motivated by a principle which plays an important role in the S.P.E. type of phonology (Chomsky and Halle 1968): the principle of eliminating, as much as is feasible, redundancy from the lexicon. That is, things which can be predictable by rule should not be included in the underlying forms. However, we have seen above (Section 5.3) the difficulties which can result from the strict application of this principle to the problem of schwa in Berber. Now, what

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about the concrete analysis?

This analysis is, likewise, motivated by general principles. One of these principles is concerned with the basis for selecting the forms posited in the underlying representation. The selection of forms such as those in (2) above as underlying forms, that is the phonetic shape of the verb in the imperative singular, is motivated by a general (if not universal) tendency: the least morphologically marked form, usually a bare root or stem, is chosen as the basic form in a great many languages (cf. Greenberg 1966, Vennemann 1972). As was pointed out above (Chapter 2, 3, and 4), the form of the verbs in the imperative singular (also referred to as 'Zero Form') exhibits no morphological material. In fact, it corresponds to the bare root. The second principle relates to the question of how abstract the underlying representation for these Berber verbs should be. Specifically, the principle which derives from strict adherence to the 'Strong Naturalness Condition', consists of minimizing the difference between the underlying and the phonetic representations (cf. Kiparsky 1968, Vennemann 1971 and subsequent works, Hooper 1973). The minimization goal takes precedence over that of reducing redundancy in the lexicon. The third principle on which the concrete analysis is based is the 'No-Extrinsic Rule Ordering' principle advocated by 'concretist' phonologists like Vennemann and Hooper (see references above), and Koutsoudas et al (1974).

According to the concrete approach, then, underlying forms for verbs such as those given in (2) above, will be as in (21) - that is identical to their phonetic shape.

(21) a. /exdem/ 'to work' [exdem]

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	/ezḍeg/	'to dwell'	[ezḍeg]
	/beddel/	'to change'	[beddel]
b.	/ens/	'to wear'	[ens]
	/ḍer/	'to go down'	[ḍer]
	/ekk/	'to pass'	[ekk]

As seen in (22), affixes will appear with vocalic support. As for the reason why the suffix for the 2nd person singular (/-ḍ/) does not appear with a schwa, see footnote 4.

(22) Personal Subject Affixes

Singular		Plural	
1.	_____+ex	1.	ne+_____
2.	θe+_____+ḍ	2m.	θe+_____+em
3m.	i+_____	2f.	θe+_____+em+θ
3f.	θe+_____	3m.	_____+en
		3f.	_____+en+θ

(Compare these affixes to the ones given in (9) above).

It should be pointed out that by positing the forms in (22), I am not replacing boundaries with schwas so as to avoid problems. The positing of affixes with schwas is in accordance with the second general principle motivating the concrete analysis. Moreover, a look at the Berber data presented here, as well as at other data, will indicate that, at the surface level, affixes - with the exception of /-ḍ/ (cf. fn. 4 however) - appear with vocalic support. For ease of reference, the full preterit conjugation of the verb 'to work' is given in (23).

(23)	Underlying	Phonetic
	/exḍem/	[exḍem]

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sg.	1.	/ exədem+ex/	1.	[xedmex]
	2.	/θe+exədem+ə/	2.	[θexədemə]
	3m.	/ i+exədem/	3m.	[ixədem]
	3f.	/θe+exədem/	3f.	[θexədem]
pl.	1.	/ne+exədem/	1.	[nexədem]
	2m.	/θe+exədem+em/	2m.	[eθxedmem]
	2f.	/θe+exədem+em+θ/	2f.	[eθxedmemθ]
	3m.	/ exədem+en/	3m.	[xedmen]
	3f.	/ exədem+en+θ/	3f.	[xedmenθ]

In (23), we see that most forms require no more than the addition of the affixes and the low level phonetic rule of vowel deletion (or absorption) given in (24):[5]

(24) e ---> ∅ / V

Only a few forms require the application of the major rules given in (25) and (26):

(25) e ---> ∅ / --- CV

(26) ∅ ---> e / --- CCV[6]

(Again, geminates = C_xC_x, i.e. a sequence, cf. Chapter 3).

Given the underlying forms in (21) and rules (24), (25) and (26), the derivation of the phonetic forms for the first person singular and the second person feminine plural would be that given in (27):

(27) a. 1st Person Singular

/#exədem+ex#/

exə m ex (by 25)

exedm ex (by 26)

xedm ex (by 25)

b. 2nd Person Fem. Plural

/#θe+exədem+em+θ#/

θe+exə m em θ (by 25)

θ exə m em θ (by 24)

θ exedm em θ (by 26)

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[xɛdmɛx] θ xɛdmɛmθ (by 25)

ɛθ xɛdmɛmɛmθ (by 26)

[ɛθxɛdmɛmɛmθ]

Note the following: first, unlike analyses A and B, the concrete analysis does not require the use of different boundary units for some suffixes, a practice which we have indicated to be questionable. Second, unlike Abstract Analysis A, it does not require extrinsic rule ordering. Third, the rules it requires are both natural and needed in the grammar anyway. Fourth, unlike the abstract analysis, it does not run into any difficulty with respect to the zero form derivation of C_1C_2 stems (cf. discussion in Section 5.2). These stems are simply listed in the lexicon with their schwa vowel in its appropriate place (cf. (26) and (21b)). The application of rules (24), (25) and (26), whenever their SD is met, would yield the correct phonetic output. According to the concrete approach, then, the principal process involved in the derivation of the phonetic forms for verbs with schwas is schwa deletion, instead of schwa insertion. This does not mean, however, that insertion plays no role in the derivation. As seen above, the insertion rule (26) is required within the concrete analysis. Note, however, that unlike rule (6), this rule is very simple and does not require the use of any of the ad hoc devices discussed in Section 5.3 above. Rule (26) merely takes advantage of the sequential constraint whereby there is to be no sequences of three consonants in a row in Berber (cf. Chapter 2, Section 2.4.2).

Despite the advantages of the concrete analysis, some objections can be raised against it by the proponents of abstract analyses. One objection would be: Since the phonetic occurrences of schwa can be predicted

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somehow, the positing of schwas as underlying segments results in the inclusion of redundant information in the lexical representation of formatives. This also implies that Berber speakers, in learning the grammar of their language, do not make all the possible generalizations which the data permit. This runs contrary to the basic tenets of the standard phonological theory (i.e. SPE). In the SPE framework, whatever can be predicted should not be included in the underlying representation.

Another objection (or reservation) which can be made against the concrete analysis outlined above, would concern its adherence to the 'NO-Extrinsic Ordering' principle: The current debate over whether extrinsic ordering of rules is needed or not is far from settled (cf. Campbell 1973). Until this debate is settled, it is not clear how one is to evaluate the consequences of constraining (or not constraining) the ordering of rules in the grammar.

The theoretical implications of the three analyses of schwa in Berber presented above are summarized in the chart given in (28). (The concrete analysis is referred to as simply 'Analysis C'.)

(28)

	Analysis A	Analysis B	Analysis C
Lexical Redundancy	NO	NO	YES
Rule Redundancy	NO	YES	YES
Rule Ordering	Extrinsic	Intrinsic*	Intrinsic
Directionality	R to L**	NO	NO

(Where: *Intrinsic in analysis B = random sequential ordering

**R to L: right to left (extrinsic))

Given the above, one would think that the only problem we are left with at this point is that of deciding between the three analyses. This

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is not so, however. In addition to these three analyses, there exist virtually a myriad of 'compromise' or 'intermediate' analyses which lie logically between the two extreme analyses (i.e. Abstract Analysis A and the concrete analysis). This is in itself a problem for the theory since one of its basic stated goals is to seek and select, among all these possible solutions, the unique solution. Once again, Chomsky and Halle's 'Evaluation Measure' is put to task. And, as will become clear below, it does not provide us with an effective way of selecting the unique solution.

5.6 The Intermediate Analyses. The various factors which can be permitted to yield intermediate analyses are listed in (29):

(29) a. limiting underlying schwas in one way or another, e.g. (i) /xəem/ instead of /xəm/; (ii) have schwas only in grammatical morphemes; (iii) have schwas in the stem but not in grammatical morphemes, etc.

b. using versus not using boundaries of different kinds for grammatical morphemes (i.e. affixes here).

c. permitting extrinsic rule ordering versus permitting only intrinsic rule ordering.

d. using directional rules versus non-use of such rules.

An example of intermediate analysis (or strategy) is given in (30):

(30) a. underlying form of the stem: /xəem/ 'to work'

b. underlying form of affixes: with schwas, except /ə/, etc.

c. rules (30') (i) e --> Ø / ____ C V̄

(ii) Ø --> e / ____ C C V

d. DERIVATION OF 1ST PERSON SINGULAR:

/#xəem+ x/ --> xəmcx --> [xəemex] (by 30'i and 30'ii).

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Another example of an intermediate strategy is the one given in (31):[7]

(31) a. underlying form: /xeḍem/ 'to work'

b. affixes with schwas, except /ḍ/.

c. rule: (31') e --> Ø/ ____ C V; directionality: right-to-left

d. DERIVATION OF 1ST PERSON SINGULAR:

/#xeḍem+ex#/ --> [xeḍmex]

5.7 Conclusion: In conclusion, we have seen that the problem of schwa in Berber can be accounted for by a number of different analyses. Thus, in addition to the problem of accounting for schwa in Berber, we also have what I will characterize in French as 'un problème de choix'. This is not surprising and it clearly shows that merely accounting for the data, while necessary, is not a sufficient criterion for deciding between the alternative solutions. Clearly one seeks some principled basis which must be determined by the theory. Both the abstract and concrete analyses were motived by general principles (cf. Section 5.5 above). But we are still faced with the question as to which of these principles are to be accepted as theoretical constraints.

Based on internal formal considerations, the abstract analysis is 'costly' because of the complexity of its rule and its requirement of additional devices which, we have seen, are ad hoc (cf. Section 5.2). Similarly, the concrete analysis can be considered 'costly' since it includes redundant information in the lexicon. The proposed evaluation metric does not permit us to fully compare complexity of rules in relation to complexity in the lexicon. Further work on Berber as well as other languages, and further comparison of such analyses seem to be

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required before we can agree on the theoretical constraints. In addition to formal comparisons, it appears that we must seek external verifications of the theory which will depend on such 'performance' factors as perceptual strategies, storage capacity of the brain, mental generalizing abilities, etc. Until we find such evidence, the linguist is left with choosing the solution which appears to be the most intuitively satisfying. I find the concrete solution more satisfactory in this case because of the ad hoc nature of the abstract analysis. In addition, the only 'serious' argument against the concrete analysis--that it allows more redundancy in the Lexicon--is not too serious an argument. It is more likely that native speakers will allow this redundancy rather than internalize a complex rule such as rule (6) and make use of the devices required by the abstract analysis. But, though there is intuitively some basis for selecting the concrete analysis, the fact remains that the present theory is still deficient in this regard. Hopefully, descriptive work such as is outlined here will provide some of the necessary input required for revising and further constraining phonological theory.

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Footnotes to Chapter 5.

1. This chapter is an expanded version of my article in Afroasiatic Linguistics vol. 3/4, 1976.

2. Other Berberists (Abdel Massih 1971, Harries 1974) list more vowels for Tamazight viz. [ɨ,ʊ, ʌ]. The question of whether schwa arises historically through vowel reduction as is the case in many languages (e.g. Moroccan Arabic [ekteb] Classical Arabic /kataba/ 'he wrote'), or is an underlying vowel in its own right, is a very interesting one. However, in absence of historical records this question cannot be addressed in any meaningful way in Berber.

3. For a detailed discussion of 'Directionality' and the 'Directional Theory', see Johnson (1970) and Howard (1973) and the references cited there.

4. The strong boundary ## in (13) - (15) is needed to insure that rule (6) will not insert a schwa before the simple suffix /ɖ/ and the /θ/ of the complex suffixes /-mθ/ and /-nθ/, which will result in incorrect surface forms. While some dialects allow the insertion of [e] before [ɖ], no dialect allows such an insertion before the /θ/ of the complex suffixes.

5. It should be pointed out that rule (24) is by no means an ad-hoc rule as it is found to be operative in other languages. It is similar, for instance, to the elision of a schwa in front of another vowel in French (e.g. /l # aRbR/ -->[laRbR] 'the tree').

6. Notice that, since the environment is not stated as in (6), no directionality is needed.

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7. This strategy was suggested to me by Ian Maddieson of UCLA. I wish to express my gratitude to Ian and to the participants in Professor Fromkin's seminar for providing me with needed feedback at the initial stages of the writing of this paper.

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CHAPTER 6

VOWEL SYNCOPE AND VOWEL REDUCTION

6.0 Introduction. This chapter investigates a particularly puzzling problem in Berber grammar--that posed by the inconsistent behavior displayed by nouns when they appear in 'construct state' (CS) environments. The term 'construct state', which is defined more precisely in Section 6.1 below, refers to the shape of the noun when it is the subject or the complement of a preposition (i.e. in the nominative or the oblique case). Specifically, the problem stems from the fact that the initial (or root) vowel of some nouns is affected by one of the processes operating in the CS, while others are not. The changes (ablaut, syncope, reduction) which affect the initial vowel of the nouns have long been observed (cf. Hanoteau 1885, Laoust 1918). However, an analysis providing a general explanation as to what nouns undergo what type of change and why they do so, is still lacking.

In this chapter, the traditional approaches to the problem are discussed, one--that of Basset and Picard--in some detail. An alternative analysis motivated by a search for phonological conditioning is offered.

6.1 The problem. The process we are dealing with is exhibited by certain feminine nouns some of which lose their initial vowel, while others reduce it to schwa, when they are in the CS. But before we precede, a word on what is meant by 'construct state' and 'free state' is in order.

'State', a term borrowed from Semitists and Egyptologists, is used in Berber studies to refer to the varying shape in which a noun appears. Depending on their position in sentences and/or phrases, Berber nouns

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are in one of two states: the 'free state' (French: 'état libre'), hereafter FS, or the 'construct state' (French: 'état construit'). A noun is in the CS when it occurs in the following syntactic environments:

(a) As the subject, postposed to the verb. (Recall, Berber is a Verb first language.)

(b) As the complement of certain prepositions.

(c) As the second of two conjoined but not disjoined NPs.

This is illustrated in (1).

(1) a. /#θ-dda##θ-amazig-θ#/ --> [θeddaθmazigθ], *[θeddaθamazigθ]
'she went, (the) Berber woman'
'the Berber woman went'

b. /#n#θ-amazig-θ#/ --> [neθmazigθ], *[enθamazigθ]
'of (the) Berber woman'

c. /#amazig##ð##θ-amazig-θ#/ --> [amazigettmazigθ]
'(the) Berber man and (the) Berber woman'
*[amazigettamazigθ]
(where [tt] results from the assimilation of ð + θ)

The FS refers to the shape of the noun in the citation form, or when it appears in the following syntactic environments:

(a) The accusative environment.

(b) A topicalized NP.

(c) After a 'neutral' preposition such as gend 'or', s 'to', etc. These prepositions are so-termed because they do not affect the nouns which they govern.[1]

This is illustrated in (2).

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(2) a. /#annay-x##θ-axam-θ#/ --> [annayxθaxamθ]

/saw I (the) tent' *[annayxeθxamθ]

'the tent, I saw it'

b. /#θaxamθ##annay-x#tt#/ --> [θaxamθannayxtt]

'(the) tent, saw I it' *[θxamθ, annayxtt]

'the tent, I saw it'

c. /#θ-addar-θ##gend##θ-axam-θ#/ --> [θaddarθgenttaxamθ]

'(the) house or (the) tent' *[θaddarθgenttxamθ]

The change which the feminine nouns undergo when they occur in construct state environments is of two kinds: Initial Vowel Deletion (Syncope) and Initial Vowel Reduction (Vowel Reduction). The examples in (1) above all illustrate the process of Syncope. This process affects the nouns in the CS regardless of their number. As illustrated in (3) plural nouns also undergo the change:

(3)	Free State (FS)	'Construct State' (CS)
	/#θimazig-in#/	/#n#θ-imazig-in#/
	[θimazigin] 'Berber women'	[neθmazigin]'of Berber women'
	/#θ-ixam-in#/	/#n#θ-ixam-in#/
	[θixamin] 'tents'	[neθxamin] 'of the tents'

The plural forms θimazigin and θixamin are derived from the singular θamazigθ and θaxamθ (cf. (1) above) via the following changes--all of which represent but one means of plural formation in Berber:

(i) Affixation of the plural suffix -in, which replaces the singular suffix -θ.

(ii) Initial vowel ablaut: sing. a --> plur. i.

Instead of exhibiting initial vowel syncope in the CS, some feminine nouns show initial vowel reduction. This is illustrated in (4), where

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the reduced vowel, phonetically a schwa, is represented in this study by e.

(4)

FS	CS
/#θ-arwa#/	/#n#θ-arwa#/
[θarwa] 'canal'	[enθerwa] 'of the canal'
/#θ-islit-t#/	/#n#θislit-t#/
[θislitt] 'bride'	[enθeslit-t] 'of the bride'

This process also affects plural nouns, hence [θislaθ-in] 'brides' appears as [θeslaθin] in the CS.

The two processes cannot be interchangeable, as seen in (5).

(5) CS

a. *[enθemazigθ] 'of the Berber women' (Vowel Red.)
*[neθemazigθ] 'of the Berber women'

b. *[neθrwa] 'of the canal'
*[nθθrwa] 'of the canal'

By way of anticipation, the reason for the non-occurrence of the forms in (5) is as follows: the process of Initial Vowel Syncope affects only nouns with an open syllable, while that of Vowel Reduction operates only on nouns with a closed syllable--a fact not mentioned in previous studies. In Berber, a syllable is closed when its consonantal coda consists of a cluster of unlike consonants or a geminate cluster (cf. Chapters 3 and 5 above). As will be clear in (8) below, only initial vowels followed by a cluster of unlike consonants are affected. For ease of exposition, we leave unanswered at this point the question of whether the surface forms in (4) result from the application of Vowel Reduction alone or from the application of both Syncope and then Epenthesis (cf. Chapter 5). We return to this matter below.

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Not all Berber feminine nouns are affected in the CS by the changes illustrated above. Certain nouns do not undergo either change. Neither their morphology nor their meaning provide us with a way of distinguishing them from those in (1), (3) and (4). Among these non-affected nouns are <u>all</u> those in which the first vowel is <u>u</u>. As seen in (6), nouns with an open initial syllable, which would normally undergo Syncope, do not delete their first root vowel when it is round.

(6)

FS	CS
/#θ-uḍay-θ#/	/#n#θ-uḍay-θ#/
[θuḍayθ] 'Jewish woman'	[enθuḍayθ] 'of the Jewish woman'
	*[neθḍayθ]
/#θ-uxeṣ-θ#/	/#n#θ-uxeṣ-θ#/
[θuxeṣθ] 'tooth'	[enθuxeṣθ] 'of the tooth'
	*[neθxeṣθ]

Nouns such as those in (6)--though limited in number--are not affected in the CS. In (7) below, nouns with <u>u</u> as the first root vowel and a closed initial syllable are not affected, as one might expect, by Vowel Reduction.

(7)

FS	CS
/#θ-ugrif-θ#/	/#n#θ-ugrif-θ#/
[θugrifθ] '(loaf) bread'	[nθugrifθ] 'of the loaf of bread'
	*[enθegrifθ]
/#θ-uzl-in#/	/#n#θ-uzl-in#/
[θuzlin] 'scissors'	[enθuzlin] 'of the scissors'
	*[neθzlin]

(Note: another pronunciation for 'scissors' is [θuzzlin].)

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Another group of nouns which, likewise, are not affected in the CS are nouns whose initial syllable is closed with a cluster of identical consonants (i.e. geminates). Contrary to one's expectation they are not subject to Vowel Reduction, as seen in (8):

(8)

FS	CS
/#θ-aqqay-θ#/	/#n#θ-aqqay-θ#/
[θaqqayθ] 'small button'	[nθaqqyθ] 'of the small button'
	*[nθeqqayθ]
/#θ-addar-θ#/	/#u#θ-addar-θ#/
[θaddarθ] 'house'	[enθaddarθ] 'of the house'
	*[enθeddarθ]

Still another group of feminine nouns not undergoing the changes in the CS is that exemplified in (9) and (10). In these, however, the initial syllable is like that of nouns in (1), (3) and (4), which are affected by the two processes under investigation.

(9)

FS	CS
/#θ-ad̲aw-θ#/	/#n#θ-ad̲aw-θ#/
[θad̲awθ] 'back'	[enθad̲awθ] 'of the back'
	*[neθd̲awθ]
/#θ-isen-θ#/	/#n#θ-isen-θ#/
[θisenθ] 'salt'	[enθisenθ] 'of the salt'
	*[neθsenθ]

(10)

FS	CS
/#θarsel-θ#/	/#n#θ-arsel-θ#/
[θarselθ] 'pillar'	[enθarselθ] 'of the pillar'
	*[enθerselθ]

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FS	CS
/#θ-alxaḍemθ#/	/#n#θ-alxaḍemθ#/
[θalxaḍemθ] 'ring'	[enθalxaḍemθ] 'of the ring'
	*[enθelxaḍemθ]

The non-occurrence of *[neθḍawθ] and *[neθsenθ] in (9) attests to the fact that Syncope is inoperative in this case. Similarly, the data in (10) clearly indicate that certain nouns are not subject to Vowel Reduction in the CS.

In summary, the situation in the CS for the feminine nouns is as given in (11):

(11) a. Some nouns with an open initial syllable delete their first root vowel if it is non-round. (cf. (1),(3))

b. Some nouns the first syllable of which is closed by a cluster of unlike consonants reduce their initial non-round vowel. (cf. (4))

c. All nouns with an initial round vowel or with a first syllable closed by a geminate cluster undergo neither of the aforementioned processes in the CS. (cf. (7) and (8))

d. Some nouns whose initial syllable is identical with that of nouns affected by the changes do not undergo the expected changes. (cf. (9), (10))

Finally, while a statistical count will indicate that the nouns described in (11d) are limited in number when compared to those in (11a,b), the situation summarized in (11) still raises a number of questions. First, and assuming that we do not simply mark the nouns in (11d) as exceptions

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to the rules, how should they be distinguished from the nouns in (11b)? Second, why do the nouns referred to in (11a,b) undergo the changes and those in (11d) do not?

In sections 6.2 and 6.3, two traditional approaches are discussed; a purely 'taxonomic' approach represented by Laoust's study of the Ntifa dialect (1918), spoken near Demnate, and the more 'descriptive' approach of Basset and Picard (1947). In section 6.4, Basset and Picard's approach is 'translated' into the generative framework and critically evaluated. An alternative approach based on syllable structure analysis is offered in its stead in section 6.5.

6.2 The traditional approach. Regarding the various changes exhibited by the nouns in the CS, previous studies on Berber dialects do not go beyond a 'level of observational adequacy'. Some authors, for example Hanoteau (1885), do not even reach this level of analysis as they are limited to stating how certain French or Latin constructions (in this case mostly that of the genitive) are rendered in Berber.

By far the most commonly held approach to the problems raised by the CS formation is what is termed--following Chomsky (1964)-- a 'taxonomic' approach (cf. Laoust 1918, and Foucauld 1920 for some good examples). This approach consists of providing a list of the changes (cf. (1), (3), and (4) above), a few illustrating examples and a few remarks. Little or no discussion--let alone explanation--as to what governs the changes (i.e. conditioning), or why some nouns are affected while others are not, is to be found in these studies. That this should be the case is surprising since the relevant data was made available at least for some dialects--the Twareg dialects. In his pioneering work

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on Twareg-Tahaggart, Foucauld, to whom we owe the first and only extensive dictionary on Berber, had the brilliant idea of indicating with the symbol Ψ the nouns which are affected in the CS; (cf. Dictionnaire Touareg-français, published posthumously (1951)). Yet studies on Twareg (Cortade 1969, and Prasse 1973) contain no in depth analysis of the problem. Cortade devotes only two pages (p. 25 and p. 118) to the CS formation. In an otherwise fairly extensive treatment of the nouns in Twareg from a historical perspective, Prasse (1974:11) simply refers the reader to previous analyses (Basset 1945, Galand 1963). For in the words of Prasse, 'Le comportement de l'initiale des noms est le seul problème de la morphologie nominale qui ait été traité, jusqu'ici, de façon satisfaisante.' (My emphasis, J.S.). Basset's analysis--included in Basset and Picard (1948)--is discussed below. It, incidentally, would not be totally adequate for Twareg as this latter language exhibits a richer variety of ways of forming the CS, two of which (vowel ablaut and vowel reduction) are not considered by Basset.

The distinct impression one gets from reading previous works in Berber is that no generalization can be arrived at. Statements like the following, "la pratique seule fait connaître les noms qui en rapport de dependance (i.e. CS), conservent leur a ou leur i initial" (Laoust 1918: 102) are common. They suggest that only usage--and hence a great deal of memorization for both language learners and Berber speakers--will indicate which nouns conserve their vowel and which do not. Laoust's statement clearly does not suggest the possibility of there being some phonological conditioning factor(s) for either of the aforementioned processes (i.e. Syncope and Initial Vowel Reduction).

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Several reasons why Laoust and other Berberists may have reached this conclusion are possible. They are: (i) The situation in present day Berber dialects is indeed very complex. (ii) On the surface, a great deal of variation and inconsistency is exhibited. Historical changes--in particular restructuring--may be responsible for this. (iii) Native speakers' judgements often fluctuate, especially regarding CS environments other than the subject position, but also with respect to individual nouns.

6.3 The non-constant vowel analysis (NCVA). A more 'descriptive' approach to the problems raised by the CS formation is adopted by a few Berberists: Basset (1945), Basset and Picard (1948), de Vincennes and Dallet (1960), and Penchoen (1973). Since the last two accounts are but notational variants of that of Basset and Picard, only the latter is discussed here in some detail.

Basset and Picard attempt to provide a general treatment of the CS formation for Kabyle (Irjen). Noting the inconsistent behavior exhibited by the nouns in the CS, they set out to find a way of determining which initial vowels are affected and which are not. Both masculine and feminine nouns are considered, though the latter group is the one chosen by the authors to illustrate their hypothesis since, in their eyes 'les faits sont plus simples et plus clairs' (p. 33), in the CS of feminine nouns.

Basset and Picard's thesis is based on the nature of the initial vowel of the nouns. This vowel may be either 'constant' ('voyelle constante') or 'non-constant' ('voyelle non-constante'). Deletion--which is the only process recognized by Basset and Picard--occurs only

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if the first root vowel is non-constant. According to the authors, the constancy of the initial root vowels in the nouns crucially depends on whether they do or do not alternate with i in the plural. As illustrated in (3) above, the alternation of initial non-round vowels with i in the plural is but one means involved in the regular plural formation. Since Basset and Picard's analysis claims that only non-constant initial vowels are affected in the CS, it will be referred to in the remainder of this chapter as the 'Non-Constant Vowel Analysis' (hereafter NCVA).

Basset and Picard's attack on the problem begins by establishing which initial vowels alternate and which do not in the plural of the nouns in Kabyle (Irjen). In this dialect, the initial non-round stem vowel of singular nouns normally alternates with i in the plural as seen in (12):

(12)	Sing.	Plur.	
	θayaẓiṭṭ	θiyuẓaḍ	'hen(s)'
	θizimmerθ	θizammarin	'ewe(s)'

(Cf. Basset and Picard's group II, p. 34.)

It should be noted that with the exception of Twareg dialects which exhibit additional initial ablauts in the plural, the alternation sing. a/i:plur. i is pan-Berber. The other vowel alternations (a:u, e:a, and i:a) are secondary developments with no bearing on the present discussion.

Nouns undergoing the plural formation such as illustrated in (12) are said to have an alternating initial vowel. It is the claim of Basset and Picard that, when the initial non-round vowel of the feminine nouns alternates with i in the plural, as is the case in (12), it is also

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non-constant. As such, it is syncopated in the CS, as seen in (13):

(13)

Sing.	Plur.
/#n#θayaẓiṯ-θ#/	/#n#θ-iyuẓaḍ#/
[neθyaẓitt] 'of the hen'	[neθyuẓaḍ] 'of the hens'
/#n#θ-izimmer-θ#/	/#n#θ-izammar-in#/
[nedzimmerθ][2] 'of the ewe'	[nedzammarin] 'of the ewes'

The authors are aware of the existence of cases where the initial stem vowel of singular feminine nouns is either non-alternating in the plural, or alternates with vowels other than i (i.e. u or a). This is exemplified in (14):

(14)

	Sing.	Plur.	
a.	θaggawθ	θaggawin	'niece(s)'
	θilefθ	θilfuθin	'sow(s)'
	θuššett	θuššanin	'jackal(s)'
	(Cf. Basset and Picard's group I-A, p. 33)		
b.	θaddarθ	θuddar	'house(s)'
	θiššerθ	θaššarin	'asperity'
	(Cf. Basset and Picard's group I-B, p. 33)		

In nouns such as those in (14a) the initial vowel remains intact in both numbers, and is thus called 'voyelle constante' (constant vowel) by the authors. In the forms in (14b) the initial vowel enters into non-productive and highly idiosyncratic alternations. It is considered alternating, as well as 'constante' by Basset and Picard. No explanation is offered for considering a, and i as constant in (14b). The only reason that we can see for such a consideration is that, though these vowels are alternating, they are not affected in the CS.

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In nouns such as those exemplified in (14) (cf. also (6)-(8) above) Basset and Picard go on to say, no change is observed in the CS. There is no difference between the phonological shape of the FS and that of the CS.

Given the facts presented in (11)-(13), the conclusion drawn by the authors is that "il y a, dans le traitement de la voyelle initiale, une relation fondamentale de nombre (i.e. pluralization) et d'état (i.e. state), (my emphasis, J.S.), les cas, s'il s'en trouve, ou ce principe ne s' applique pas, ne peuvent être qu'accidentels" (p. 34). A 'correlation' is thus established between two grammatical processes 'pluralization' and 'state', with the former providing a means of predicting the latter.

As for pronunciation problems caused by clusters that arise after the deletion of the initial vowel of feminine nouns, Basset and Picard make the following statement (p. 34):

In the CS, if the prefix θ and the first stem consonant form what they term "un groupe phonétiquement prononçable", they are permitted to follow one another without being separated by any vocalic segment (e.g. [θyazitt] 'hen'). If, on the other hand, they form "un groupe unprononçable", the two consonants (i.e. θ + 1st stem consonant) are separated by a vocalic element, phonetically a schwa (e.g. [θeθbirθ] 'dove').

Basset and Picard do not go into details concerning the question of what constitutes a pronounceable cluster and what does not. However, from the examples they provide, viz. FS: θaθbirθ, CS: θeθbirθ 'dove', it would seem that what they have in mind are sequences resulting from the combination of the feminine prefix θ- and non-strident dentals. In

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the form for 'dove', the sequence θ + θ would result in a geminate [tt] if an epenthetic vowel is not inserted between the two dental segments (cf. Chapters 2 and 3).

The authors end their discussion on the behavior of feminine nouns in the CS by a series of 'practical' suggestions. These suggestions concern the possibility of predicting the CS from the FS and the FS from the CS, based on the initial vowel of the nouns in the singular and the plural. The authors' often confusing statements are reproduced here in the form of tables given in (15) and (16). These tables are to be utilized in the following way, taking as an example the first case in (15):

In the FS singular, if the initial vowel of a noun is u, then the initial vowel in the CS is predictable since it is u. However, if the initial vowel is a or i, it is not possible to predict the vowel in the CS, since a and i can be either constant or non-constant; etc.

(15) Relative Predictability of CS from FS

Initial Vowel in FS		Predict. in CS	Reason
Sing.	u	yes	Same vowel as in FS
	a	no	a and i can be constant or non-constant.
	i	no	
Plur.	u	yes	Same vowel as in FS
	a	yes	
	i	no	i can be constant

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(16) Relative Predictability of FS from CS

Initial Vowel in CS		Predict. in FS	Reason
Sing. or Plur.	u	yes	Same vowel as in FS
	a	yes	
	i	yes	
Sing.	{ø, e}	no	Vowel in FS can be a or i
Plur.	{ø, e}	Plur. yes	Vowel can be only i
Plur.	{ø, e}	Sing. no	Vowel can be a or i

The analysis of Basset and Picard (hereafter B&P) can be summed up as follows:

(17) (i) As far as plural formation is concerned, the initial root vowels in the nouns belong to one of two groups: [+Alternating] (a,i); or [-Alternating] (a,i,u).

(ii) With regard to the CS formation, these vowels are subdivided into two groups: a group of constant vowels (a,i,u); and a group of non-constant ones (a,i).

(iii) Non-constant vowels are those which alternate with i in the plural formation.

(iv) Only those nouns with initial non-constant vowels are affected in the CS.

(v) Only one process (initial vowel syncope in our terminology) is said to be operative.

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6.4.1 B & P's analysis in the generative framework. Assuming that B & P's analysis is correct, the facts presented above would be revealed within the generative framework by the addition of a diacritic feature [±Constant], hereafter [±C], to the feature specification of the vowels. The vowels would then be classed as either [+C] (viz. u, a, i), or as [-C] (viz. a, i). The evidence in favor of such a feature would be provided by the behavior of the initial vocalic segment in the plural formation. As stated above, the initial vowel of singular nouns may be alternating or non-alternating in the plural. Alternating initial vowels in the plural are non-constant in the CS.

With the addition of the specification [±C] to the feature matrix of the vowels, the CS rule can be written so as to apply only to nouns with an initial non-constant vowel. Nouns with an initial vowel specified as [+C] will be exempt. In this way the exceptional nouns are taken care of through exclusion by the CS rule, instead of being set aside as exceptions.[3] Note that if B & P's analysis is strictly adhered to, an additional diacritic feature, [±Alternating] ([±Alt]), would be required for the purpose of deriving the correct initial vowel of the nouns in the plural. Of the three vowels which appear as initial root vowels, u is consistently non-alternating, and a may be alternating or non-alternating in the plural. As for i its status with respect to this feature cannot be determined since the ablaut is one between a vowel and i (cf. the tables in (15) and (16)). Given the above facts, the two rules claimed by B & P to be necessary for the CS formation are as formulated in (18) and (19).

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(18) Initial Vowel Ablaut: (Plural Formation)

$$\begin{bmatrix} V \\ +Alt \end{bmatrix} \longrightarrow \begin{bmatrix} +high \\ +Alt \end{bmatrix} \; / \; +\_\_\_\_ \begin{bmatrix} +N \\ +Fem \\ +Pl \end{bmatrix}$$

(An alternating vowel (a,i) ablauts into a high and alternating vowel (i), initially in the plural of feminine nouns.)

(19) Syncope: (CS Formation)

$$\begin{bmatrix} V \\ +Alt \\ -C \end{bmatrix} \longrightarrow \emptyset \; / \; +\_\_\_\_ \begin{bmatrix} +N \\ +Fem \\ Pl \\ +CS \end{bmatrix}$$

(An alternating and non-constant vowel (a,i) is deleted initially in the CS of feminine nouns.)

The repetition of the feature [+Alt] in the structural change (SC) of rule (18) is necessitated by the fact that the CS rule applies also to plural nouns. The only way to tell that a vowel is non-constant is if it is specified as [+Alt]. By repeating the feature [+Alt] to the right of the arrow, we ensure that the initial vowel of the plural is also subject to the CS rule. However, a readjustment rule converting the feature [+Alt] into [-C] would also be required before (19) can apply.

Note that the requirement of such a rule points to a deficiency in the analysis: that of not having rules (18) and (19) in a direct feeding relationship. To alleviate this problem, a departure from B & P's assumptions is necessary. A way out would be to reject B & P's proposal that the diacritic feature [±Alt] be used as the trigger for the plural rule. Since alternating vowels are also non-constant, a more

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economical way of formulating the plural rule would be to use only one diacritic feature, namely [±C]. Rule (18) can then be reformulated as shown in (18').

$$(18')\quad \begin{bmatrix} V \\ -C \end{bmatrix} \longrightarrow \begin{bmatrix} +high \\ -C \end{bmatrix} \;/\; +\_\_\_\_ \begin{bmatrix} +N \\ +Fem \\ +Pl \\ -CS \end{bmatrix}$$

As seen in (18'), two adjustments are made: the repetition of [-C] in the SC of the rule and the addition of the specification [-CS] to its SD. Their justification is as follows: the carry over of the feature [-C] to the SC of the rule is needed to ensure that the initial vowel of the plural nouns be also subject to rule (19). The specification [-CS] is needed to block the application of (19). Since the input segments are now specified as [-C], they can also be operated on by rule (19). The application of this rule would have the effect of 'bleeding' the input for the plural rule. As indicated in the table given in (16) above, the initial vowel of the nouns in the FS is not always recoverable from the CS forms.

The other ways of ensuring the applicational precedence of the plural rule (18) over that of the CS are: (i) by imposing an order on their application, (ii) by marking all the nouns subject to the CS rule with an exception feature such as [-Rule 19], (iii) by letting the CS rule go 'global' (cf. Kisseberth 1969).[4] The need for a 'global' CS rule in Berber is revealed by the fact that, if the output segment of the plural rule is not marked for constancy, the CS rule would be applicable to it only if it had access to its derivational history. As stated above, only those initial i's in the plural nouns which are

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derived via initial vowel ablaut, are subject to the CS rule.

Given the assumptions of the standard theory, the most adequate way to remedy the deficiencies of B & P's analysis would be to reformulate the plural rule as in (18'), and to impose an order on the application of the two rules involved.

Other alternative solutions could be posited within the generative framework such as:

1) The use of phonological features as diacritics, e.g. to distinguish between two a's and two i's. Those which alternate could be represented as /æ/ and /e/ respectively--that is [-high, -back]. Those which do not (/a/ and /i/), would be specified as [+back]. The rules would be formulated to apply to the specified phonological features, and absolute neutralization rules would be needed to derive the correct phonetic segments. The arguments against such an approach are strong enough not to consider such a solution seriously.

2) The rule exception feature of the type [-Rule X]. Under this solution, nouns with a non-alternating initial vowel in the plural, and nouns which do not undergo syncope in the CS, would be so marked in the lexicon.

6.4.2 Summary and critique. To summarize, the generative interpretation of B & P and the alternatives outlined above can handle the problem posed by the inconsistent behavior of the initial vowel of the feminine nouns in the CS. However they do so only through the use of a number of formal devices which, for ease of reference, are listed in (20).

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(20) a. The use of diacritic features

b. The diacritic use of phonological features

c. Rules of absolute neutralization.

It may indeed be necessary that a theory of phonology incorporate such devices to account for exceptions. There is at present no accepted hypothesis regarding how exceptions should be handled, although there is discussion on exceptions in SPE and by Kisseberth (1970) and Schane (1973).

A more important problem regarding B & P's solution is that, as will be shown, their proposal is descriptively adequate only up to a point. B & P base their analysis on the fact that the constant initial vowel of the nouns does not alternate in the plural. However, a close look at the Tamazight data will show that this criterion fails in many cases.

Specifically, some feminine nouns with an alternating (hence non-constant) initial vowel in the plural do not undergo the changes in the CS. This is illustrated in (21) where it can be seen that neither syncope (21a), nor vowel reduction (21b), apply.

(21)	CS (sing.)	CS (plur.)
a.	/#n#θasa#/	/#n#θ-isatt-in#/
	*[neθsa], *[netsa]	*[neθsattin], *[netsattin]
	[enθasa] 'of the liver'	[enθisattin] 'of the livers'
b.	/#n#θaɣ̞ɣ̞alθ#/	/#n#θ-iɣ̞ɣ̞al#/
	*[neθɣ̞ɣ̞alθ], *[enθeɣ̞ɣ̞alθ]	*[neθɣ̞ɣ̞al], *[enθeɣ̞ɣ̞al]
	[enθaɣ̞ɣ̞alθ] 'of the widow'	[enθiɣ̞ɣ̞al] 'of the widows'

Another set of data which B & P's analysis fails to handle is

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afforded by a group of syncopating feminine nouns with no plurals. As seen in (22) the initial vowel of these nouns undergoes syncope in the CS.

(22)

	FS	CS
a.	/#θ-abaga#/	/#n#θabaga#/
	[θabaga] 'tobacco'	[enθbaga] 'of the tobacco'
		*[enθabaga]
b.	/#θ-açessa#/	/#n#θ-açessa#/
	[θaçessa] 'Act. of tending sheep'	[neθçessa] 'of tending sheep'
		*[enθacessa]

Nouns such as the one in (22b) belong to the class of deverbal nouns. While B & P recognize the problem posed by these nouns to their analysis, their proposed remedy consists of positing yet another correlation. Whether the initial vowel of deverbal nouns is constant or non-constant depends on whether or not the related verbs exhibit vowel and/or consonantal alternations in their conjugation (p. 36). Clearly, this is still another complicated way to predict initial vowel constancy which only an analyst would utilize.

But the most problematic case for B & P's analysis is with respect to determining the constancy of the initial vowel of the nouns which begin with i (e.g. θizimmerθ 'ewe' etc.). Here the authors' criterion fails completely. This is indicated in the tables given in (15) and (16) above. Since the initial vowel ablaut in the plural is one between a non-round vowel (a, i) and i, given a noun with an initial i, one has no way of determining--save arbitrary marking--whether the initial i of the singular is alternating or not. Consequently, the constancy of the

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initial vowel of these nouns cannot be determined by what is taking place in the plural. This serious problem is recognized by B & P. However their solution for it--i.e. the postulation of two distinct 'series' of i's, one constant and the other non-constant--is clearly arbitrary. Moreover, it points to a serious deficiency in their analysis--its circularity.

B & P's handling of nouns with initial i's is arbitrary because there is no independent justification for postulating two series of i's. Nor is there any justification for their claim (p. 35) that, 'confusion aside' (sic; my translation), there is no connection between the i of the singular and that of the plural. B & P's solution for the problem posed by nouns with initial i's is also circular since the only time we have an indication as to the constancy (or non-constancy) of initial i's is precisely in the CS formation, which the authors sought to predict.

In addition to these arguments based on empirical evidence, a number of objections based on theoretical considerations can be made against B & P's NCVA and its variants. First, in order for these analyses to account for the data, an extensive use of one or more of the devices listed in (20) is resorted to. While, due to phonological leveling and other historical processes, some sort of marking is necessary, the requirement of the marking devices (20a and b) makes these analyses very costly. As such, they should rank very low in the evaluation scale. This is so because--apart from using exception features--the only reason for requiring rules of absolute neutralization is to fix things up in the derivation so that the correct output would be

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obtained. Clearly, this is ad hoc and hence objectionable on principled grounds.

Second, B & P's analysis, if considered viable, not only implies that native speakers make a connection between the behavior of the initial vowel in the plural and its constancy in the CS, but also that a great deal of memorization is involved in their mastery of the CS formation. It also implies that the behavior of the initial vowel of the feminine in the CS is not phonologically conditioned. In other words, the phonological shape of the nouns is of no consequence.

The first implication is highly suspect since only an analyst would normally make a connection between the behavior of the initial vowel in the plural and its constancy in the CS. As for the second and third implications of B & P's analysis, it remains to be seen whether other means, e.g. phonological conditioning, are not utilized by Berber speakers. In the following section, the possibility that the behavior of the nouns in the CS depends on their phonological make-up is explored.

6.5 The Syllable Structure Analysis (SSA). The analysis to be presented owes its name to the fact that it is based on the syllable structure of the nouns--especially the shape of the initial syllable. It is motivated by a search for phonological conditioning for the changes which occur in the CS.

6.5.1 The proposal. The proposal embodied in the syllable structure analysis is that the initial vowel of the nouns undergoes the changes in the CS (i.e. Syncope or Vowel Reduction) if: a) it occurs in an open syllable (i.e. it deletes), b) it occurs in a syllable closed by

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a cluster of unlike consonants (i.e. it reduces), c) the feminine form is derived from a masculine form.

Thus, a relationship between the ability of a feminine noun to undergo the changes in the CS and its derivability from the masculine is posited, rather than one between singular/plural alternations as suggested by B & P.

Two rules are necessary to account for these facts, rules which do not depend on an arbitrary [±Constant] diacritic feature. One rule, formulated in (23), states that the non-round vowel of derived feminine nouns is deleted initially in the CS if the syllable containing it is open.

(23) Initial Vowel Syncope:

$$\begin{bmatrix}+\text{voc}\\-\text{rnd}\end{bmatrix} \rightarrow \emptyset \;/\; +\_\_\_\_\; CV] \begin{bmatrix}+\text{N}\\+\text{Fem}\\+\text{Der}\\+\text{CS}\end{bmatrix}$$

This rule accounts for the great majority of the syncopating feminine nouns examples of which are given in (1) and (3) above. The second rule needed within SSA is given in (24). It states that the non-round vowel of derived feminine nouns is reduced initially in the CS if the syllable containing it is closed by a cluster of unlike consonants.

(24) $$\begin{bmatrix}+\text{voc}\\-\text{rnd}\end{bmatrix} \rightarrow e \;/\; +\_\_\_\_\; C_1C_2] \begin{bmatrix}+\text{N}\\+\text{Fem}\\+\text{Der}\\+\text{CS}\end{bmatrix}$$

(where $C_1 \neq C_2$, and e = [ə])

Rule (24) handles nouns such as those given in (4), which are mainly disyllabic. Native polysyllabic (i.e. three or more syllables)

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singular feminine nouns with a closed initial syllable are limited in number in the lexicons used for this investigation. Another fact about polysyllabic nouns not shared by disyllabic ones is that only a few of them are not affected by the changes. That is, the number of exceptional cases is higher among disyllabic nouns. What this seems to suggest is the existence of a correlation between the number of syllables contained in the singular nouns and their amenability to undergo the changes. This is evidenced by the fact that, while most disyllabic singular nouns are affected by the changes in the CS, monosyllabic nouns are not affected at all. This is illustrated in (25), where only examples of monosyllabic nouns are given. (For some examples of disyllabic nouns which undergo the changes, see (4) above.)

(25)

FS			
/#θayθ#/	'shoulder'	/#n#θayθ#/	'of the shoulder'
[θayθ]		*[neθyeθ], [enθayθ]	
/#θixθ#/	'sigh, sorrow'	/#n#θixθ#/	'of the sigh'
[θixθ]		*[neθxeθ], [enθixθ]	

A possible explanation for this state of affairs is that the loss of the initial vowel (or its reduction) is not as crucial for polysyllabic nouns as it is for monosyllabic and disyllabic ones. In these latter nouns, the initial clustering which would result (viz. #θ+CC), would be in violation of the sequential constraints of Berber (cf. Chapter 2, seq. SC 1). It may be possible that stress is involved in some way. This has been suggested by Prasse (1973, vol. 1). However, the author does not provide any analysis along these lines. Prasse's suggestion, though it is very tempting, is not followed in this

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investigation. In absence of a comprehensive study on stress in Berber which is non-distinctive, it is not clear how reliable an analysis of the CS formation based on it would be.

In addition to rules (23) and (24), a rule for the initial vowel ablaut which takes place in the plural formation, would also be required within SSA. This rule would be as given in (26).

(26) Initial Vowel Ablaut: (Plural Formation)

$$\begin{bmatrix}+\text{voc}\\-\text{rnd}\end{bmatrix} \longrightarrow \begin{bmatrix}+\text{high}\\-\text{rnd}\end{bmatrix} \;/\; +\_\_\_\_\;] \begin{bmatrix}+\text{N}\\+\text{Fem}\\+\text{Pl}\end{bmatrix}$$

It should be pointed out that, in contrast with the analyses outlined and discussed above (Section 6.4), no absolute neutralization rules are needed. Nor is there a need to posit, as B & P are forced to do, two distinct *i*'s. Due to the 'messiness' of the synchronic situation, some exceptions to SSA do exist, e.g. θamettutt 'woman', θaçessa 'action of tending livestock'. However, these exceptions point to one direction: a small number of non-derived feminine nouns--mainly polysyllabic--are affected by the changes in the CS. All in all, however, the syllable structure analysis is basically sound. In what follows, evidence in support of the syllable structure approach is presented.

6.5.2 The evidence for SSA. Evidence that it is the openness of the initial syllable which provides an environment for syncope is indirectly afforded by non-syncopating nouns exemplified in (4) above. This is illustrated in (27), where the vowel in the non-open initial syllable does not delete.

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(27) a. /#n#θ-algem-θ#/ 'of the camel'

*[neθlgemθ], [enθelgemθ]

/#n#θ-arbaθ-θ#/ 'of the girl'

*[neθrbatt], [enθerbatt]

b. /#n#θ-aqqay-θ#/ 'of the button'

*[neθqqayθ], *[enθeqqayθ], [enθaqqayθ]

The initial vowel is reduced in (27a) and remains intact in (27b). To ascribe the feature [+C] to the initial vowel in forms such as the one in (27b), as B & P would do, on the basis that it does not alternate in the plural, still does not explain why this vowel is constant in the plural.

Further evidence in favor of positing the syncope rule (23) is afforded by the plural formation of some nouns. Due to vowel deletion and vowel insertion processes brought about by the addition of some plural suffixes, these nouns wind up with an open initial syllable. As such, they become subject to syncope of the initial vowel in the CS. This is illustrated in (28).

(28) a.	FS (sing.)	FS (plur.)	
	[θalgemθ]	[θilegmin]	'camel(s)'
	[θigremθ]	[θigermin]	'hamlet(s)'
	[θaddarθ]	[θiyeḍrin]	'house(s)'
b.	CS (sing.)	CS (plur.)	
	[enθelgemθ]	[neθlegmin]	'of the camel(s)'
	[enθegremθ]	[neθgermin]	'of the hamlet(s)'
	[enθaddarθ]	[neθyeḍrin]	'of the house(s)'

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(I am assuming that, in the CS plural, the rules apply to the output of the plural formation.)

The changes which take place in the plural formation also provide evidence for the second rule (Vowel Reduction) needed in the SSA solution. This is illustrated in (29). Note that the underlined vowels in the FS singular are deleted in the FS plural. This deletion which is caused by the addition of the suffixes -awin and -in creates an impermissible cluster, thereby providing an input to the schwa insertion rule(s) (cf. Chapter 5).

(29) a.

FS (sing.)	FS (plur.)	
[θixefθ]	[θixfawin]	'small head(s)'
[θameslemθ]	[θimselmin]	'moslem(s)'

b.

CS (sing.)	CS (plur.)	
[neθxefθ]	[enθexfawin]	'of the small head(s)'
[neθmeslemθ]	[enθemselmin]	'of the moslem(s)'

As can be inferred from the data in (28) and (29), the evidence presented in support of the SSA solution involves deletion and/or insertion of a vowel--mainly schwa--which occur in the plural. The SSA solution, thus, depends on the analysis which includes some or all schwas in underlying forms (cf. Chapter 5). Moreover, the SSA solution works on the premise that the initial schwa exhibited by some nouns in the CS results from vowel reduction, rather than insertion by epenthesis rules applied to the output of a non-phonologically conditioned syncope rule. Below, we present another solution based on the distinction [±derived] but in which all the schwas are inserted by epenthesis.

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Given that the occurrence of schwas can be predicted in Northern Berber, the underlying forms for plural nouns such as θilegmin 'camels' need not have a schwa in the second syllable, viz. /θ-ilgm-θ-in/, before the syncope rule applies. This rule, which would be stated without reference to the openness of the initial syllable, can apply yielding the intermediate form θ-lgm-θ-in. At this stage the plural formation rule which deletes the feminine suffix /-θ/, and the rule of schwa insertion, viz. $\emptyset \rightarrow e$ / ____ CCV ,would apply in the order given to yield the correct output in the CS: [eθlegmin].

Similarly, plural nouns such as θixfawin 'small heads' need not appear with a schwa in their underlying representation. The underlying form for θixfawin can be /θ-ixf-θ-awin/ instead of /θ-ixef-θ-awin/. Given /θ-ixf-θ-awin/, a syncope rule not sensitive to the shape of the initial syllable, i.e. a different rule from (23), can apply yielding the intermediate form θ-xf-θ-awin. This latter form would be operated on by the plural formation rule, and the aforementioned epenthesis rule would insert a schwa in its appropriate place yielding the correct surface form [θexfawin]. In the case of /θimslm-θ-in/ 'moslems', a right-to-left iterative application of the schwa insertion rule (cf. Chapter 5) would be necessary.

Notice that this alternative, which for case of reference I will call 'the derived noun analysis' (DNA), is yet another notational variant of B & P's analysis. Both analyses assume that 1) only one process, initial vowel syncope, takes place in the CS, and 2) this process is not phonologically conditioned. Like B & P's analysis, DNA implies that the way native speakers know which nouns are affected in the CS

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and which are not is through extensive memorization. Unlike B & P's analysis, however, DNA does not run into any trouble with respect to nouns with initial i. Nevertheless, the theoretical arguments advanced above against B & P's analysis (cf. Section 6.4.2) also apply to the DNA solution. The argument in favor of DNA, that it is economical in that it exploits the persistent nature of needed epenthesis rule(s), is not enough - we believe - to make us prefer this analysis to the phonologically motivated SSA.

This conclusion is reached in spite of the fact that, because of the nature of the supporting data, the evidence for a process of initial vowel reduction in the CS is not a clear-cut one. The fact that the schwa exhibited initially by some nouns can also be predicted by one of the regular rules of epenthesis in Northern Berber may very well be a coincidence. The investigation of the CS formation in Southern Berber (i.e. Twareg) lends support to this statement. A look at data from Twareg (cf. Foucauld 1920, and Prasse 1974) reveals that initial vowel reduction is one of the processes involved in the CS. The other processes are: syncope, ablaut, and shortening.

That this is indeed the case can be seen in (30). Notice that the initial vowel is reduced even though it occurs in an open syllable.

(30)

	FS	CS	
a.	[tami:dit]	[təmi:dit]	'female companion'
	[tanu:bit]	[tənu:bit]	'young girl'
	[tenirt]	[tənirt]	'antelope'
	[temirit]	[təmirit]	'sweetheart'

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b. [tibiag] [təbiag] 'small goatskins'

[tibua:n] [təbua:n] 'small leather bags'

[tidəba] [tədəba] 'beds'

(Note: The use of [ə] instead of [e] for schwa is necessitated by the fact that Twareg has a phonemic mid front vowel [e]).

To claim that the initial schwa of the CS forms in (30) results from the application of epenthesis to the output of vowel syncope would be incorrect. As in other Berber languages, consonant clusters do exist in Twareg and are subject to sequential constraints. However, no impermissible sequence would have resulted, had syncope applied. This is shown in (31).

(31) FS CS

a. [tahaggart] [thaggart] 'noble; name of a tribe'

[tamahaq] [tmahaq] 'the Berber language'

b. [tiḍiḍin] [ḍḍiḍin] 'bad women'

[tina:riwi:n] [tna:riwi:n] 'plains'

Notice that the forms in (30) and those in (31) are of a similar phonological shape. Yet, no schwa is inserted between the feminine prefix t- and the first root consonant. The need for such an insertion, whose motivation is to break up impermissible clusters, does not arise in the case of the forms in (31). The inescapable conclusion, then, is that the schwa of the CS forms in (30) results from vowel reduction, not epenthesis.

Further support for the claim that initial vowel reduction is involved is afforded by the CS formation of masculine nouns. Contrary to what occurs in Northern Berber, the same CS processes apply to nouns in

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Twareg regardless of gender. A group of masculine nouns exhibit an initial schwa in the CS which cannot be shown to be derived via epenthesis. This is illustrated in (32).

(32)

FS	CS	
[amis]	[ə̆mis]	'camel'
[aš̆ə̆k]	[ə̆šə̆k]	' a kind of plant'
[emi]	[ə̆mi]	'mouth'
[egə̆f]	[ə̆gə̆f]	'head'

No consonant cluster, let alone an impermissible one, would have resulted in the forms if syncope had applied. Hence, there is absolutely no reason to suppose that the initial schwa of the CS forms in (32) results from epenthesis.

The above evidence from Twareg clearly indicates that a process of initial vowel reduction is involved in the CS. Given the relatedness of Twareg to Northern Berber, this evidence can be used, at least heuristically, to support the assumption that the process in question also operates in Northern Berber. Now, what about the distinction [± derived] which is assumed under the SSA solution? What evidence can be presented in its support?

The aforementioned distinction is posited because, on the basis of the data available to us, feminine nouns with no corresponding masculine are normally not affected by the changes in the CS. This is particularly true of disyllabic nouns. Nouns like θadawθ 'back', θarselθ 'pillar' (cf. (9) and (10) above), θafusθ 'sun', θisenθ 'salt' belong to the group of non-derived nouns. They also do not undergo the stated changes in the CS. A connection, thus, exists between the two facts.

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This helps explain why a number of nouns are not subject to either Syncope or Vowel Reduction.

That the first two nouns are not affected in the CS is particularly interesting since this cannot be explained by B & P's analysis. This is so because their initial vowel alternates in the plural, viz. θiḍiwa 'backs', θirsal 'pillars', which makes it non-constant and hence subject to the changes in the CS. Since the initial vowel of nouns such as these remains unaffected, we have an important argument against B & P's criterion for predicting vowel constancy. Notice that this does not represent a problem for an analysis, such as SSA, which utilizes the distinction [± derived].

The inadequacy of B & P's criterion for predicting the constancy of the initial vowel is further revealed by the investigation of the CS formation in Twareg. In Twareg the initial non-round vowel of a singular noun can be alternating in the plural and yet remain constant in the CS. This contradicts B & P's claim that, if a vowel alternates with i in the FS plural, it is non-constant and thus subject to the changes in the CS singular and plural. This is illustrated in (33). The data are drawn from Prasse (1974), vol. 3, p. 20.

(33) a. FS (sing.) FS (plur.)

[ama:kras] [ima:kra:san] 'provider(s)

[tasa:kayt] [tisa:kayi:n] 'young camel(s)

b. CS (sing.) CS (plur.)

[ama:kras] [ma:kra:san]

*[ma:kras], *[imə:kra:san],

*[əma:kras] *[əma:kra:san]

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6.6 Conclusion. The purpose of this chapter was to investigate a particularly vexing problem in Berber grammar - that posed by the inconsistent behavior displayed by nouns in the CS. The aim was twofold. First, it was to present as clearly as possible all the facts about the CS formation in Berber. Second, it was to explore the possibility that the changes which affect the initial root vowel of the nouns in the CS may be phonologically conditioned. This possibility was denied by the previous approaches to this problem. The traditional approach assumed that only usage - hence memorization - can determine which nouns undergo the changes in the CS and which do not. Basset and Picard claimed to have found a solution to the problem. Whether a noun is affected or not depends on whether its initial vowel alternates in the plural. According to B & P, only those nouns with an alternating initial vowel undergo the changes.

Both approaches were shown to be inadequate on empirical and principled grounds (cf. Sections 6.4 and 6.5 above). Given our present knowledge of Berber, the syllable structure analysis, while not totally free of problems, seems to meet the criteria of descriptive adequacy better than do the traditional approaches. Until a more thorough investigation of the CS formation is undertaken, it is this latter analysis which appears to be more intuitively satisfying.

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Footnotes to Chapter 6.

1. With respect to the CS formation, the prepositions can thus be subdivided into two groups. Some of the prepositions after which the nouns are affected in the CS are: i 'to', y 'in', amm 'like', s 'with (instrumental)', zeẓ 'from', addaw 'under', etc. The prepositions after which the nouns are affected in the CS are: s 'to (directional)', gend 'or', all 'until', qbel 'before', bla 'without' and bled 'after'.

2. The changes θ + θ -> [tt] and θ + z -> [dz], in the first and second forms respectively, are due to regular assimilation rules in Berber. We have taken the liberty to supply them. For some inexplicable reason, Basset and Picard give the following phonetic forms for 'ewe': [θzimmerθ], and [θzammarin]. These forms are not accepted by Iqbayliyen.

3. [± C] is of course an exception feature. According to Chomsky and Halle, it should be, by convention, spread to every segment in the morpheme (cf. SPE p. 175). But to specify all vowels in a stem with an alternating initial vowel as [+C] makes little sense, since it is only the first vowel which is either deleted or retained. There are a few instances of alternating (i.e. non-constant) non-initial vowels in the plural (e.g. θizimmerθ 'ewe': θizammarin 'ewes'), but these are completely unsystematic and represent the exception rather than the norm. Thus, the application of Chomsky and Halle's convention merely complicates matters.

4. The concept of 'global rules', first introduced for phonology by Kisseberth (1970), is still the object of much debate. See Kiparsky

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(1973), Dinnsen & King (1972), Dinnsen (1975) for some arguments against global rules, and Miller (1975) for arguments in their support. Nevertheless, the Berber data appear to support Kisseberth's contention that global rules, i.e. rules which require access to the derivational history of segments (or forms), be incorporated into the theory.

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APPENDIX: The plural and intensive form derivations

The purpose of this appendix is to provide more information about the plural formation and the intensive form derivations in Tamazight Berber. These processes were touched upon in the main body of this study. However, for expository purposes, only few aspects of the derivations were exemplified. In what follows a fuller description of them is given. (For more information, see Abdel Massih 1971, Penchoen 1973, and Harries 1974).

1. The plural formation. Noun pluralization in Berber is achieved via one of the following means: (i) suffixation, (ii) vowel ablauts: mostly a replacement of a stem vowel with a or u, (iii) a combination of the first two means, (iv) procliticization of an unbound morpheme, id. (This is, of course, in addition to the alternation of the initial vowel, sing. a --> plur. i, and the automatic deletion of the feminine singular suffix -t). An illustration of these means is given in (1).

(1) a. Suffixation

	sing.	plur.	gloss
masc.	amazig	imazigen	'Berber man/men'
fem.	t-amazig-t	t-imazig-in	'Berber woman/women'

b. Vowel ablauts

masc.	amaz-ir	imizar	'camping ground(s)'
	axbu	ixba	'hole(s)'
	amalu	imula	'shadow(s)'

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(ii)	ameçsa	imeçsawen	'shepherd(s)'
(iii)	ixef	ixfawen	'head(s)'
(iv)	awal	iwaliwen	'speech, word(s)'
(v)	agerda	igerdayen	'rat(s)'
(vi)	arwa	irwaten	'threshing(s)'

b. Fem. Nouns

(i)	tagatt	tigetten	'goat(s)'
(ii)	tadla	tadelwin	'sheaf(s)'
(iii)	tizemt	tizmawin	'lioness(es)'
(iv)	targa	targiwin	'sock(s)'
(v)	tirritt	tirryin	'live charcoal(s)'
(vi)	talemt	tile matin	'camel(s)'

As can be seen from the data above, the synchronic situation is hopelessly complex.

However, based on internal reconstruction, dialect comparison and comparative evidence from other Afro-Asiatic languages, it can be hypothesized that the plural formation in Berber originally involved only two means. They are: initial vowel ablaut in conjunction with either suffixation of /-n/ (masc.) and /-in/ (fem.), or replacement of a stem vowel with a. Note that this last means is widely attested in Afro-Asiatic languages. It is involved in the derivation of the so-called broken plurals. All the other suffixes result from secondary developments.

2. The intensive form (I.F.) derivation. The means involved in the derivation of the intensive form from the zero form (Z.F.) are as follows: (i) prefixation of /tt -/ to the stem, (ii) gemination of a

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stem consonant and (iii) the combination of either prefixation or gemination and the insertion of a. The I.F., it should be recalled, is the shape of the verb in the Imperfect/Habitual aspect, while the Z.F. is the shape of the verb in the Imperative (cf. Chapter 4). As seen in (3), prefixation is used to derive the I.F. of verbs with underlying plain vowels, and verbs with an initial geminate consonant.

(3)

Z.F.	I.F.	Gloss
amez	tt-amez	'to hold'
fafa	tt-fafa	'to wake up'
kker	tt-kker	'to get up'
ddu	tt-ddu	'to go'

As seen in (4), gemination is the process by which the I.F. of native triconsonantal verbs with no plain vowels is derived.

(4)

Z.F.	I.F.	Gloss
ezdeg	zeddeg	'to dwell'
erzem	rezzem	'to open'

Native verbs which end with u also form their I.F. via gemination, e.g. erzu : rezzu 'to look for'. For this reason, we may hypothesize that this u is actually a consonant underlyingly, viz. /w/. The combination of prefixation and insertion of a is required by verb quadriconsonantal stems with no plain vowels. (As stated in Chapter 3, geminates count as sequences of two consonants). This is illustrated in (5).

(5)

Z.F.	I.F.	'Gloss'
berrem	tt-berram	'to turn'
serwet	tt-serwat	'to thresh'

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	sing.	plur.	gloss
fem.	t-amaẓir-t	t-imizar	'land(s)'
	t-aqqmu-tt	t-iqqma	'little mouth(s), kiss(es)'

c. Combination of a. and b.

masc.	azger	izgaren	'bull(s)'
fem.	t-afus-t	t-ifassin	'little hand(s)'

d. Procliticization

xali	id xali	'maternal uncle(s)'

(Notes: 1) the list is not exhaustive, 2) spirantization is disregarded here, 3) e = [ə].)

The suffixation process involves a fairly rich variety of suffixes. In addition to /-n/ (masc.) and /-in/ (fem.) shown in (1a), the suffixes given in Table I and exemplified in (2) are also used in present-day Berber dialects:

TABLE I

Masc. Nouns		Fem. Nouns	
(i)	-an	(i)	-en
(ii)	-wen	(ii)	-win
(iii)	-awen	(iii)	-awin
(iv)	-iwen	(iv)	-iwin
(v)	-yen	(v)	-yin
(vi)	-ten	(vi)	-atin

(2) a. Masc. Nouns

	sing.	plur.	gloss
(i)	azur	izuran	'root(s)'

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The combination of gemination and insertion of a is required by biconsonantal stems with no plain vowels, as seen in (6).

(6)

Z.F.	I.F.	Gloss
ens	nessa	'to spend the night'
ers	erras	'to land'

Given the above facts about the intensive form derivation, we can predict, on the basis of the phonological shape of the verb stem, which of the means is to be utilized.

1) Gemination of the second radical consonant is the means selected by native triconsonantal and biconsonantal stems with no plain vowels. (This leaves out stems such as ers 'to land', but these are only a few: 5 items to be exact).
2) Prefixation of /tt-/ is the process selected by other verbs.
3) The vowel a is inserted after the geminated second consonant of biconsonantal stems, and before the last consonant of quadriconsonantal stems. These stems are without plain vowels.

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