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30. Current Issues in Semitic Phonology

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0 Introduction

A great variety of phonological properties of Semitic languages, especially Arabic and Hebrew but also Tigrinya, Amharic, and Aramaic, have been studied within modern phonological frameworks. In fact, the very first work within the generative phonological tradition (Chomsky 1951) and several works that lead up to that tradition were analyses of Semitic languages. These languages have attracted the attention of phonologists for several reasons:

- · Some Semitic languages exhibit phonetic properties, especially the use of the pharynx as a main or secondary place of articulation, that are rare in the languages of the world.

- · The Semitic languages are notorious for the discontinuous or nonconcatenative structures that pervade their morphologies and interact in many ways with their phonologies.

- · The Semitic family consists of a group of closely related languages which are fundamentally similar but nevertheless exhibit a wide variation in phonological structure; this is especially salient within the Arabic language family, where classical or standard Arabic is essentially identical to the ancestor of the many vernacular dialects, most of which are similar in their inventories of segment types and features but diverse in such properties as syllable structure.

- · There is a long history of study of many of these languages, beginning with sophisticated and hotly argued debates among Arabic and Hebrew grammarians in the Middle Ages, and continuing with comprehensive grammars and dictionaries within the Western philological tradition and with excellent structuralist work including several superb structuralist grammars.[1] Consequently it has been possible to propose and test analytical hypotheses with relative ease, compared to many non-Western languages.

1 The Role of the Pharynx

The Semitic languages are famous for possessing consonants articulated in the pharyngeal and uvular region, and consonants, chiefly apicals, with a coarticulation in that region. The phonetics of this coarticulation are complex, usually described as including pharyngealization, velarization, labialization, and sometimes additional gestures. As a cover term for this varying constellation of properties the traditional term "emphatic" is useful. (Other cover terms sometimes used are "flat" and "back.") Acoustically the chief mark of emphasis is a lowering of the second formant in vowels and sonorants.[2]

Lexically, emphasis is in most cases a property of one or more consonants of a root morpheme, rather

than of an affix or of a vocalic stem morpheme. Thus in Cairo Arabic [ṣaạ

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ib] "friend", the source of the emphasis in the first syllable is the ṣ of the root ṣ

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b, rather than either the vowel morpheme *ai* or the prosodic template CVVCVC, as the latter two are found in the word [kaatib] "writer" with no emphasis. Phonetically, however, emphasis frequently spreads, affecting a string of adjacent segments, so that the phonetic domain of emphasis ranges from a single consonant, to one or more syllables (as in [ṣaạ

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ib]), to a whole word. Thus in [ṣạ

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bạķ] "your-(masc.) friend", underlyingly

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aah

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ib + *ak*, the entire word is emphatic, while in [ṣạ

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bik] "your-(fem.) friend" only the first syllable is affected. The chief phonological problem in the analysis of emphasis in any language is to predict the extent of the spreading.

The character of emphasis as a prosodic or "long" component in a Semitic language was first recognized by Iushmanov (1938), writing about a dialect of modern Aramaic in which emphasis most often affects an entire word. The suggestion of Charles Ferguson that emphasis in Arabic can be analyzed as a long component or prosodic feature was adopted by Harris (1942, 1944) and by Lehn (1963), who demonstrated that in Cairo Arabic emphasis is a property of syllables as a whole, and examined several alternative surface-phonemic representations, all of which are observationally adequate: (a) mark all emphatic consonants (

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ti "you-(fem.) honored"; (b) mark all emphatic vowels (*šạrrạfti*); (c) mark all emphatic segments (

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aṛṛạ

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ti; (d) mark each emphatic syllable (.*šar.rafti*); he considers (c) and (d) to represent prosodic analyses.

Lehn prefers representation (d) because it involves the smallest number of units with the greatest freedom of distribution and the minimum of morphophonemic alternations. Broselow (1976, pp. 32–47; 1979) was the first to write generative rules specifying the extent of spreading of emphasis in any language, and the nucleus of Broselow's analysis was translated into autosegmental terms by Van der Hulst and Smith (1982). The first extended autosegmental treatment of emphasis was by Card (1983, pp. 126–152).

In the Arabic dialects described by Broselow, Card, and Herzallah (discussed below), the spreading of emphasis in a word is strictly limited by factors which include the direction of spreading, the type of syllable, and the particular vowels and consonants involved. In some varieties of Aramaic and Arabic spoken in Kurdistan, emphasis generally spreads throughout a word.[3] Hoberman (1988) analyzes one such Aramaic dialect, proposing that the emphasis feature (represented by [+constricted pharynx] or [+CP]) in underlying forms is most often floating, i.e., unassociated with any segmental position, in which case it applies to the whole word including all affixes. In a small minority of words, such as [pešṭaṃal] "towel", the feature is underlyingly linked with a particular syllable, which must contain the vowel _a_, and spreads rightward to the end of the word, including suffixes, as in [pešwạẓ-ọx] "welcoming-you". A few derivational suffixes contain prelinked emphasis: [naqšḳaṛ] "engraver", cf. [naqš] "engraving".[4] The facts that nonemphatic pronunciation never spreads and that no affix is immune to the spread of emphasis show that [CP] in this language must be a privative feature, not binary: the negative value [–CP] cannot appear in the underlying representation of any root, stem, or affix. The privative nature of the feature also accounts for several other properties of this language: the lack of words with three sections, plain–emphatic–plain or emphatic–plain–emphatic; the absence of any affix that remains plain in an emphatic word; the fact that emphatic words are only half as numerous in the lexicon as plain words; and that in irregular, lexically marked alternations between plain and emphatic allomorphs it is always the more basic or general (less marked) form that is plain and the derived (or more narrow, more marked) form that is emphatic: [tmanya] "eight", [tmạni̯i] "eighty"; [brata] "daughter", [ḅḷaṇe] "daughters"; [idaa] "to come", imperative singular [ida], but imperative plural [iḍaṃụṇ].

McCarthy (1989, 1991, to appear) has presented an array of arguments demonstrating that the "guttural" consonants, i.e., the laryngeals ? _h_, the pharyngeals

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, and the uvulars χ

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, form a natural class that functions in many processes in various Semitic languages, processes which are independent innovations in the various languages, and proposed representations for them in terms of feature geometry. He introduces the feature [pharyngeal], which characterizes not only all six gutterals but also the uvular _q_ and the coronal emphatics such as ṣ ṭ, etc.[5] The following is a selection of the evidence presented by McCarthy.

> (1) Well-known co-occurrence restrictions limit the consonants which may appear together in an Arabic root (Greenberg 1960); in general, two homorganic consonants do not appear together. While there are a small number of exceptions, the statistics show that the gutterals ? _h_
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> ħ
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> ʕ

χ

К

co-occur significantly less often than expected from their frequency in the language. The uvular stop *q* avoids co-occurring either with the six gutterals or with the velars,[6] but it has a closer affinity (stronger avoidance of co-occurrence) with the velars than with χ

К

. These restrictions follow formally from the Obligatory Contour Principle (see chap. 12, this volume) in combination with a language-specific rule forbidding the feature [pharyngeal] from spreading, that is, being linked (in underlying form) with more than one root consonant.

(2) Syllable-final gutterals are avoided in Biblical (Tiberian) Hebrew and in Beduin Arabic by the insertion of epenthetic vowels (except at the end of a stem). In the Arabic case this is known as "the *gaháwah* Syndrome" (Blanc 1970, pp. 125–127) from the word for "coffee" (from *qahwah*), a typical instance. While this applies with some morphological limitations and variably in some cases (both *á*

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la and *a*

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ála "nicer" occur), it apparently applies equally with all the gutterals except ?, which does not exist in the dialect:

(1)

Plain roots		Guttural roots	
ašrab	"I drink"	aħalam	"I dream"
		aʕarf	"I know"
		aχabar	"I know"
yašrab	"he drinks"	yaharǰ	"he speaks"
bnašrab	"we drink"	bnaˠazil	"we spin (thread)"

The phenomenon in Hebrew is similar, with *ya*

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âlom "he dreams", compared with *yiktob* "he writes".

(3) In both Ge'ez (classical Ethiopic) and Hebrew short vowels assimilate in height (and in Hebrew in backness and roundness as well) across a guttural. Ge'ez has two short vowels, *i* and *a*. Before a guttural only *i* appears if the vowel after the gutteral is *i* or *ii*, and only *a* appears if the following vowel is *a*.

(2)

Sound root:	yinabbir	
Guttural roots:	ya?ammin	yili??ik
	yaħanniṣ	yisiħħit
	yaʕakʼkʼib	yibiʕʕil
	yaχabbir	yi?iχχiz

(4) In both Hebrew and Tigre (Raz 1983, p. 4) the gutterals ? *h*

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never appear geminated, even in morphological environments in which other consonants are geminate. Both languages lack the velar / uvular fricatives χ and

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McCarthy's work raises but leaves unresolved several questions concerning the affinities and differences in the phonological behavior of the six gutterals, the uvular *q*, velar *k g*, and coronal emphatics such as ṭ ṣ, and how these differences are to be expressed in a feature–geometry framework. These questions are treated in detail by Herzallah (1990), in a work characterized by meticulous attention to acoustic and articulatory phonetics. Herzallah treated a Palestinian Arabic dialect, examining many rules involving this group of sounds and many problems of feature hierarchy and adjacency.

Herzallah, following unpublished work by George N. Clements and the proposals by McCarthy mentioned in the preceding paragraphs, adopts a framework in which a single set of features characterizes both consonants and vowels: [labial], [coronal], [dorsal], and [pharyngeal].[7] In consonants these features are dominated by the node "C–place," while the same features dominated by the node "V–place" determine both the quality of vowels and secondary articulations of consonants. The following are examples of Palestinian Arabic sounds and their underlying feature specifications (Herzallah 1990, p. 249). Derived feature specifications are in parentheses.

(3)

Segments	C-place	V-place
tsd̠zr̠	[+coronal]	[+dorsal, +pharyngeal]
k	[+dorsal]	[-dorsal]
xġKᵇ	[dorsal, pharyngeal]	([-dorsal, -pharyngeal])
ħʕ	[pharyngeal, radical]	
h?	[pharyngeal]	
a		[pharyngeal]

These features make it possible to express the natural classes of segments that function in the phonology of this dialect. Three such instances are summarized here:

(1) The class of the emphatics, back velars, pharyngeals, and laryngeals, ṣ

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ẓ ṛ x g *K*

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h ʔ, consists of all consonants with [pharyngeal] under either the C-place or the V-place node. These trigger a rule of Feminine Vowel Assimilation, by which the feminine noun and adjective suffix *–i* is lowered to *a* ([a] or [a]) by acquiring the feature [pharyngeal] from the immediately preceding consonant. Examples: [barzi] "projection", [

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ilmi] "a dream", [zaṛaafi] "an ostrich", [quṭni] "piece of cotton-wool", but [marġa] "loitering", [fallaa

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a] "peasant woman", [zarrii

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a] "plants", [šaṭ

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a] "picnic", [ba

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a] "type of goods", [buṛh

ç

] "period of time".

(2) The class including the emphatic coronals ṭṣ

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ṛṛ and the back velars *x ġ K* is specified as having the features [dorsal, pharyngeal] dominated by either the C-place or the V-place node. The segments of this class trigger the change from *i* to *u* in the Imperfective of Form I verbs; [yunṣub] "he sets up", [yubluġ] "he reaches", but [yiktib] "he writes".

(3) The class of back-velar continuants, pharyngeals, and laryngeals (McCarthy's six gutterals: *x ġ*

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h ʔ) is characterized by the feature [pharyngeal] dominated by C–place, with the additional stipulation of [approximant] to exclude *K*. This class triggers the rule of Imperfective Pharyngealization, which applies in the same morphological situation as the preceding rule, Form I Imperfectives, and those verbs to which both rules could apply must be lexically marked to take one or the other. Imperfective Pharyngealization lowers the vowel *i* to [a] or [a]: [yifta

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] "he opens", [yimraġ] "he stains", [yis?al] "he asks".

2 Templatic Morphology

In a word containing a Semitic–style discontinuous consonantal root such as Arabic *kaatib*– "writer", the root consonants behave in some respects as though they were adjacent, despite the intervening vowels, as if they formed an abstract entity separate from the vowels. For instance, the consonantal root may be shared with other words with related meanings, and so constitute a morpheme; there are also restrictions on the segments that may co–occur in a root, restrictions that do not apply to affixal segments. Early attempts to formalize this bivalent structure took the shape of a transformational rule of interdigitation (for instance Chomsky 1951, p. 28, rule MR3, discussed in McCarthy 1981, pp. 414–416), basically of the form $C_1C_2C_3+V_1V_2 \rightarrow C_1V_1C_2V_2C_3$. McCarthy (1979, 1981) introduced an autosegmental approach to such structures by proposing what later came to be called the Morpheme Tier Hypothesis: the segments of a morpheme lie on its own autosegmental tier, separate from the segments of other morphemes. Chomsky's interdigitation rule was replaced by the conventions of autosegmental association, which had been developed in the analysis of phonological, not morphological, processes.

The most extensive and penetrating analysis of a Semitic language in terms of templatic morphology is Health's (1987) analysis of Moroccan Arabic. He finds that morphological processes may work through three general kinds of mechanisms (Heath 1987, p. 3):

> 1 The "*local–rules model*: the output is based on the input shape with one or two specific phonological operations applied to it (geminating a C, infixing a V, or the like). This model would be most attractive for ablauts in which a wide variety of input shapes is associated with a similarly wide variety of output shapes." Heath concludes that this is not a suitable model for the ablaut (internal stem changes) he is examining, though of course it is the mechanism of ordinary linear affixation.

> 2 The "*fixed–template model*: the input is mapped onto an output such as /CCaCC–i/… consisting (in MCA [Moroccan Colloquial Arabic]) of unfilled C positions and already specified Vs… This model is appropriate for ablauts whose output shape is invariant although inputs of various shapes feed into it…"

> 3 The "*template–plus–projection model*: the output consists of a fixed template such as /CCiC/ at the begining or end, plus a *projection* of variable canonical shape and length that carries over those input segments that are not involved in the mapping of the input onto the partial fixed template."

> An example of the template–plus–projection model is the process of forming broken plurals, that is, noun and adjective plurals formed by changing the syllabic makeup and vocalism of the stem (Heath 1987, pp. 100-113). The output of the pluralization process is represented as a fixed template containing a projection variable:

> (4) Moroccan Arabic Nominal Plural Ablaut (Heath 1987, p. 108) Output Representation "/CCVCX*/, where V is /a/ when X* is nonnull, and is otherwise a lexical choice among / a u/ (rarely /i/), with /u/ as the default choice."

The process also involves several rules, specific to ablaut (broken) plurals, which determine vowel

selection and manner of association.

This general approach to nonconcatenative morphology has been recast in terms of prosodic units (mora, syllable, and foot) by McCarthy and Prince (1990a, 1990b) and broadened to accommodate the analysis of many more kinds of morphological processes, especially reduplication. McCarthy and Prince's solution to the broken plural problem is essentially the same as Heath's except for their prosodic formulation.[9]

Bat-El 1989 proposes that much of the work which in other analyses has been performed by templatic morphology can be accomplished, at least for modern Hebrew (and to a more limited extent in Arabic) by rules of syllabification. Taking as input linear representations annotated to indicate consonant clustering potential, the syllabification rules accomplish the interdigitation of roots and patterns, after which the separate identity of morphemes is not required. Derivation of new words is based not on preidentified roots but on sequences of consonants extracted from existing words.

3 Association Conventions

One problem of Semitic morphology for which many solutions have been proposed has nonetheless still not gone away. Arabic verbs of Conjugation II (and similar conjugations in most Semitic languages) always have geminate middle consonants, as in *kattab-a* "he made (someone) write". Arabic roots and prosodic stem templates are regularly aligned by autosegmental association from left to right, and this direction of association and consequent spreading accounts for the large number of stems from biconsonantal roots in which the second consonant of the root morpheme appears twice, as in *ra*

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d-a "he returned", *radad-tu* "I returned" and for other facts of Arabic morphology (McCarthy 1979, 1981). No stems appear with duplication of a root segment in the other direction: **radad-tu*. Furthermore, just such left-to-right spreading takes place in Conjugation IX forms of triconsonantal verbs, such as

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marar-tu "I turned red". Several approaches are conceivable for distinguishing the association pattern of Conjugation II (*kattab-tu* from that of Conjugation IX (

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marar-tu). Nearly all the proposals take for granted that Conjugation II and similar structures involve some sort of ad hoc rule, lexical or grammatical marking; the main options for this approach are to incorporate the ad hoc marking into the stem template through some elaboration of the formalism (Heath 1987, pp. 69-71; Goldsmith 1990, pp. 93-98; Farwaneh 1990), or to specify these forms as undergoing a rule which repairs an inappropriate initial pattern of association (McCarthy and Prince 1990, pp. 44-48). Contrary to all these approaches it has been argued that it is Conjugation IX and similar patterns that are the exceptional cases while the far more productive type represented by Conjugation II is the normal pattern in a variety of morphological categories in several Semitic languages (Hoberman 1988). These facts fall out automatically if the fundamental principle of association is not left-to-right but edge-in (Yip 1988). In Heath's treatment of Moroccan Arabic morphology several derivational processes involve edge-in asociation, while other derivtional processes require left-to-right asociation; the direction of asociation must be specified for each process.

4 Other Topics

Several other areas in the phonologies of Semitic languages have received significant attention from theoreticians in recent years, and it is impossible to do more here than to mention the most salient of recent publications.

A great deal of work has been done on the interrelated problems of syllable structure, epenthesis, and stress in various Arabic dialects and in Biblical Hebrew. On Arabic see Angoujard (1990) and Broselow (1992). Rappaport (1994) is a treatment of Biblical Hebrew stress and vowel length and reduction in terms of metrical trees and the grid.

1 The indigenous Arabic grammatical tradition has become much more accesible in recent years. See, for example, Owens (1988).

2 Languages of the Ethiopian Semitic group have ejective stops and fricatives in place of the pharyngealization, etc. of the other Semitic languages. Thus the first consonant of Tigre *šalót* "prayer" (Raz 1983, p. 10) is ejective, while the cognate consonant in Arabic *sala:* (t) is pharyngealized. Both are traditionally called "emphatic" and indicated with an inferior dot. In contrast to the traditional usage, I restrict both the term emphatic and the dot to the Arabic type, pharyngealization.

3 Heath (1987, pp. 295–326) describes a variety of Arabic in which the distribution of Arabic in which the distribution of emphasis remains predominantly a matter of underlying emphatic consonants with spreading, but the system is in the process of moving toward one of emphasis harmony afecting whole words.

4 This example illustrates the fact the there is no necessary co-occurrence between uOvular articulation and emphatic coarticulation: q can occur in plain environments and k can occur in emphatic ones, where it can have an allophone [k]. This fact has yet to be incorporated into a system of phonological feature (see work by McCarthy and Herzallah discussed below).

5 Thus the set of segments characterized by the feature [pharyngeal] includes much more than the pharyngeals of traditional phonetic terminology. McCarthy stresses that this feature refers not to the active articulator (which may be the vocal cords or the dorsum of the tongue) but to the general region of the articulation, which is the oropharynx as a whole.

6 Arabic jO behaves as a velar in this respect as well as in other ways.

7 Herzallah's analysis (following Clements's unpublished work) requires that some features be equipollent (or bivalent) rather than privative.

8 These sounds, corresponding to χ

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q in other varieties of Arabic, are back velar but not uvular in Herzallah's dialect. Consequently the low vowel in their vicinity is [a], not [a] – in this dialect it is only the emphatic coronals that conditon the back allophone [a]. In this dialect, too, k is front velar and slightly palatalized, varying for some speakers with [č]. Not only do the back velars x ġ *K* not constitute a source for the spread of emphasis, as their cognates χ

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q do in some other dialects, but they even triger de-emphaticization of underlying emphatics: the emphatic sounds [ṣ

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ṛ] do not appear to the left of a back velar in the word, so the dialect has [sabaġ] "he dyed," [

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aaK] "it became narrow," cf. Classical Arabic *ṣabara*,

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aaqa. There is no such restriction on [t].

9 McCarthy and Prince appear to have discovered the solution independently of Heath.

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