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Part I

Part II: Studies in Native American Languages XI

The Interaction of Stress, syllable Structure, and Gemination in Jordanian Arabic (JA)

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Abstract: The purpose of this study is to show that certain cases of heteromorphemic gemination can be better explained through showing their relatedness to syllable structure and stress (cf. McCarthy (1979) and (1986)). The data show that stress and syllable structure play a major role in creating some cases of heteromorphemic gemination. Moreover, the paper focuses on viewing assimilation, which also plays a role in creating other cases of heteromorphemic geminates, as a spreading phenomenon. The data discussed in this paper are from Standard Arabic (SA), JA, and Palestinian Arabic (PA). Major theories about gemination are briefly presented in this paper.

1. Views on Gemination:

There have been three main views about the nature of gemination. The first one views geminates in terms of syllable structure. Gemination has been viewed as the process of rearticulation of a consonant. Geminates are seen as two identical consonants, one which fills the coda and the other which fills the adjacent onset (Delattre (1971)). Delattre observes that geminates differ from single consonants in that they have two phases in their articulation. The first phase constitutes a syllable-final-occurrence of the consonant (in the coda), and then the same consonant is rearticulated in the next syllable-initial position (in the onset). The second view deals with geminates as long consonants. Ladefoged (1971) argues in support of this view by showing examples from Italian and Spanish in which 'short' consonants contrast with long consonants in minimal pairs. He illustrates that morphemes with short consonants contrast with morphemes with long consonants in some languages. Such a distinctive contrast is traced in Italian and Spanish (Majdi and Winston (1993)):

1. a. Italian: fitto [fit:o] 'done' and fato [fato] 'fate'.

b. Spanish: perro [per:o] 'dog' and pero [pero] 'but'.

The third view, advocated by McCarthy (1979) and Leben (1980), represents the autosegmental analysis of geminates. According to McCarthy's ((1979) and (1986)) autosegmental analysis, geminates are analyzed as single segments mapped onto two skeleton slots. McCarthy analyzes the Arabic paradigms (binyans) as prosodic templates that have biconsonantal or triconsonantal roots. He argues that two templates (3) are needed to generate the binyans:

2. a. 

→ samma 'poisoned'

b. 

sallam 'shook hands'

3. a. CV((CV) [+seg]) CVC

b. CCV ([+seg]) CVC

[+seg] refers to an element that can be either a consonant or a vowel, depending on the binyan. The binyans in (4a) can be generated by the first template (3a), while the ones in (4b) can be generated by the second template (3b):

4. a. CVCVC → katab 'wrote'
CVCCVC → kattab 'made write'
b. CCVCVC → ktatab 'write, be registered'
CCVCCVC → staktab 'write made, write'

It is clear that Ladefoged and McCarthy agree on the idea that a geminate should be represented as one segment. Delattre, however, argues that a geminate should be represented as two identical segments.

2. Constraints on gemination:

Kenstowicz and Pyle (1973) and Guerssel (1978) established the well-known generalization in (5):

5. Geminate structures cannot:
   a. be split by epenthesis,
   b. allow one half of the cluster to undergo a rule that the other half does not undergo

That is, geminates cannot be separated by inserting a vowel between them as in (6a) below:

6. a. kattab 'made write' → *katatab
   c. gul-t 'I said' → gul-it

Semitic Spirantization[1] is a good example that explains the second part of the generalization. Spirantization is a set of rules that turn a postvocalic stop into a spirant However, the following example (7) from Tigrinya shows that this process fails to affect [k] although the first X-slot in the geminate is postvocalic (Schein and Steriade (1986)). The only explanation for this exception is to argue that since 'k' is a geminate, no rule can affect half of the 'cluster' without affecting the other:

7. a. f a k a r a
   X X X X X X

   *b. f a x k a r a
   X X X X X X

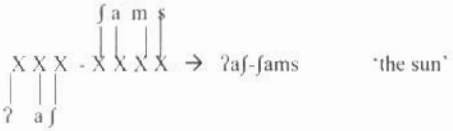
The second well-known constraint, which is advocated by McCarthy (1986), is 'the Obligatory Contour Principle'(the OCP):

8. Obligatory Contour Principle
   In a given autosegmental tier, adjacent identical segments are prohibited.

He argues that since a geminate is represented as one segment that is mapped onto two skeleton slots, the existence of identical X-slots does not violate the OCP:

9.  'he tore'

A heteromorphemic geminate does not violate the OCP although it is represented as two adjacent identical segments. This is because the identical segments belong to different morphemes and are represented on different autosegmental tiers:

10.  'the sun'

→ ʔaʃ-ʃams

This analysis suggests that we can distinguish two types of geminates: monosegmental geminates (11a) and bisegmental geminates (11b). According to McCarthy (1986), tautomorphemic geminates are monosegmental, whereas heteromorphemic geminates are bisegmental:

11. a  b. 

To sum up, McCarthy (1979) and (1986) provides a vivid analysis of geminates in Semitic languages. He introduces templates that would generate the SA binyans. Moreover, he distinguishes between tautomorphemic and heteromorphemic gemination. In tautomorphemic gemination the geminate is represented as one segment mapped onto two skeleton slots, whereas in heteromorphemic gemination the geminate is viewed as two identical segments that are represented on different autosegmental tiers. Since the identical adjacent segments of a heteromorphemic geminate belong to two different morphemes, and hence represented on different autosegmental tiers, the OCP is not violated.

Heteromorphemic geminates generally result from either assimilation or deletion (Guerssel (1978), McCarthy (1986)):

12. a. ʔal-ʃams → ʔaʃ-ʃams 'the sun' (Assimilation)

b. ʔal-qamar → *ʔaq-qamar 'the moon'

c. ta-tabbaʕ → t-t-abbaʕ 'followed' (Deletion)

(12a) is an example of a well-known phonological rule in Arabic in which the coda of the definite article 'ʔal' assimilates to the onset of the following syllable provided that the onset is [+coronal]. This justifies the oddness of (12b), where the onset of the syllable that follows the definite article is [+Dorsal]. In (12c) the deletion of [a] between the first and second [t] results in a heteromorphemic geminate.

The data from JA raise serious questions about the analysis of heteromorphemic gemination. In fact, some cases of heteromorphemic gemination, as in (13a) and (13b), are not accounted for in McCarthy's analysis:

13. a. ʕaduw 'enemy'

b. ʕaduww-uk 'your enemy'

14. a. gul-t lah 'I said to him'

b. gul-t-illah 'I said to him'

A detailed discussion of these two cases will be provided later in the discussion. The next section focuses on the nature of the relation holding between syllable structure and stress.

3. Stress and syllable structure in JA:

Brame (1974) presents an interesting scenario of stress assignment in (PA). He argues that stress is assigned according to the following conditions:

14. a. The final syllable of a word receives the stress only if it contains a long vowel or ends in a consonant cluster.

b. If the last syllable of a word does not attract the stress, accent the rightmost heavy syllable of the word, otherwise, the first syllable is accented provided that it does not exceed the antepenult.

As stated in (14), the location and heaviness of the syllable are connected to stress assignment in PA. Heavy syllables in PA (as well as in JA) can be: CVC, CVCC, CVV, or CVVC. The following examples illustrate the conditions mentioned above in (14):

15. a. kátab 'he wrote'

b. kátab-u 'they wrote'

c. kataáb-na 'we wrote'

d. daras-tii 'you f. sg. studied'

e. darás-t 'I studied'

f. daras-uúk 'They studied you m. sg.'

The stress falls on the last syllable in (15d, e, and f) as the last syllable in each case either contains a long vowel (d and f) or ends in a consonant cluster (e). In (15c) the rightmost heavy syllable is accented, because the last syllable did not receive the stress. As expected, the first syllable is accented in (15b and a) due to the absence of heavy syllables, having in mind that the last syllable does not contain a long vowel or ends in a consonant cluster.

JA spoken in Amman, the capital of Jordan, is very similar to PA. Here I assume that the stress assignment rule stated above applies to JA as well. One important difference between the two dialects is that in JA words do not end in long vowels. For example, the word 'daras-tii' would be pronounced as 'daras-ti' in JA. That is, the morpheme 'ii' is pronounced as [i] in word-final position. However, it remains [ii] when it is followed by a consonant. The remainder of the words cited in (15) are pronounced the same way in JA.

To simplify stress assignment rule in JA, we can adopt a solution sketched in Kenstowicz (1994). We can introduce the device of 'extrasyllabicity' and argue that final consonants are extrasyllabic in JA. We can assume the following stress rule:

16. Accent the rightmost heavy syllable of a word, otherwise, the first syllable is accented provided that it does not exceed the antepenult.

Examples (17a, b, and c) illustrate how extrasyllabicity simplifies stress assignment rule in JA:

17. a. katab	→ kata<b>	→ káta<b>	'he wrote'
b. daras-uuk	→ daras-uu<k>	→ daras-uú<k>	'they studied you sg. m.'
c. daras-kum	→ daras-ku<m>	→ darás-ku<m>	'he studied you 3pl.'
d. ʕaduw	→ ʕadu<w>	→ ʕadú<w>	'enemy'
e. saxiy (SA)	→ saxi<y>	→ saxí<y>	'generous'

In (17a) [b] becomes extrasyllabic, and since the last syllable is no longer heavy, the stress falls on the first syllable. The last syllable attracts the stress in (17b), because it is still the rightmost heavy syllable even after [k] becoming extrasyllabic. The penult in

(17c) becomes the rightmost heavy syllable and hence attracts the stress after the extrasyllabification of [m]. However, (17d and e) apparently violate the simplified stress rule stated in (16). One explanation for this exception lies in the nature of glides. It has been argued that glides are different from the rest of consonants. Ladefoged (1993), for example, refers to glides as semivowel. As we will see later in the following sections, glides are also an exception to other generalizations that are related to assimilation and gemination in JA.

So far, the data presented in this section indicate that in JA the stressed syllable might be light in mainly one environment, word-initial position. That is, any stressed syllable in a word must be heavy unless it is the first syllable where it can be either heavy or light. However, there is only one case (18b) where a light syllable is stressed in a non-initial position, which apparently violates the generalization made above. In fact, both words in (18a and b) are used in JA:

18. a. katáb-t
    b. katâb-it

Abu-Salim (1980) argues that such an apparent exception is due to a rule of epenthesis[2] that applies after stress assignment:

19. katab-t

katab-<t>	'Extrasyllabicity'
katab-<t>	'Stress Assignment'
katáb-it	'Epenthesis'

Since onsetless syllables are prohibited in JA, [b] resyllabifies as the onset of the next syllable:

20

A formal condition on stress assignment in JA can be stated as follows:

21. Stressed syllables that occupy other than word-initial position must be licensed ([+L]). To be licensed, a syllable must be heavy.

The following examples explain the statement made above in (21):

22. a. mázaʕ 'he tore'
b. mazáʕ-na 'we tore'
c. mazaʕ-uú-ha 'they tore it'
d. d̪ˤarabuúk 'they beat you'
e. d̪ˤaráb-t 'I hit'

Examples (22b, c, d, and e) show that all stressed syllables in those environments are heavy, i.e., [+L]. Although the stressed syllable in (22a) is light, it does not violate the condition in (21), since it is in word-initial position. Notice that after the extrasyllabification of the last consonant in (22d and e), the last syllable is the rightmost heavy syllable that attracts the stress. On the contrary, after extrasyllabifying [ʕ] (21a), the last syllable is no longer heavy, and since there are no heavy syllables in the word, the first syllable is stressed.

4. Assimilation and heteromorphemic gemination:

As mentioned earlier, heteromorphemic gemination in Arabic results mainly from two phonological processes, assimilation and deletion (12). The following examples illustrate the role of assimilation in creating heteromorphemic geminates in various phonological environments in JA.

23. a. ʔal-naas → ʔan-naas 'the people'
b. ʔal-ðel → ʔað-ðel 'the tail'
c. ʔɪ-ð-t-akar → ʔɪð-ðakkar 'he remembered'
d. maʕat-t-ha → maʕatˤ-tˤ-ha 'I tore it'

The examples in (23) show that one consonant takes on some features of a neighboring consonant resulting in a geminate. In (23a) [l] takes on some features of [n], namely, the features that are related to manner of articulation. That is, [l] becomes [n] by assimilating [n]'s manner of articulation. In (23b) [l] assimilates the features that are related to place and manner of articulation of [ð]. However, more features are assimilated in (23c). [t] assimilates [ð]'s voicing, place and manner of articulation features. The only difference

between [tˤ] and [t] in (23d) is that [tˤ] is pharyngrealized whereas [t] is not. [t] assimilates to [tˤ] resulting in a geminate.

The process of assimilation can also be looked at as a phenomenon that 'spreads' some features from one consonant to another (see Schein and Steriade (1986)). For example, assimilation in (23a) can be viewed as spreading the features that are related to manner of articulation (e.g., [cont] and [nasal]) from [n] to [l]

We notice that the direction of assimilation is the same in the examples mentioned above (23). In all cases a consonant in the affix assimilates to a neighboring consonant in the root. The neighboring consonant in a prefix (e.g., 23a) or in an infix (e.g., 23c) assimilates to the first consonant in the root. Similarly, the neighboring consonant in a suffix assimilates to the last consonant in the root (23d). The opposite direction of the process (assimilation) results in unacceptable forms:

24. * a. ʔal-naas → ʔal-laas
    *b. ʔal-ðel → ʔal-lel
    *c ʔið-takar → ʔit-takkar
    *d. maʕatˤ-tha → maʕat-tha

Exceptions to the directionality of assimilation can be traced in examples like the ones in (25), where the first consonant in the root is a glide:

25. a. waʕaðˤ 'preached'
    b. ʔit-waʕaðˤ 'was preached'
    c. ʔit-taʕaðˤ 'was preached'
    d. yaʔis (SA only) 'gave up'
    e. ʔi-y-t-aʔas 'became desperate'
    f. ʔi-t-taʔas 'became desperate'

The examples in (25) show that a glide assimilates to the neighboring consonant in the prefix (25b) or to the neighboring consonant in the infix (25f). In fact, glides behave differently from the rest of the consonants. They are the only consonants that can be replaced with a relevant vowel, [u] for [w] and [i] for [y]:

26. a. waʕad (root) → t-uuʕid 'you promise'
b. ʕawad (root) → t-ʕuud 'you came back'
c. yabɪs (root) → t-ɪbas 'it becomes hard'
d. mayal (root) → t-miil 'you recline'

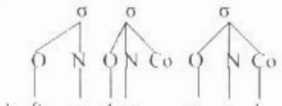
The fact that glides are the only consonants in a root that can be dispensed with by being replaced by vowels in cases like the ones in (26) is an indication of the possibility for glides to assimilate to other consonants in the affixes.

In the next section, we will see how syllable structure, stress, and spreading (assimilation) can explain cases of heteromorphemic gemination that have not been accounted for in earlier gemination studies.

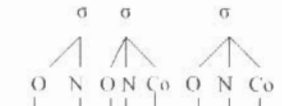
5. Heteromorphemic gemination and spreading:

This section elaborates on the role of stress, syllable structure, and spreading in creating cases of heteromorphemic gemination in JA. The association lines in (27c) and (28d) mean that an empty position is filled by spreading the consonant that occupies the onset of the following syllable:

27. a. ʕaduw 'enemy'

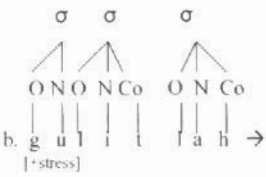


b. → *ʕaduw –uk 'your enemy'
[-L]

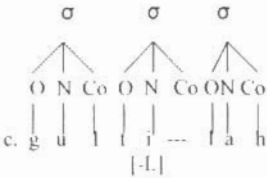


c. → ʕaduww-uk 'your enemy'
[+L]

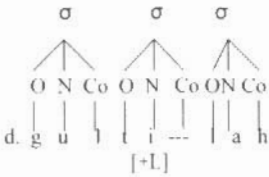
28. a. g u l-t l a h 'I said to him'
C1C2C3



b. gul-it lah → gul-it lah 'I said to him'



c. gultilah → *gultilah 'I said to him'



d. gultillah → gultillah 'I said to him'

The condition on stress assignment in JA (21) that we have argued for requires the stressed syllable to be [+L] in any position except in word-initial position. This means that (27b) is not acceptable because the stressed syllable is [-L]. For (27a) to be acceptable, the stressed syllable must be [+L], i.e. heavy. To make the stressed syllable heavy, we spread [l] in the onset of the following syllable to the coda of the stressed syllable, which renders the stressed syllable [+L]. This will result in the desired form (27c). The same argument can be made about (28). Notice that we have a cluster of three consonants in (28a), which is impermissible in JA, if we treat 'gul-t-lah' as one word[i]. In fact, if we treat 'gul-t-lah' as two words (gul-t lah), the problem is solved, because we end up with a two consonant cluster in 'gul-t' which permissible in JA (cf. (15e) and (18a)). However, consonant clusters can be broken through epenthesis which can occur between C_1C_2 (28b) (cf. (18b)) or C_2C_3 (28c). Stress location and the possibility of pausing after 'gul-it' without affecting the meaning indicate that (28b) should be treated

as being composed of two words. As we notice, the stress falls on the first syllable of 'gul-it' as expected after the extrasyllabification of [t]. However, (28c or d) should be treated as one word for two reasons. First, we cannot pause after 'gul-t' in both cases. Second, Jordanian speakers of Arabic, unexpectedly, tend to stress the second syllable rather than the first syllable of 'gul-ti-lah'. If it were two words, we would expect the stress to fall on the first syllable. The problem we face here is that for the second syllable to be stressed, it has to be [+L] as indicated by (21). We obtain the desired form by spreading the consonant in the onset of the next syllable to the coda of the stressed syllable, which causes the stressed syllable to become heavy, i.e., [+L] (28d).

The situation in (29) is different from the one in (28) in that no epenthesis takes place in (29):

29. a. g u l- t- ii- l ah 'you (f. sg.) said to him'

Recall that the morpheme that refers to 'you sg. f' in JA is pronounced as [ii] except when it occurs in word-final position where it is pronounced as [i]. As expected, the stress falls on the second syllable which is already [+L].

6. Summary:

This paper has been an attempt to study the interaction of stress, syllable structure, and gemination with respect to JA. The main emphasis of this paper is that certain cases of heteromorphemic gemination are better explained through showing the role of stress and syllable structure in deriving them. It has been argued that the OCP regulates and constraints the processes of gemination and antigemination (McCarthy (1979) and (1986)). McCarthy further argues that since heteromorphemic geminates are represented on different autosegmental tiers, the OCP is not violated. That is, the existence of

adjacent identical segments, as in the case of heteromorphemic geminates, is allowed because the two identical segments are in different morphemes.

The data presented in this paper show that some cases of heteromorphemic gemination can be easily accounted for through considering the relationship between stress and syllable structure, on the one hand, and heteromorphemic gemination, on the other. The main hypothesis in this paper is that the condition on stress assignment (21) triggers the derivation of the problematic cases of heteromorphemic geminates ((13) and (14)). To avoid violating (21), we have to license the stressed syllable by making it heavy. Spreading the onset of the neighboring syllable to the coda of the stressed syllable renders the stressed syllable heavy, which means that it becomes [+L] as required ((27) and (28)).

Glides are found to behave differently from the other consonants in two ways: first, they can assimilate to the consonant in the neighboring affix (25c). In fact, they are the only exception to the directionality of spreading (25) which is always from the root to the affix. Second, glides are the only consonants that can be replaced with vowels (26).

Notes:

[1] For more details see Schein (1981) and Kenstowicz (1982)

[2] $O \rightarrow \begin{matrix}-\text{syll} \\ +\text{high} \\ \text{around}\end{matrix} \quad \begin{matrix}V \\ \text{around}\end{matrix} \; C \text{ —— } C \; \left\{ \begin{matrix} \# \\ C \end{matrix} \right\}$ (Abu-Salim (1980))

[3] The raised symbol following the consonant indicates that the consonant is pharyngrealized (emphatic).

[4] Here I argue that 'gul-t' and 'lah' in (28a) are two words (at least when stress is concerned) because we can pause after 'gul-t' without affecting the meaning. However, 'gul-tillah' should be treated as one word because pausing after 'gul-t' is not acceptable in JA.

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