Chapter

Six

Stress in UHA:

a Derivational Account

6.0. Introduction:

In the previous chapter, the process of footing and stress assignment in UHA is investigated adopting the constraint-based framework of OT. This chapter provides the derivational alternative in an attempt to dispense with the relative complexity of the constraint interactions proposed there. As we experienced with chapters three and four above, this will contribute greatly to the realisation of the main objective of this study that provides a comparison between the rule-based and the constraint-based theoretical frameworks as far as the processes of syllabification and metrification in UHA are concerned.

Among other issues, chapter two provided the theoretical background pertaining to stress. There, the three major approaches to metrification, suggested in the DT literature, were summarised. In particular, the focus was on the different interpretations of the main principles and parameters governing the overall process of stress assignment, in those three approaches. Consequently, this chapter is divided into three main sections. Each is devoted to a theoretical approach, namely Halle and Vergnaud (1987), Hayes (1995), and Idsardi (1992). My goal is to provide the most elegant account of UHA's stress pattern. Primarily, I will compare the most plausible derivational accounts to what OT had to provide in the previous chapter. In this

respect, however, the claim this chapter aims to demonstrate is quite analogous to what we have experienced with syllabification above. As we shall see below, only the constraint-based framework of OT is capable of providing a plausible analysis of stress assignment in UHA, without depending on language-particular stipulation.

The fundamental weakness of any derivational account of stress in UHA is the conditioned application of some metrical rules. One of the challenges posed by the data we analyse, and Arabic in general, is the asymmetric syllable weight distinctions word-internally and word-finally. Utilising Extrametricality may partially contribute to the analysis, yet can bring about more complications. Trying to find an answer in a wholly different theory, that also has its own shortcomings but achieves extrametricality effects by employing an independently motivated principle (Idsardi 1992) will not be completely plausible. Anyway, this is just an example of the difficulties we face when we attempt a derivational account of UHA stress.

6.1. Rule-based Footing in UHA:

Although the contribution of Halle & Vergnaud (1987) was, and still is considered, substantial in most senses, it has its own drawbacks and shortcomings, at least as far as UHA is concerned. It is the purpose of this section to fully examine this claim by applying the basic principles of this approach to UHA. This will prompt us to talk about the independent principle "extrametricality", on which a good part of the overall structure of the argument in this section is built. Eventually, I will then present a set of stress rules for UHA. That set may not be completely perfect, however. This

will motivate us to look for a different solution within other derivational approaches to metrification.

In the previous chapter, we considered some data and were able to determine how stress works in this language. Consequently, we outlined a step-by-step algorithm manifesting the stress pattern of the language in question. For convenience, I give that algorithm in (1) below:

(1) a. Stress a final superheavy syllable,
b. Otherwise, stress a heavy penult,
c. Otherwise, stress a heavy antepenult,
d. Otherwise, stress a light penult or antepenult, whichever is separated from the first preceding heavy syllable or (if there is none) from the beginning of the word by an even number of light syllables.

If we carefully consider this stress pattern, we will notice some points that are indicative of the type and order of stress assignment rules in UHA. The first thing that attracts our attention is the fact that a final syllable is stress neutral unless it is superheavy. This point indicates that we must employ a restricted version of final syllable extrametricality. Therefore, we will only allow superheavy ultimas to take part in stress computations. Another trait of this stress pattern is the word-internal syllable weight distinction of light vs. heavy. It is obvious that a heavy penult or, if there is none, a heavy antepenult will attract stress regardless of the number and/or type of preceding syllables. Therefore, in what follows, and before introducing the set of stress assignment rules, I will address these two issues showing how they are analysed within the present framework.

We must start with the default case, (1 d). We have to aim at finding a way by which we can designate the antepenult or the penult as the head of the right-most

metrical constituent constructed on line 0. Unless we do that, we will not be able to assign it headedness of the whole form later in the derivation. This might be achieved by constructing bounded (binary) left-headed feet proceeding rightwards from the beginning of the form. This can only be done if we treat the final syllable as non-existing. Otherwise, the antepenult, in forms with an odd number of light syllables, may not be assigned main stress. In particular, it may not be assigned headedness of any peripheral constituent. This is illustrated below with a form like [ʃa.d͡ʒa.rá.tu.hu] 'his tree':

```
(2)                              *    line 2
       (*          *             *)   line 1
       (*     *)  (*    *)      (*)   line 0
      *ʃ a . d͡ʒ a . r a . t u . h u
```

Extrametricality is the device that will enable us perform this function, i.e. end our counting one syllable in.[1] In the particular case of UHA, I will mark the final syllable extrametrical, for the reasons clarified above, as illustrated in (3) below:

```
(3)                 *                       line 2
      (*            *)                      line 1
      (*     *)   (*    *)   <*>            line 0
      ʃ a . d͡ʒ a . r a . t u . h u
```

Obviously, I will need to parameterise this to accommodate final stress in words that terminate in superheavy syllables, though.

As mentioned above, the other important characteristic of the stress pattern in UHA is the relation between heavy syllables and stress. This prompts us to activate an

[1] This is not the only case where extrametricality is needed. Lack of final stress, even on final heavy syllables, is usually attributed to this device.

accent projection rule (discussed in chapter two above). It will assign line 1 asterisks to heavy syllables. This will distinguish these syllables as potential foot heads. The following representations clarify this point:

```
(4)     /maktabna/    →     [mak.táb.na]   'our office'
                *                                      *
           (*      *)                                 (*)
           (*)    (*)    <*>                          (*      *)    <*>
a.        m a k . t a b . n a        vs.     b.      *m a k . t a b . n a
```

In (5) below, all these facts are summarised in a set of rules regulating the stress assignment procedure in UHA.

(5) a. Assign a line 0 asterisk to every syllable head.
b. Mark the final syllable extrametrical *unless it is superheavy*.
c. Assign a line 1 asterisk to the head of each branching rime.
d. Line 0 parameter settings are [+ HT, + BND (binary), left, left-to-right].
e. Construct constituent boundaries on line 0.
f. Locate the heads of line 0 constituents on line 1.
g. Line 1 parameter settings are [+ HT, - BND, right].
h. Construct constituent boundaries on line 1.
i. Locate the heads of line 1 constituents on line 2.
j. Conflate lines 1 and 2.[2]

In what follows, I will test the plausibility of this set of metrical rules. I will employ different forms that represent a large variety of syllabic configurations and positions to cover almost all possible environments: (/mubaaħaθaat/ → [mu.baa.ħa.θáat]

[2] Not all languages exhibit primary and secondary or subsidiary stresses. Arabic, in general, is a language with only primary stress, i.e. a single stressed syllable per word. This means that the rhythmic stresses on line 1 are not realised. To achieve this, Halle & Vergnaud proposed what they called *Line Conflation*. The function this rule performs is quite simple, yet effective. It only preserves the constituents on line 1 whose heads are also heads on line 2, i.e. the grid mark representing the primary stressed syllable. However, I will adopt a more recent understanding of line conflation where it is paralleled with a mere deletion of line 1 (cf. Halle and Kenstowicz 1991).

‘negotiations’, /ʔaχwaani/ → [ʔaχ.wáa.ni] ‘my brothers’, /beetakum/ → [bée.ta.kum] ‘your *pl.* house’, and /tˤalabatuh/ → [tˤa.la.bá.tuh] ‘his students’).

```
(6)    a.                   *line 2          b.          *            line 2
          (*    *      *    *)        line 1                  (*       *)           line
1
          (*)  (*       *)  (*)       line 0                  (*)      (*)   <*>   line
0
        m u . b a a . ħ a . θ a a t                          ʔ a χ . w a a . n i

       c.  *                          line 2         d.            *          line 2
          (*)                         line 1            (*          *)line 1
          (*     *)  <*>              line 0            (*    *)   (*)  <*>   line 0
        b e e . t a . k u m                            tˤa . l a . b a . t u h
```

The form in (6 a) is a quadrisyllabic word whose final syllable is superheavy. After assigning line 0 asterisks to all syllable heads, the final syllable is not marked extrametrical as a consequence of the conditioned extrametricality rule (5 b). Then, boundaries on line 0 are introduced after assigning line 1 asterisks to syllables with branching rimes, namely /-baa-/ and /-θaat-/. However, there is one unary rather than binary constituent on line 0. The fact that the syllable /mu-/ constitutes a foot on its own is self explanatory. Simply, there is no potential unmetrified element, i.e. light syllable, to the right of that syllable with which it may construct a binary constituent. Here, the exhaustivity condition determines the fate of such a syllable constructing a degenerate unary foot on it. Then, after designating the heads on line 0 constituents on line 1, an unbounded constituent is constructed locating its right-most element head on line 2. This is basically what is done to the other examples. The only difference, though, is that the final syllable in those forms is marked extrametrical as it is not superheavy.

Although the set of rules in (5) above are shown to be successful in deriving true stress outputs, there remain some problems. Firstly, the application of the extrametricality rule (5 b) lacks uniformity. It would then be an appealing goal to dispense with such a condition and aim at formulating a more systematic and elegant implementation of that extrametricality effect. Secondly, and more importantly, these rules will erect a foot over a heavy syllable and a following light. If so, the set of rules, proposed above, cannot achieve the rhythmic counting from a preceding heavy syllable. Consider the following application of the above set of rules to a form like[mak.tá.ba.ti] 'my library'.[3]

(7)

```
                  *
  (*              *)
  (*       *)   (*)  <*>
*m a k . t a . b a . t i
```

To account for this problem, I will adopt Halle and Vergnaud's proposal for Cairene. They suggested projecting a line 0 grid mark for every phoneme in the rime. However, they excluded final consonants in superheavy syllables since they do not belong to the rime, as we shall see below. So, every heavy syllable will constitute a foot on its own. This is because the binary parsing of grid marks will not allow more than two elements per-foot. Therefore, (5 a) is re-formalised as follows:

(8) Assign line 0 asterisks to all phonemes in the rime.

[3] In Hayes' model, this idea is captured by proposing the moraic trochee as a foot type licensing a maximum of two moras, as we shall see below.

Applying this to the form in (7) above will yield the desired effect. Consider the following representations, that compare the effects of both (5 a) and (8):

```
(9)              *                                               *
           (*       *)                                    (*             *)
           (* *)  (*     *)  <*>                           (*      *)   (*)  <*>
a.        m a k . t a . b a . t i          vs.     b.      *m a k . t a . b a . t i
```

Now, I return to the conditioned rule of extrametricality. An appealing alternative to achieve a less marked formalisation, and consequently a more uniform application, would involve systematically restricting extrametricality to final segments, rather than to final non-superheavy syllables. This means that (5 b) may be re-formalised as follows:

(10) Mark the final segment extrametrical.

Doing this will expand the domain of the "light vs. heavy" binary syllable weight distinction to be the whole word instead of it being word-internal. Also, this will render the other binary syllable weight distinction of "light and heavy vs. superheavy" word-finally redundant. Now, this distinction is only between heavies, former superheavies, and lights, former heavies, as illustrated in (11).

(11)	Before Extrametricality	Weight	After Extrametricality	Weight
	CV	light	C<V>	N/A
	CVV, CVC	heavy	CV<V>, CV<C>	light
	CVVC, CVCC	superheavy	CVV<C>, CVC<C>	heavy

Although this proposal seems promising, it could cause an unattested stress placement in words like /maktabak/ ‘your *sg. ms.* office’. In particular, stress will be assigned to the penult rather than the antepenult. Consider the representation below:

```
(12)              *
             (*      *)
             (* *)  (*     *)
         *  m a k . t a . b a < k >
```

Because the final heavy syllable, that would have otherwise been marked extrametrical by (5 b), participates in the computation, this undesired footing is created. So, we should block this final syllable and the asterisk representing its vowel from being included in a metrical constituent and at the same time maintain the revised extrametricality rule (10). The *Percolation Convention*, Archangeli (1986), is basically developed to facilitate the realisation of this ambitious objective.

The basic Semitic stress pattern, where ultimas are marked extrametrical unless they are superheavy, motivates introducing the percolation convention. The core idea of this convention is quite simple. Basically, “extrametricality of any segment in the rime passes to the rime.” (Archangeli 1986: 1). This entails that extrametricality will not percolate upwards and render the inter rime invisible to the metrical rules unless the entity marked extrametrical is part of that particular rime (Halle & Vergnaud 1987). Archangeli formally outlines this idea as follows.

```
(13)   R       <R>
       | ====> |
      <x>       x
```

(Archangeli 1986: 1)

Nevertheless, Archangeli makes a further important comment before examining this convention with concrete examples taken from Damascene Arabic. Building on an earlier claim made by McCarthy (1979 b), she thinks that a certain rule will have to Chomsky-adjoin a final extrasyllabic consonant, crucially, to the syllable (σ) node as (14) clarifies.[4]

```
(14)    Syllabification      →      Chomsky-adjunction
          σ        σ                   σ        σ
         /|       /|                  /|       /|\
        / R      / R                 / R      / R \
       /  |\    /  |\               /  |\    /  |\  \
      d  a r . r  a s t            d  a r   r  a s t
```

(Archangeli 1986: 4)

This will mean that extrametricality will not percolate to the rime of a superheavy syllable because the final segment, marked extrametrical, is not dominated by the rime node.

Therefore, the percolation convention and the Chomsky-adjunction rule guarantee that an asterisk representing the head of a superheavy syllable is not marked extrametrical as a result of final segment extrametricality. On the other hand, the asterisk representing the rime of either a heavy or a light syllable is extrametricalised. The following three examples where the final syllables are light, heavy, and superheavy, respectively, will clarify this process. For purposes of clarity, extrametricality is marked both on the segmental tier and, only when it percolates, on line 0.

[4] This does not look like Chomsky-adjunction, though.

```
(15)  a.          *                   b.  *                  c.       *          line 2
        (*        *)                       (*)                      (*    *)      line 1
        (* *)   (* *)    <*>   (*)   <*>              (*)  (**)          line 0
       ʔ a χ . w a a . n < i >        g a . m a < r >        k a . t a b < t >
```

Now, I can say that the objective outlined above is realised. We are able to constrain the extrametricality rule by systematically restricting its application to final segments, across the board. At the same time, a final syllable is prevented from becoming a member of or, more precisely, forming any metrical constituent unless it is superheavy. This argument looks quite attractive in its own right. However, the percolation convention itself is not adequate enough to account for different stress patterns. In what follows, I elaborate on this point.

Roca (1992) questions the adequacy of Archangeli's Percolation Convention. He presented two pieces of empirical evidence for which this device is not able to account properly. Firstly, in Mountain Cheremis, a language spoken in some parts of Russia, the application of the Percolation Convention is not totally consistent with the language's stress pattern, which is very similar to that of Classical Arabic or Hindi. It can be described as in (16).

(16) Stress falls on the right-most non-final heavy syllable. In absence of heavy syllables, stress falls on the initial syllable.

Employing the percolation convention will achieve extrametricality of final syllables with long vowels. This is illustrated in the stress derivation of (oːlíːstäː 'street') below.

```
(17)   σ      σ          σ
       |     /|         /|
       R    / R        / R
       |\  /  |\      /  |\
       o : l   iː s    t   ä <ː>
      (*)    (*)      <*>      line 0
      (*       *)              line 1
             (*)               line 2
```

On the other hand, the percolation convention is blocked in words like (βoːčʌɣáːč 'shoulder ornament in a woman's blouse'). As a result, a derivation similar to (15 c) would incorrectly predict final stress as shown below.[5]

```
(18)                              *           line 2
                          (*           *)line 1
                          (*    *)   (*)       line 0
                        * β oː č ʌ ɣ  aː <č>
```

The other piece of evidence presented by Roca is taken from Western Aranda. That language is discussed by Archangeli where she claimed that only the percolation convention may provide an appropriate account of its stress system. Stress in this language works as follows:

(19) Stress falls on the initial syllable if it has an onset or if the word is disyllabic. In all other cases, the second syllable is stressed, but never the final.

Archangeli suggested using segment extrametricality on both edges. Firstly, this will prevent the final syllable from being stressed as the extrametricality of the final segment will percolate to its rime and render it invisible to stress rules. Secondly, extrametricality of the initial segment will only percolate upwards if that segment is

dominated by the rime node, i.e. a vowel in this case. The problem that Roca noticed is related to disyllabic words where segment extrametricality on both edges could render the whole word extrametrical. Of course, we know of a particular general principle governing the application of extrametricality, namely the Nonexhaustivity condition (see chapter two), where extrametricality rules are usually blocked if their application would mark the whole stress domain extrametrical. However, "this principle makes no prediction regarding the identity of the syllable to be metricalised, which, as stated, in W. Aranda must be the initial one." (Roca 1992: 244).[6]

Obviously, this has cast some doubt on the adequacy of the percolation convention as a device basically developed to account for forms like [mák.ta.bak], (12) above. Consequently, adopting final segment extrametricality as an attempt to regulate the extrametricality effect needed in UHA is not very attractive, to say the least. This means that we are back to square one.

In addition to the problems connected with final segment extrametricality, there is yet a more fatal consequence of (8), i.e. assigning a grid mark to every phoneme in the rime. Assuming the binary parsing, this means that a foot may not include any additional material besides a heavy syllable. If so, a light penultimate

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[5] Obviously, we must be assuming that Mountain Cheremis employs final segment rather than final syllable extrametricality to satisfy certain requirement(s) of its stress system.

[6] Archangeli endeavoured to maintain her claims concerning Western Aranda. First of all, when she suggested, following Davis (1985), final segment extrametricality to account for the systematic lack of final stress, she assumed that the application of this rule would precede the application of initial extrametricality, that she had suggested earlier for reasons already known. Also, as a way of confirming her intention, she introduced an independent principle that she called *Non-empty Domain Hypothesis* to ensure that extrametricality is not allowed to cover the whole stress domain (cf. Hayes' Nonexhaustivity). However, it is obvious that the Nonexhaustivity condition (or Archangeli's Non-empty Domain Hypothesis) is a constraint on the application of some rules. If that is true, and it is, this is yet another example that some derivations in DT require both rules and constraints.

syllable following a heavy antepenult is forced by the exhaustivity condition to form a foot on its own. This foot, being right-most, will be assigned headedness of the form, and consequently receive primary stress. Consider the following derivation:

(20)

```
                 *           line 2
          (*      *)         line 1
          (* *)  (*)  <*>    line 0
        *m a k . t a . b i
```

The only feasible solution is to propose a rule that would mark the final foot extrametrical. The application of such a rule must be conditioned to apply only to final degenerate feet. This will attract stress to a final superheavy syllable. Also, it must not apply to a degenerate foot erected on a light penultimate syllable preceded by a light antepenult. In other words, it must only apply to forms that are stressed on a heavy antepenultimate syllable. Applying before line 1 constituent construction (5 g), this rule can be formalised as follows:

(21) Mark a final *degenerate* foot extrametrical *if preceded by a heavy syllable*.[7]

This must be coupled with the assumption that applying extrametricality on different levels does not prejudice Peripherality. This means that we must take the view that a foot erected over a penultimate syllable that is followed by an extrametrical ultima is final, as feet and syllables do not belong to the same level. Now, let us consider the following derivation assuming rule (21):

---

[7] This rule resembles Hayes' "extrametricality in clash", which is also true of rule (40 c) below. In particular, Hayes claims that the stress pattern of some languages may motivate extrametricalising a constituent "in clash with a preceding stress":

$\sigma \rightarrow <\sigma> / x ---]_{word}$ (Hayes 1995: 108).

```
(22)  a.   *                   line 2        b.           *            line 2
          (*)    <*>           line 1                (*       *)       line 1
          (* *)  (*)  <*>      line 0                 (* *)  (*)  <*>  line 0
         m a k . t a . b i            vs.          *m a k . t a . b i
```

Although this rule of extrametricality attains the desired effect, it is *ad hoc* and extremely stipulative. It does not say why only degenerate feet are marked extrametrical, or why that is even conditioned further by restricting its application to those preceded by heavy syllables. Therefore, the asymmetry concerning the application of the final foot extrametricality rule (21) remains unresolved. However, it is the only possible solution available in the present framework.

In the following section, I will explore another metrification model in an attempt to account for these issues more elegantly. Hayes (1995) argues for a stress assignment approach that, among other more important points, views the questions of foot degeneracy and extrametricality from a slightly different angle. There, degenerate feet are almost banned, and extrametricality is achieved with a horizontal interpretation of its peripherality condition. Thus, the question that arises is whether or not such departure from the norms of Halle & Vergnaud's model attain any true analytical competence as far as the stress pattern of UHA is concerned.

6.2. Parsing Feet in UHA:

We saw in the previous section how the facts of UHA stress motivated the application of restricted versions of extrametricality rules, which are themselves restrictions on footing. Rules of *non-superheavy* syllable and *degenerate* foot extrametricality are in order to render only these syllables and feet invisible to the

process of metrification. Precisely these particular issues are the motives behind any investigation I shall conduct within Hayes' alternative approach to metrification. In particular, we shall see how degenerate feet are banned in UHA. This will help dispense with the asymmetry in foot extrametricality outlined above. However, that may not be consistent with all the reported facts of our stress pattern. On the other hand, the scope of extrametricality itself will be limited to linear application, i.e. affecting only one level of the representation. As we shall see below, this will be regulated by the two principles of Extrametricality Domination and Extrametricality Non-chaining. As we shall see below, this will provide for further implications bearing determinant consequences on stress placement.

In what follows, I will first talk about degenerate feet. We will see how and why they are forbidden in UHA, amongst other languages. After that, I will briefly summarise what Hayes had to say about an issue that is of considerable importance, at least to us, i.e. Extrametricality. Lastly, I will attempt an analysis of the UHA data using two Arabic dialects discussed by Hayes, viz. Palestinian and Negev Bedouin, for comparison. There, it will be most appropriate to tackle the process on Final Vowel Shortening in the current framework of derivational metrification.

6.2.1. UHA and Degenerate Feet:

Along the lines of Prince (1980), McCarthy and Prince (1986, 1990), and Kager (1989), Hayes (1995) argues for a ban of degenerate feet. His proposal, however, calls for setting a parameter determining the varying levels of prohibition of

such feet. There are three different levels of prohibition, viz. strong, weak, and non-existent. These are clarified below:

(23) Degenerate Feet Prohibition Parameter:

a. Strong Prohibition:
Creating degenerate feet is absolutely disallowed.

b. Weak Prohibition:
Creating degenerate feet is only allowed when there is only one syllable left in the parse. Nonetheless, only degenerate feet in strong positions, i.e. dominated by a word-level grid mark, survive throughout the derivation. Weak degenerate feet are subsequently removed.

c. Non-prohibition:
Creating degenerate feet is freely allowed.[8]

As pointed out by Hayes, the requirement on the minimal word is the determinant factor, here. An absolute ban on degenerate feet hints at the size of the minimal word, assuming that prosodic words minimally contain one foot. Therefore, if words in a certain language are minimally bi-moraic, degenerate (mono-moraic) feet are expected to be banned.[9] For UHA, this is the case. Words are minimally bi-moraic.[10] This is why we were not able to provide examples of words that are wholly composed of a single CV syllable, when we discussed syllabification above.

This is a theory-internal evidence against degenerate feet. Nevertheless, it is supported empirically. In particular, we do not assign stress to a degenerate foot. In the present framework, only proper feet are promoted for stress placement in UHA. This is because if we allow our foot construction rules to create degenerate feet, the

[8] Due to the lack of empirical evidence bearing on this level of prohibition, a thing described by the author as surprising, Hayes expressed reservation about including this third level.
[9] I cannot see the connection.

End Rule may motivated undesirable instances of stress placement. Consider the following example:

(24) /maktabak/ → [mák.ta.bak] 'your *sg. ms.* office'

```
a.        (       x)                b.      (x)
          (x)    (x)                        (x)
          —      ∪  <—>                     —      ∪  <—>
        *m a k . t a . b a k               m a k . t a . b a k
```

(gloss: — = heavy syllable and ∪ = light syllable, notation used in Hayes 1995)

Consequently, at least in the current model we are adopting, mono-moraic degenerate feet are absolutely prohibited in UHA.

By this I conclude the discussion of the degenerate foot and move to the other interesting issue of extrametricality. Because the stress pattern of UHA depends greatly on extrametricality, it is necessary to discuss this device with more depth (see chapter two above).

6.2.2. More on Extrametricality:

As we saw in chapter two, Hayes (1981) aimed at constraining the effects of this device proposing some restrictions on its application, to wit Constituency, Peripherality, Edge Markedness, and Nonexhaustivity. Hayes (1995), however, discusses more profound issues related to this device. An important point, that is directly related to our argument below, is the application of extrametricality on different levels and the effects this has on the overall derivation. In this subsection, I

[10] It must be mentioned that this only holds for content words. Function words may be of a subminimal size (McCarthy and Prince 1986, 1990).

will focus on this issue. I will demonstrate the need for constraining extrametricality even further. In particular, this will be attributed to two essential principles governing its application, namely extrametricality Domination and Chaining.

Hayes thinks that extrametricality may apply on different levels, at the segmental level and at higher levels (syllables and feet). Segment extrametricality distinguishes between some final and non-final syllables of the same weight by rendering the former lighter. Also, syllable or foot extrametricality will facilitate constructing some foot one syllable in from an edge or will prompt a certain word layer rule to locate stress on a non-final foot.

In some cases, we find ourselves obliged by the nature of a particular stress pattern to apply extrametricality on two levels. This may not be as straightforward as expected. For example, if final consonant extrametricality did already apply to a certain form, we will have to determine whether or not foot extrametricality can also apply afterwards. In other words, we must decide whether or not the final foot is still peripheral and consequently eligible to be marked extrametrical. Otherwise, we will have to assume that the final extrametrical consonant intervenes between that foot and the word edge, blocking extrametricality by the Peripherality Condition. The following abstract example outlines these two possibilities.

```
(25)   a.  (        x     )          b.  (x)
           (x)   (x    .)                (x) <(x    .) >
```

```
 —    ∪ ∪              —    ∪ ∪
 σ    σ  σ             σ    σ  σ
/|\   /|  /|\          /|\   /|  /|\
CVCCVCV<C>             CVCCVCV<C>
```

(Hayes 1995: 106)

Hayes provides more than one example as empirical evidence supporting (25 b), one of which is Palestinian Arabic, discussed below. This means that a foot on an edge may be considered peripheral, and consequently marked extrametrical, even if one of its dependents is marked extrametrical earlier in the derivation. To put it formally, Hayes proposes the following principle:

(26) Extrametricality Domination:
Extrametrical higher level constituents may dominate extrametrical lower level constituents.[11]

(Hayes 1995: 106)

Nevertheless, extrasyllabic consonants must be treated differently. These consonants are not properly syllabified until very late in the derivation (cf. Steriade (1982), Clements and Keyser (1983), Kenstowicz (1986), and Itô (1986)). This should not be confused with McCarthy and Prince's (1990) argument that all stem-final consonants in Arabic are onsets of incomplete syllables, however, because it would include final consonants in final /CVC/ syllables. As we shall see below, these must be treated as part of the final syllable, if the extrametricality effect described above is to be realised. In particular, Hayes is talking about final consonants in final /CVVC/ or /CVCC/ sequences, in Arabic for example (cf. Chapter 4 above). Hayes refers to these

[11] The central idea of this principle is reminiscent of Archangeli's Percolation Convention. There, domination induces extrametricality percolation, and here it facilitates containing extrametrical constituents in higher extrametrical ones.

consonants as “stray”, i.e. not part of any syllable and hence any foot.[12] Therefore, if marked extrametrical, they cannot be dominated by a higher level extrametrical constituent, as they do not belong to any. As a result, the Peripherality Condition will block extrametricality from proceeding leftwards or upwards in the form. The representation in (27) demonstrates this.

(27)
```
 (      x)
 (x)  (x)
 —    —
  σ    σ
 /|\  /|\
CVCCVC<C>
```

Because a rule of final foot extrametricality cannot affect the final foot in (27), an End Rule Right places primary stress on the final syllable. But, marking the final consonant in (27) extrametrical will not qualify the final foot for extrametricality, as a result of becoming peripheral. Hayes thinks that doing so would “chain” extrametricality, and he excludes such a possibility from his theory. He suggests activating yet a further constraint on the application of extrametricality, given in (28) below:[13]

(28) Extrametricality Chaining:
Extrametricality does not chain; i.e., a constituent followed by an extrametrical constituent is not counted as peripheral.

(Hayes 1995: 107)

[12] As we saw in Chapter 4 above, these consonants are licensed by extraprosodicity (extrasyllabicity) as they may not be incorporated in the already maximised template of the final syllable. I explicitly mentioned the need for such licensing since stray elements are subject to Stray Erasure, in the model I am adopting.

[13] Again, we need both rules and constraints.

This is not a totally new idea. A principle of a similar nature was proposed earlier in Halle & Vergnaud (1987). They claimed that only a single entity may be marked extrametrical otherwise we might be tempted to mark two final syllables extrametrical to achieve antepenultimate stress.

My own interpretation of the whole argument will differ slightly from Hayes' assumptions. I will aim at uniform effect of the Non-chaining constraint throughout the lexical component, where syllabification and footing apply. My central claim is that we must not, and cannot, mark the final consonant in CVXC sequences extrametrical as it has already been marked extrasyllabic. Equally, this assumption will guarantee denying peripherality of any constituent to the left of such an extrasyllabic consonant, and consequently block extrametricality. This puts the Non-chaining constraint in a wider perspective. Consider the redefinition of this constraint below:

(29) Extraprosodicity Chaining:
Extraprosodicity does not chain; i.e., a constituent followed by an extraprosodic constituent is not counted as peripheral.

Therefore, in UHA, no rule of extrametricality may affect any constituent in words terminating in CVXC sequences. The following derivation clarifies the implications of this assumption:

(30)	/sˁarraχt/	→	[sˁar.ráχt]	'I/ you *sg. ms.* screamed'
	/sˁarraχat/	→	[sˁár.ra.χat]	'she screamed'

```
(a)   σ   σ  <ex>        (b)   σ   σ   σ        Syllabification
      /|\ /|\  |               /|\ /|  /|\
```

```
sˤa r  r a χ   t                sˤa r  r a  χ a t

 (       *)                     (*              )        Stress Assignment
 (*)   (*)                        (*)
 —     —                          —   <∪    ∪>
 σ      σ  <ex>                   σ     σ     σ
 /|\    /|\    |                  /|\   /|    /|\
sˤa r  r a χ   t                sˤa r  r a  χ a<t>
```

The final consonant in (30 a) may not be marked extrametrical as it is already marked extrasyllabic. Consequently, the final syllable and the final foot in that form are not subject to any extrametricality rule, as neither is peripheral. On the other hand, the final consonant in (30 b) and the final foot that dominates it are marked extrametrical, by appropriate rules discussed below. The central point here is the uniform application of extraprosodicity. The Domination and Chaining constraints imposed on the application of extraprosodicity achieved the desired stress pattern. Below, we will investigate such matters in more depth.

By this, I conclude talking about extrametricality and move to some description and analysis of UHA employing Hayes' metrical approach. As mentioned above, I shall utilise two other Arabic dialects, analysed in Hayes (1995), for the purpose of comparison.

6.2.3. Hayes and Two Arabic Dialects:

After outlining the core and relative issues of Hayes' theory of metrical structure, I will analyse the stress pattern of UHA along these lines. First, I will present Hayes' own account of two Arabic dialects, Palestinian and Negev Bedouin.

Doing so will widen our perspective of the whole matter and contribute some fresh ideas that will help make the argument more plausible when we tackle our data afterwards. These two dialects utilise different foot types. Quite crucially though, they both require some form of final foot extrametricality, a device without which I think we may not be able to account for UHA stress pattern, as we will see below. However, there will remain interesting differences between these dialects and UHA.

As is the case in almost all Arabic dialects, Palestinian Arabic shows the common syllable weight distinction of superheavy vs. other syllable types word-finally. This is manifested in stress assignment: only final superheavy syllables attract stress. To account for this fact, Hayes suggested marking final consonants extrametrical to distinguish between final CVC syllables, on the one hand, and final CVVC and CVCC sequences, on the other. This will render the former structurally light and the latter heavy. That is not all, however, the language has a rather complex stress pattern, as the following group of examples demonstrates.

(31)	a	da.rást	‘I studied’
	b	mak.táb.na	‘our office’
	c	ká.tab	‘he wrote’
	d	ʕál.la.mat	‘she taught’
	e	ká.ta.bu	‘they wrote’
	f	ma.káa.ti.bi	‘my offices’
	g	bá.ka.ri.to	‘his cow’
	h	mak.tá.bi.to	‘his library’
	i	ʃa.d͡ʒa.rá.tu.hu	‘his tree’

From this list, we can say that stress in Palestinian works as follows: stress a final superheavy syllable; otherwise, stress a heavy or initial penult; otherwise, stress a

heavy or initial antepenult; otherwise, stress the antepenult or the preantepenult whichever is separated by an even number of light syllables from the first preceding heavy syllable or (if there is none) from the beginning of the word.

Obviously, the central point is the default stress pattern. In particular, Hayes focuses on how to assign stress to a light antepenult or preantepenult, assuming a theory that ultimately counts pairs of syllables. He proposes building binary trochaic feet from left-to-right and marking the final one extrametrical to achieve this default stress pattern. Therefore, he suggests the following set of metrical rules.

(32)	a. Consonant Extrametricality	C → < C > / --- #
	b. Foot Construction	Parse the word from left to right into moraic trochees. Degenerate feet are forbidden.
	c. Foot Extrametricality	Foot → < Foot > / --- #
	d. Word Layer Construction	End Rule Right

(Hayes 1995: 128)

These rules can successfully account for the stress pattern described above. As for the default stress, parsing an even-numbered string of light syllables into moraic trochees from left to right and marking the final foot extrametrical will assign stress to the preantepenult. Doing the same to an odd-numbered string of syllables will achieve antepenultimate stress, where foot extrametricality is blocked because the peripherality condition is not satisfied as the final stray syllable intervenes between the final foot and the word edge.

```
(33) a.  (x      )                    b.   (          x     )
         (x    .) <(x   .)>                 (x    .)  (x    .)
          ∪    ∪   ∪   ∪                     ∪    ∪    ∪    ∪    ∪
```

```
b a . k a . r i . t o                ʃ a . j a . r a . t u . h u
```

Another interesting case is CVC syllables vs. superheavies in final position. Consonant extrametricality will not block foot extrametricality in final CVC sequences as the marked consonant is dominated by the final syllable, and consequently the final foot. On the other hand, it will with final consonants in superheavy syllables.

```
(34) a.      (x)                          b.        (     x)
             (x)  <(x     .)>                              (x)
             —     ∪    ∪                               ∪   —
            ʕ a l . l a . m a < t >                 d a . r a s < t >
```

Finally, Hayes mentioned that the analysis suggested for Palestinian is very similar to that for Cairene. The difference is foot extrametricality in Palestinian, which only applies in two cases: final /∪ ∪ ∪ ∪/ (33 a above) and /— ∪ ∪/ (35 below). In all other cases, the two systems are identical.

```
(35)  a.   (          x)                      b.    (            x      )
                     (x)  <(x     .)>                         (x)   (x     .)
             ∪     —     ∪   ∪                        ∪     —     ∪   ∪
            m a . k a a . t i . b i        vs.       m a . k a a . t i . b i
           Palestinian                               Cairene
```

I will now move to Negeve Bedouin, another dialect Hayes discusses. Though unsurprisingly somewhat similar to that of other Arabic dialects, the stress pattern of Negeve is interestingly distinctive. The crucial difference is the fact that stress may be assigned to non-superheavy ultimas. Let us consider some data.

(36)	a	ga.ha.wa.tíih	‘my coffee’
	b	baʃ.ʃib.ríy.yih	‘with the knife’

c	át.ti.fag	'to agree'
d	bi.ná	'he built'
e	an.ki.tá.law	'they were killed'
f	za.lá.ma.tak	'your man'

(36 a, b, and c) follow the stress patterns of Palestinian. (36 d, e, and f), however, reveal the identity of Negev Bedouin stress algorithm. Disyllabic words with an initial light syllable are stressed on the ultima (36 d). More interestingly, words terminating in /∪ ∪ σ/ are stressed on either the penult or the antepenult, whichever is separated by an odd number of syllables from the first preceding heavy syllable or (if there is none) from the beginning of the word (36 e, f). To account for this system, Hayes proposed the following metrical rules.

(37) a. Syllable Weight — CVC, CVV = /—/, CV = /∪/. Final C is unsyllabified in CVCC, CVVC.

b. Foot Construction — Parse the word into iambs from left to right: degenerate feet are permitted in strong position.[14]

c. Foot Extrametricality — Foot → < Foot > / --- #

d. Word Layer Construction — End Rule Right

(Hayes 1995: 227)

Here, Hayes does not use consonant extrametricality and solely depends on the assumption that a final consonant in a superheavy syllable is syllabified only after the application of the rules in (37). Also, he is utilising iambs to account for the fact that the number of intervening syllables between the stressed syllable and the word edge or the first preceding heavy is odd rather than even. Iambs, as we saw in chapter two

[14] Hayes must be assuming that the minimal word in this language may be mono-moraic.

above, can be build on a pair of syllables whose left member is light, regardless of the other syllable's internal structure. This means that a final CVC syllable will be a member of the final foot whether or not its final consonant is marked extrametrical, as long as the preceding syllable is light. Thus, only foot extrametricality is required. This may be contrasted with the cases of Palestinian, and more clearly UHA below, where final consonant extrametricality is necessary to account for the attested alternation.

Again, the unsyllabified consonant of final superheavies blocks foot extrametricality from applying to the final foot. Consequently, stress is assigned to a final superheavy syllable.

```
(38) a.   (                x)              b.   (     x)
          (.    x)  (.     x)                   (.    x)  <(.    x)>
           ∪    ∪    ∪     —                     ∪    ∪     ∪    —
          g a . h a . w a . t i i . h           z a . l a . m a . t a k
```

6.2.4. Moraic Trochees in UHA:

The stress pattern of UHA poses some challenges to this model of metrification. The fact that degenerate feet are strongly banned in the language will necessitate some form of final segment extrametricality, rather than final syllable extrametricality. Also, the default stress pattern coupled with the strictly defined stress domain (the final three syllable window) will impose a restriction on the application of the foot extrametricality rule. Nonetheless, before going into such matters, let us, for convenience, reintroduce the stress pattern of the language clarified with examples.

(39) i. Stress a final superheavy syllable:

a	ka.tábt	‘I/ you wrote’
b	faa.núus	‘a lantern’

ii. Otherwise, stress a heavy penult:

c	mák.tab	‘an office’
d	si.míʕ.ti	‘you *sg. fm.* heard’
e	mu.dár.ris	‘a male teacher’
f	mus.táw.sˤaf	‘a clinic’

iii. Otherwise, stress a heavy antepenult:

g	máħ.ka.mah	‘a courthouse’
h	ma.dáħ.ta.hum	‘I/ you praised them’

iv. Otherwise, stress the penult or the antepenult, whichever is separated from the first preceding heavy syllable or (if there is none) from the beginning of the word by an even number of syllables:

i	dˤa.ra.bá.tak	‘she did hit you *sg. ms.*’
j	tˤa.la.bá.tuh	‘his students’
k	ʔis.ta.la.fá.tuh[15]	‘she borrowed it’
l	mak.tá.ba.ti	‘my library’
m	daħ.rá.d͡ʒa.ti	‘my rolling’
n.	ʃa.d͡ʒa.rá.tu.hum *msa*	‘their tree’

Though distinctive, this stress system is similar to other patterns attested in different Arabic dialects. In addition to Palestinian and Negeve Bedouin, analysed above, Cairene (Langendoen 1968, McCarthy 1979b, Halle and Vergnaud 1987, Hayes 1995 and others) provides a useful comparison. What distinguishes UHA from Cairene is its recognition of the heaviness in antepenults. In Cairene, the internal structure of the antepenultimate syllable is of no importance. On the other hand, in

[15] In such forms with initial vowel and glottal-stop epenthesis, the even number of light syllables separates between the stressed syllable and the left edge of the stem, rather than the preceding heavy syllable. This is due to the fact that this process of initial vowel and glottal-stop epenthesis, that creates

UHA, it takes precedence and attracts stress, if the following syllables are non-heavy, even if it is not separated by an even number of syllables from the designated edge (39 iii-h). This even number characterises the difference between UHA and Negev Bedouin. Finally, the only difference distinguishing UHA from Palestinian is the absence of preantepenultimate stress. Stress never goes beyond the final three syllable window. Therefore, in order to account for all these characteristics, we will first have to determine the foot type employed in the language.

To ensure that the default stress is placed correctly, UHA must adopt some form of trochaic footing that proceeds from left-to-right. In addition, the footing must count moras rather than syllables, as the language is quantity sensitive. Therefore, the foot type I shall suggest for UHA is the moraic trochee. Consequently, I propose the following set of rules:

(40)	a. Consonant Extrametricality	C → < C > / --- #
	b. Foot Construction	Parse the word from left to right into moraic trochees. Degenerate feet are forbidden.
	c. Foot Extrametricality	Foot → < Foot > / $(\mu\mu)_\sigma$ --- #
	d. Word Layer Construction	End Rule Right

The two extrametricality rules are the interesting ones. Rule (40 a) derives final consonant extrametricality, rather than final segment extrametricality. More generally, it is a rule of segment, rather than syllable, extrametricality. Also, the application of (40 c) is conditioned to only affect those feet preceded by heavy syllables. Below, I

---

the initial heavy syllable, is ordered postlexically. Thus, it is orthogonal to footing and stress placement

will clarify why we also need all this restriction in the present approach to metrification.

If we acknowledge the absolute ban on degenerate feet, we are obliged to activate a certain rule of final segment extrametricality. To demonstrate this claim, consider the derivational stress assignment processes in words terminating in a CVC heavy syllable preceded by an odd number of three or more light syllables like [dˤa.ra.bá.tak] 'she hit you *sg. ms.*':

```
(41)  a.      (x          )                 b.      (          x     )
              (x      .)                            (x      .)  (x      .)
               ∪    ∪    ∪                           ∪    ∪    ∪    ∪
           *dˤ a . r a . b a . <t a k>             dˤ a . r a . b a . t a <k>
```

As stress is never final in UHA, some form of extrametricality is in order. However, unless that pre-footing extrametricality effect stops at the level of the final segment, to precisely render final heavy syllables light (41 b), true footing and consequently stress placement may not be realised, as (41 a) demonstrates. This may not be extended to final vowels of especially final CV syllables.[16] If a final short vowel is marked extrametrical, the whole syllable will be rendered invisible to any metrification rule. In forms composed of four CV syllables for example, this extrametricality effect makes it impossible to include the penultimate syllable, the true stress bearer, in any foot. The following derivation assigning stress to a form like [ba.ga.rá.ti] 'my cow' clarifies this point:

(see chapter 4 above).

[16] Also, a more general rule of final segment extrametricality may not account for forms with final CVV syllables. Nevertheless, these syllables do not occur finally and are accounted for by a specific rule applied in a specific ordering, as we shall see below.

```
(42)                    (x         )
                        (x    .)
                         ∪    ∪    ∪
                       *b a . g a . r a . t <i>
```

Thus, final segment extrametricality is confined to consonants only.

The conditioned extrametricality application is even more obvious in the rule of final foot extrametricality (40 c). This rule is only allowed to apply to a peripheral foot that is preceded by a heavy syllable. This will prevent it from marking a final foot in words ending in four light syllables extrametrical. Consequently, this will prevent deriving unattested preantepenultimate stress, as it is the case with Palestinian. Thus, such a rule is only allowed to apply to forms terminating in / — ∪ ∪ / or / — ∪ — /. Therefore, in what remains of this section, I will demonstrate by examples that the list of rules in (40) is capable of correctly assigning the stress patterns in (39).

For forms ending in a superheavy syllable, neither the final consonant nor the final foot may be marked extrametrical as they are separated from the edge by the word-final extrasyllabic consonant. Consequently, final superheavies are assigned main stress, as illustrated below.

```
(43)   (      x )
             (x )
          ∪   —
        k a . t a b . < t >
```

By contrast, extrametrical final consonants of final CVC syllables are dominated by the rightmost foot, which will be marked extrametrical if preceded by a heavy syllable.

```
(44)      (x)
          (x)  <(x     .)>
          —      ∪     ∪
        m a ħ . k a . m a < h >
```

A final CVC syllable is not always dominated by the rightmost foot. This is because that foot may already be maximised, by parsing preceding syllables. Also, after final consonant extrametricality, a syllable in such a position may not constitute a foot on its own. This will block the foot extrametricality rule (40 c) from applying to the right-most foot.

```
(45)    (       x      )
               (x)
          ∪     —     ∪
        m u . d a r . r i < s >
```

Finally, the following two examples demonstrate the default stress contrast, i.e. penultimate vs. antepenultimate stress.

```
(46)  a.     (         x         )        b.     (        x     )
             (x     .) (x    .)                  (x   .)  (x    .)
              ∪    ∪    ∪    ∪    ∪               ∪  ∪     ∪   ∪
             ʃ a . d͡ʒ a . r a . t u . h u < m >   t a . l a . b a . t u < h >
```

In (46 a), foot extrametricality is blocked both by non-peripherality of the final foot and by not meeting the environment of (40 c). However, the final foot in (46 b) is not marked extrametrical only because the preceding syllable is not heavy.[17]

There remains one problem, though. Underlying final CVV sequences are potentially parsable into final heavy syllables by any syllabification process we may adopt. A syllable of this type would independently constitute a moraic trochee, as final consonant extrametricality is obviously not applicable to final vowels. Such final moraic trochaic feet may or may not be marked extrametrical by rule (40 c). A metrical configuration where a foot of this type is preceded by a light syllable will surely fail to motivate our foot extrametricality rule. As a result, this final foot will incorrectly attract stress. This is clarified in the following example:

```
(47)        (             x)
            (x      .)    (x)
             ∪    ∪       —
          *ʔ a . k a . l u u
        (gloss: [ʔá.ka.lu] ‘they ate’)
```

To block this undesirable stress pattern, the language will have to activate a vowel shortening rule that is only applicable to final long vowels. In the following section, this process of final vowel shortening is reintroduced within a DT framework. However, an appropriate stipulative rule and rule ordering are in order to help derive the correct stress pattern attested in the language.

---

[17] In the previous chapter, we saw how principled the application of consonant extrametricality (final consonant weaking) is. There the motivation is to achieve perfect footing. However, this DT analysis aims at creating a metrical configuration that will eventually achieve true stress assignment.

6.2.5. Final Vowel Shortening: DT Account:

As we saw in the previous chapter, underlyingly long vowels shorten finally. Such an operation is not prompted by syllabification, licensing in particular. The syllable template of the language (CVX) is fully capable of accommodating the second timing slot of the final long vowel. In a derivational framework, the most obvious motivation of this type of vowel shortening is distribution.[18] The language does not allow CVV syllables in word final position. For convenience, the following group of examples reintroduce the process:

(48)	a.	/misik + naa/	→	[mi.sík.na]	'we caught'
	(cf.	/misik + naa + ha/	→	[mi.sik.náa.ha]	'we caught her')
	b.	/katab + tii/	→	[ka.táb.ti]	'you *sg. fm.* wrote'
	(cf.	/katab + tii + hum/	→	[ka.tab.tíi.hum]	'you *sg. fm.* wrote them')
	c.	/ʔaχað + tuu/	→	[ʔa.χáð.tu]	'you *pl.* took'
	(cf.	/ʔaχað + tuu + ni/	→	[ʔa.χað.túu.ni]	'you *pl.* took me')
	d.	/gatal + uu/	→	[gá.ta.lu]	'they killed'
	(cf.	/gatal + uu + h/	→	[ga.ta.lúuh]	'they killed him')

As we saw in chapter five above, these forms demonstrate a surface length contrast of the underlyingly long vowels of the subject pronouns /-naa/, /-tii/, /-tuu/, and /-uu/. This is determined by the vowels' position in relation to the right boundary of the word: they shorten finally but retain their underlying length internally. Consequently, I will attribute this to a rule similar to the one suggested for internal

[18] In chapter five above, we saw how both WSP and HEAD-MAX motivate this type of vowel shortening.

vowel shortening (in chapter 4 above). This rule will account for this process of vowel syncope by only shortening final long vowels. It may be formulated as follows:

```
(49)        σ           σ
            |           |
            N           N
            /\          |
           X  X    →    X      / --- ] #
            \/          |
            v           v
```

This rule will have to be ordered after syllabification and before footing. This will eventually bleed final stress on final CVV syllables.[19] The derivations below demonstrate the environment, showing the asymmetric application of (49) with final and non-final vowels.

```
(50)   a. (i)   /gatal + uu/        b. (i)   /gatal + uu + h/
                 σ  σ  σ                      σ  σ  σ              Syllabification
                 /|  /|  /|                   /|  /|  /|
                O R O R O R                  O R O R  O  R
                | | | | | |                  | | | |  |  |
                | N | N | N                  | N | N  |  N <ex>
                | | | | | /\                 | | | |  | /\  |
                c v c v c v v                c v c v  c v v c
                | | | | | \/                 | | | |  | \/  |
                g a t a l u                  g a t a  l  u   h

       (ii)      σ  σ  σ            (ii)     N/A                Final Vowel
                 /|  /|  /|                                     Shortening
                O R O R O R
                | | | | | |
                | N | N | N
                | | | | | |
                c v c v c  v
                | | | | | |
                g a t a l u
```

[19] This rule may be cross-linguistically motivated to block final lengthening in some iambic languages (Kager p.c.) (see Hayes 1995).

```
(iii)     (x          )(iii)     (          x)       Stress Assignment
          (x    .)                      (x    .)  (x)
           ∪  ∪  ∪              ∪  ∪  —
          g a . t a . l u              g a . t a . l u u h
```

Obviously, this account is rather stipulative, although it explains the length contrast that attracts stress in one case but fails in the other.

In conclusion, we can say that the accounts provided within both Halle & Vergnaud's and Hayes' approaches are far from perfect. The main problems are the unsystematic application of extrametricality rules and the theoretical and empirical inadequacy of final segment (consonant) extrametricality.

Idsardi (1992) and Halle & Idsardi (1995) put forward a new theory of stress that does not employ extrametricality *per se*, potentially solving our current problem with UHA. However, the reported facts of UHA seemingly pose formidable challenges to that theory. It is the purpose of the next subsection to layout the problem and attempt to reconcile the different proposals.

6.3. Edge-Marking in UHA:

In this theoretical framework, the effect of extrametricality is provided by a more general principle operative in all languages, *Edge-Marking* (see chapter two). In an attempt to dispense with the difficulties outlined above, I will apply this theory's principles and parameters to UHA. However, I should mention that UHA is not the type of language that might be used as a textbook example demonstrating the

superiority of this theory. On the contrary, the following discussion will pose some questions that might be left unanswered.

Neither Idsardi (1992) nor Halle & Idsardi (1993,1995) attempted any analysis of any Arabic data. In this section, I will address this issue and try to account for the stress pattern of UHA. As we saw in chapter two above, it is a matter of setting the parameters, namely Projection, Edge-Marking, ICC, and Headedness, in a manner that satisfies language particular requirements.

Considering the stress algorithm in UHA helps determine the appropriate parameter settings. Edge-Marking, a parameter that is usually set to operate on both line 0 and line 1, will have to be set as RLR on line 0 to ensure that final syllables are not included in the computation; (something will have to be done for final superheavy syllables, though, as clarified below). On the other hand, RRR is the setting of Edge on line 1. This will promote the final constituent for stress assignment. ICC should be set to introduce right boundaries. This means it will proceed from left to right, which is the direction of footing that we need for UHA. As for the Head Location parameter, which again has to be set on both lines, it must be set to assign left-headedness for constituents on line 0. This will explain why the number of light syllables that intervene between the stressed syllable, the antepenult or the penult, and the designated edge is even rather than odd. On line 1, we will have to appoint the right-most element as the head of the whole form to confirm stress placement on the right-most foot.

On the other hand, setting Project is rather problematic. The following stress assignment derivations using words like [ma.dáħ.ta.ha] 'l/you praised her' and [ma.ħab.bá.tu.hu] 'his affection' demonstrate this.

(51)

```
Project: R                          Project: L
a.          x                       b.              x
   x        x)                                x     x)
   x   x)   x   x)  x                     x  (x     x)  x)  x
 m a . ħ a b . b a . t u . h u         *m a . ħ a b . b a . t u . h u

c.          x                       d.      x
   x        x)                              x)
   x   x)   x)  x                        x (x    x)  x
*m a . d a ħ . t a . h a               m a . d a ħ . t a . h a
```

This shows that setting Project to project either edges of a heavy syllable will yield bad results, hinting at the need for projecting both edges of heavy syllables. Yet, the standard parameter setting will not achieve this. We cannot use Project to perform this function because of the limitation on its application where only a single boundary, the left or right, of the target syllable is contributed (Syllable Boundary Projection Parameter in chapter two above). What we can do to solve this problem, however, is to employ both Line 0 Mark Projection and ICC, respectively.

When Halle & Idsardi (1995) first introduced Line 0 Mark Projection, that projects a line 0 grid mark for each syllable, they mentioned the possibility of projecting elements other than syllable heads. They suggest that "elements within syllables other than heads can be stress-bearing in some languages. In such languages such elements will also be projected onto line 0 by a suitably extended version of (*Line 0 mark projection*)." (Halle & Idsardi 1995: 407). What I will propose here is to

project a line 0 grid mark for each element in the rime, which means extending *Line 0 mark projection* for the purposes of UHA, as follows:

(52) *Line 0 mark projection*
Project a line 0 element for each element in the rime.

After doing that, the left boundary of heavy syllables is projected by setting Project to do so. Then the ICC comes to finish the job and contribute a right parenthesis after the pair of grid marks representing the heavy syllable delimiting that particular heavy syllable with both boundaries and designating it as a constituent on its own.[20] Consequently, I will suggest the following set of parameter settings for UHA:

(53)	Line 0	Project: L	Edge: RLR	ICC: R	Head: L
	Line 1		Edge: RRR		Head: R

On line 0, Project: L will introduce left boundaries of heavy syllables. ICC will construct binary constituents, going from left to right. As Head: L says, these will be left-headed constituents. Edge-Marking will render the final syllable outside the stress domain, at least when it has a non-branching rime. On line 1, the right-most element will be allocated headedness of the unbounded constituent and consequently of the whole form. These settings yield the desired results in forms with a light ultima, as illustrated in (54) with the form [ma.ħab.bá.tu.hu].

(54)

Line 0	Project: L	x (x x x x x m a . ħ a b . b a . t u . h u
	Edeg: RLR	x (x x x x) x

[20] We may suggest adopting this extended version of *Line 0 mark projection* for all quantity sensitive systems, i.e. languages that may require iambs or moraic trochees.

		m a . ħ a b . b a . t u . h u
	ICC: R	x (x x) x x) x m a . ħ a b . b a . t u . h u
	Head: L	x x x (x x) x x) x m a . ħ a b . b a . t u . h u
Line 1	Edge: RRR	x x) x (x x) x x) x m a . ħ a b . b a . t u . h u
	Head: R	x x x) x (x x) x x) x m a . ħ a b . b a . t u . h u

After that, conflation will apply to the final step of the derivation and delete line 1, as the language does not have secondary stresses.

There remain some problems with the proposed account. Firstly, and most importantly, the settings suggested above will not derive (39 iii), i.e. will not assign stress to a heavy antepenult, as (55) illustrates.

(55)

Line 0	Project: L	x (x x x x m a . d a ħ . t a . h a
	Edge: RLR	x (x x x) x m a . d a ħ . t a . h a
	ICC: R	x (x x) x) x m a . d a ħ . t a . h a
	Head: L	x x x (x x) x) x m a . d a ħ . t a . h a
Line 1	Edge: RRR	x x) x (x x) x) x m a . d a ħ . t a . h a
	Head: R	x x x) x (x x) x) x * m a . d a ħ . t a . h a

Accounting for (1 c or 39 iii) was problematic when we discussed both Halle & Vergnaud and Hayes above, and is so now. To solve this conundrum in a derivational (rule-based) approach, we will always have to resort to some *ad hoc* account. For the time being, I will propose using an avoidance constraint. It will discriminate against a configuration with a form-final one-element constituent that is preceded by a two-element one, whose both boundaries are projected. This is because a left boundary will only be projected by a heavy syllable (Project: L). This will amount to excluding final feet that are preceded by heavy syllables This avoidance constraint is given in (56) below.

(56) Avoid (x x) x) x #

This constraint will take effect on the ICC level because it is the last rule that will provide a parenthesis to get the undesired configuration, as clarified in (57), where (55) is re-introduced affecting (56)

(57)

Line 0 Project: L	x (x x x x m a . d a ħ . t a . h a
Edge: RLR	x (x x x) x m a . d a ħ . t a . h a
ICC: R Avoid (x x) x) x #	x (x x x) x m a . d a ħ . t a . h a
Head: L	x x (x x x) x m a . d a ħ . t a . h a
Line 1 Edge: RRR	x) x (x x x) x m a . d a ħ . t a . h a
Head: R	x x) x (x x x) x

	m a . d a ħ . t a . h a

Obviously, introducing this avoidance constraint solves the problem. However, once more, it is a matter of complete stipulation.[21]

This is not the only problem the present framework encounters with UHA. As a consequence of "Project: L", the procedure will incorrectly predict final stress in forms with a heavy ultima. In (58), I use the form [si.míʕ.tak] 'I heard you *ms. sg.*' as an example showing this misbehaviour.

(58)

Line 0 Project: L	x (x x (x x s i . m i ʕ . t a k
Edge: RLR	x (x x (x)x s i . m i ʕ . t a k
ICC: L Avoid (x x) x) x #	x (x x) (x)x s i . m i ʕ . t a k
Head: L	x x x (x x) (x)x s i . m i ʕ . t a k
Line 1 Edge: RRR	x x) x (x x) (x)x s i . m i ʕ . t a k
Head: R	x x x) x (x x) (x)x * s i . m i ʕ . t a k

The only feasible strategy to account for the asymmetric final stress will follow the proposal in McCarthy and Prince (1990 b) that "syllables at the periphery of a stem, word, or other domain may be incomplete, consisting solely of a moraic

[21] Let us not forget to mention that is a further example of constraints regulating the application of rules.

consonant (a Coda) or a nonmoraic consonant (an Onset).” (McCarthy and Prince 1990: 15). What this means is that we will be analysing word-final consonants as onsets of syllables with empty nuclei. Accordingly, we will assume that these incomplete or nucleusless syllables are not represented on line 0 due to absence of the material that may be projected, i.e. syllable heads. This seemingly *ad hoc* assumption solves the outstanding problem with UHA heavy ultimas while leaving unaffected the heaviness of superficially final superheavies, as illustrated.

(59)

Line 0 Project: L	x (x x x s i . m i ʕ . t a . k Δ	x (x x x (x x m u . b a a . ħ a . θ a a . t Δ
Edge: RLR	x (x x) x s i . m i ʕ . t a . k Δ	x (x x x (x)x m u . b a a . ħ a . θ a a . t Δ
ICC: L Avoid (x x) x) x #		x (x x) x (x)x m u . b a a . ħ a . θ a a . t Δ
Head: L	x x (x x) x s i . m i ʕ . t a . k Δ	x x x (x x) x (x)x m u . b a a . ħ a . θ a a . t Δ
Line 1 Edge: RRR	x) x (x x) x s i . m i ʕ . t a . k Δ	x x) x (x x) x (x)x m u . b a a . ħ a . θ a a . t Δ
Head: R	x x) x (x x) x s i . m i ʕ . t a . k Δ	x x x) x (x x) x (x)x m u . b a a . ħ a . θ a a . t Δ

(“Δ” stands for the postulated empty nucleus, or rime.)

As can be seen, the syllabification of the last consonant as an onset renders final heavies formally light, hence their stresslessness. With final superheavies, however, “Project: L” is still operative, as their rimes remain heavy.[22]

[22] Nonetheless, such an assumption may have far reaching implications for syllabification. As we saw in chapter four above, final consonants of heavy syllables are licensed by the syllable template. Here,

By this, I conclude discussing Idsardi's framework after demonstrating that it is not capable of providing a sound account of UHA's stress system. There remain the problems of the avoidance constraint and final heavies, that were accounted for in a rather *ad hoc* manner.

6.4. Conclusion:

Though relatively more complex, our OT analysis is surely more plausible than any DT counterpart presented in this chapter. In particular, the issues of the commitment to universality versus stipulation and constraints versus rules and constraints are key factors favouring OT. The purpose of the following chapter, where I give the concluding remarks is to summarise the fundamental findings of the study, highlighting these and other such issues.

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they are not, however. They are licensed by an extrametrical syllable node. Thus, such an analysis is not completely compatible with our earlier assumptions.