43. Extrametricality and Non-finality

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Sections

1 Introduction

Extrametricality and *non-finality* are often treated as two terms that refer to the same principle of final stress avoidance, the former being implemented in a rule-based framework and the latter being implemented in a constraint-based framework. The labels and native frameworks of the two approaches, however, do not constitute the full extent of their differences. As **Prince and Smolensky (1993)** explain, extrametricality focuses on the parsability of prosodic constituents, while non-finality focuses on the position of stress peaks. Extrametricality is concerned primarily with dominance relations, and non-finality is concerned primarily with prominence relations.

Liberman and Prince (1977) introduced extrametricality in their foundational work on metrical stress theory to capture the apparent exclusion of certain English suffixes from the domain of stress rules.[1] Recognizing the potentially wide range of applications, **Hayes (1980)** proposed the general formulation for extrametricality rules in (1), where the initial or final constituent of a particular domain is designated as extrametrical.

(1)
$$C \rightarrow [+\text{extrametrical}] \; / \; \left\{ \begin{array}{l} \underline{\quad} \;]_D \\ {}_D[\; \underline{\quad} \end{array} \right\}$$

The result of extrametricality is essentially invisibility to the application of subsequent rules. When a constituent is designated as extrametrical, it is excluded from the domain of rules that might incorporate it into higher levels of prosodic structure. An extrametrical segment cannot be associated with a mora; for example, an extrametrical syllable cannot be footed, and an extrametrical foot cannot be included in a prosodic word.

As part of his general approach, Hayes proposed four restrictions on extrametricality. The first, *constituency*, ensures that only constituents – segments, syllables, feet, affixes, and so on – can be designated as extrametrical. *Peripherality* restricts

extrametrical constituents to the edges of a domain, while *edge markedness* prefers that they occur at the right edge. Finally, *non-exhaustivity* ensures that extrametricality cannot exhaust the domain of a rule, preventing it from applying altogether.

Prince and Smolensky (1993) incorporated similar restrictions into non-finality when they presented it as a replacement for extrametricality as part of their initial work on Optimality Theory. As (2) indicates, non-finality only applies at the edge of a domain (peripherality), and it only applies at the right edge in particular (edge markedness). The stress peaks that must avoid the right edge are prosodic categories (constituency) that are the heads of larger categories.

(2)   *Head-based non-finality*

No head *Cat1* of a *Cat2* occurs in final position in *Cat3* (where *Cat1*, *Cat2*, and *Cat3* are prosodic categories).

The effect of non-finality constraints is to prevent prominent categories – the heads that represent stress peaks – from occurring at the right edge of a domain. Non-finality might prevent the head moras of syllables from occurring at the right edges of feet, for example, or head syllables of feet from occurring at the right edge of a prosodic word.

Although it is usually a simple matter to distinguish non-finality from extrametricality, some approaches do exhibit characteristics of both. This is especially true of approaches that target relationships between final constituents and entries on the metrical grid, the classical device for representing stress patterns (see CHAPTER 41: THE REPRESENTATION OF WORD STRESS). As (3) indicates, the non-finality constraints of **Hyde (2003)** prohibit stress peaks – grid entries – in final position, but they specify a particular final constituent that stress must avoid.

(3)   *Grid-based non-finality*

No *Cat1*-level grid entry occurs over the final *Cat2* of *Cat3* (where *Cat1*, *Cat2*, and *Cat3* are prosodic categories).

Under the grid-based approach, a non-finality constraint might prevent foot-level grid entries (secondary stress) from occurring over the final mora of a foot, for example, or prosodic word-level entries (primary stress) from occurring over the final foot of a prosodic word.

The grid-based non-finality approach is like the head-based approach, then, in that it focuses on stress peaks, but it is similar to an extrametricality approach in that it excludes a particular final element from associating with some structure (in this case, certain levels of the metrical grid). A similar mixture of characteristics can be found in approaches that are typically considered extrametricality approaches. Since the grid-based account of **Prince (1983)** lacked feet, for example, the effect of extrametricality was to prevent syllables from mapping to the metrical grid – in other words, from associating with a stress peak – rather than to prevent them from being footed.

As we shall see below, extrametricality and non-finality are among the most well-motivated principles in phonological theory, with support coming from several different lines of evidence. Perhaps the most compelling, however, is that they can be usefully applied in an unusually broad range of contexts. §2 and §3 examine phenomena involving final syllables and final feet, respectively, two types that can be handled equally well by extrametricality or non-finality. §4 examines phenomena involving final moras, a strength of non-finality approaches, and §5 examines effects involving final consonants, a strength of extrametricality approaches. In §6, I review some of the classic arguments marshaled in support of extrametricality and discuss the extent to which they also support non-finality. Finally, §7 reviews some of the arguments for the asymmetry in edge specifications (edge markedness).

2 Final syllables

One of the most well-known uses for extrametricality and non-finality is avoidance of stress on final syllables. The most compelling examples are languages where a binary pattern is perturbed at a word's right edge so that an anticipated final stress either arrives early or is absent altogether.

An anticipated final stress arrives early, for example, in "iambic reversal" languages such as Southern Paiute (**Sapir 1930, 1949**), Axininca Campa (**Payne *et al.* 1982**), and Aguaruna (**Payne 1990**; **Hung 1994**). In the Aguaruna examples below, alternation of unstressed and stressed syllables from left to right would place the final stress on the ultima in even-parity forms, but it actually emerges on the penult.[2]

(4)   *Final stress avoidance in Aguaruna*

    a.   i'ʧiˌnaka   'pot (NOM)'
    b.   i'ʧinaˌkana   'pot (ACC)'
    c.   ʧaŋ'kinaˌ ɲuˌmina   'your basket (ACC)'
    d.   ʧaŋˌkinaˌ ɲumiˌnaki 'only your basket (ACC)'

An anticipated final stress is absent altogether in the iambic pattern of languages like Hixkaryana (**Derbyshire 1985**), Carib (**Hoff 1968**), and Choctaw (**Nicklas 1972, 1975**). In the Choctaw examples below, alternation of unstressed and stressed syllables would position the final stress on the ultima in even-parity forms, but the ultima and the penult both emerge

without a stress. The examples are combinations of /pisa/ 'to see', /tʃi-/ 'you (OBJ)', /-tʃi/ 'causative', and /-li/ 'I (SUBJ)'.

(5) *Final stress avoidance in Choctaw*

    a.   tʃi'pisa
    b.   tʃi'pisali
    c.   tʃi'pisa'tʃili

An extrametricality approach would produce the Aguaruna and Choctaw patterns by making word-final syllables extrametrical and then constructing iambic feet from left to right. With the final syllable extrametrical, the last two syllables in an even-parity form cannot form an iambic foot, so the expected final stress fails to appear. The difference between the two languages would be that Aguaruna tolerates degenerate feet – and can parse the penult as a degenerate foot after iambic footing is no longer possible – but Choctaw does not. Since Aguaruna can parse the penultimate syllable as a degenerate foot, as (6) illustrates, the expected final stress shifts to the penult.

(6) *Aguaruna extrametricality analysis*

                  extrametricality   parsing
   i.tʃi.na.ka → i.tʃi.na⟨ka⟩   →   (i.'tʃi)(ˌna)⟨ka⟩

Since Choctaw cannot parse the penult as a degenerate foot, however, as (7) illustrates, the expected final stress is absent altogether.

(7) *Choctaw extrametricality analysis*

                  extrametricality   parsing
   tʃi.pi.sa.li → tʃi.pi.sa⟨li⟩   →   (tʃi.'pi)sa⟨li⟩

For additional, and more detailed, extrametricality analyses of final stress avoidance, see **Halle and Vergnaud (1987)** and **Hayes (1995)**.

A non-finality approach produces the same patterns, although a bit more directly, simply by prohibiting stress at the right edge of the word. Head-based non-finality, where heads represent stress, prohibits the head syllable of a foot from occurring in final position. Grid-based non-finality, where grid entries represent stress, prohibits a foot-level gridmark from occurring over the final syllable. In either case, prohibiting final stress effectively prohibits a final iambic foot.

The difference between Aguaruna and Choctaw is in the options that they employ to avoid a final iamb. As (8) illustrates, Aguaruna employs a final trochaic foot, shifting the expected final stress to the penult. Notice that the non-finality analysis does not necessarily require underparsing like the extrametricality analysis. (In (8) and examples throughout, the expression "*X* >> *Y*" indicates that *X* is more harmonic than *Y* or that some constraint, in this case non-finality, prefers *X* to *Y*.)

(8) *Aguaruna non-finality analysis*

              non-finality
   (i.'tʃi)(ˌna.ka)   >>   (i.'tʃi)(na.ˌka)

In contrast, as (9) illustrates, Choctaw prefers to leave its final two syllables unparsed in order to avoid a final iamb.[3]

(9) *Choctaw non-finality analysis*

              non-finality
   (tʃi.'pi)sa.li   >>   (tʃi.'pi)(sa.'li)

See **Hyde (2002, 2003)** for more detailed grid-based non-finality analyses of final stress avoidance, and **McCarthy and Prince (1993)** and **Kenstowicz (1995)** for more detailed head-based non-finality analyses.

In this section, then, we have seen that extrametricality and non-finality provide equally effective analyses for the avoidance of stress on final syllables. Both approaches account for cases where a binary stress pattern is perturbed at the right edge, whether the final stress arrives early or is absent altogether.

3 Final feet

Another important use of extrametricality and non-finality has been to prevent primary stress from occurring over a word-

final foot. In the clearest examples of the phenomenon, the primary stress is the penultimate stress, the presence of a secondary stress further to the right being the clearest indication that there is a final foot that primary stress might have occupied.

Consider Banawá (**Buller** *et al.* **1993**; **Everett 1996, 1997**) and Paumari (**Everett 2003**). In Banawá, consonant-initial words have a trochaic pattern, and vowel-initial words have an iambic pattern. In both the trochaic pattern and the iambic pattern, however, the primary stress is the penultimate stress. The secondary stress that follows indicates that there is a final foot that primary stress might have occupied if it had been drawn as far to the right as possible.

(10) *Primary stress in Banawá*

    a. a'bari,ko   'moon'
    b. ,metu'wasi,ma 'find them'
    c. ,tina'rifa,bune 'you are going to work'

The primary stress is also the penultimate stress in the consistently iambic Paumari, indicating the presence of a final foot that primary stress has avoided.

(11) *Primary stress in Paumari*

    a. ka'baha,ki   'to get rained on'
    b. ,aha'kaba,ra   'dew'
    c. a,t^{h}ana'rari,ki   'sticky consistency'
    d. bi,kana,t^{h}ara'ravi,ni 'to cave in, to fall apart quickly'

It is a relatively simple matter to produce the Banawá and Paumari patterns with either extrametricality or non-finality. In the extrametricality approach, a word-final foot is designated as extrametrical, excluding it from the prosodic word. As (12) illustrates, when a right-headed prosodic word is constructed, it positions the primary stress over the penultimate foot, rather than the final.

(12)
                                 extrametricality   *word layer*

```
                                                 (       x    )
                                 x    )( x  )(( x  ))     x   )( x   )(( x
( x   )( x   )( x     ) → ( x    )( x  )(( x  )) → ( x    )( x   )(( x     ))
 ti na  ri fa  bu ne       ti na  ri fa  bu ne        ti na    ri fa   bu ne
```
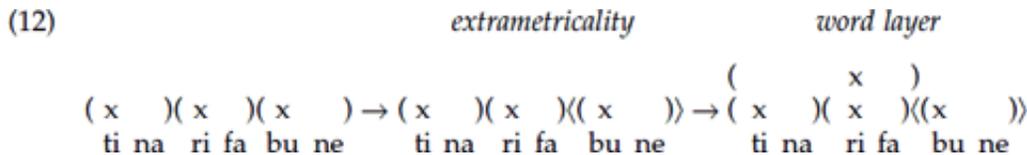
The non-finality approach produces a similar result, although it does not require that final feet be excluded from the prosodic word. Head-based non-finality avoids primary stress on final feet by prohibiting head feet from occurring in final position. Grid-based non-finality prohibits a prosodic word-level gridmark from occupying the final foot.

(13)   *non-finality*

```
(        x          )   (                 x    )
( x   )( x  )( x     )   ( x    )( x   )( x    )
 ti na  ri fa  bu ne  >>  ti na   ri fa  bu ne
```
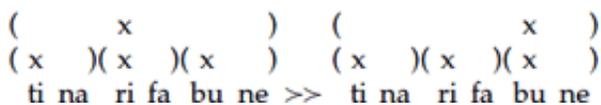
In either case, the primary stress and the foot associated with it are pushed back from the right edge. As a result the primary stress is the penultimate stress, and the associated foot the penultimate foot.

It should be noted at this point that many of the examples cited in the literature on primary stress avoiding final feet are not as compelling as those discussed above. **Hayes (1995)** presents several languages as potential examples of foot extrametricality: Bedouin Arabic (**Blanc 1970**), Cayuga (**Chafe 1977**; **Foster 1982**; **Michelson 1988**), Delaware (**Goddard 1979, 1982**), Eastern Ojibwa (**Piggott 1980, 1983**), and Palestinian Arabic (**Kenstowicz and Abdul-Karim 1980**; **Kenstowicz 1983**). **McCarthy (2003)** points out, however, that these are not especially clear cases, because no secondary stress has been reported in a position associated with the supposed extrametrical foot. While McCarthy's point overreaches a bit – **Piggott (1983)** reports post-tonic secondary stresses in Ojibwa, and patterns of reduction and non-reduction suggest post-tonic feet in Delaware – it is true of many of the traditional examples. As Banawá and Paumari demonstrate, however, the avoidance of stress on final feet is still one of the important functions performed by extrametricality and non-finality.

4 Final moras

The avoidance of final moras can make stress sensitive to the weight of syllables generally or to the weight of domain-final

syllables (see **CHAPTER 57**: QUANTITY–SENSITIVITY). As we shall see below, non-finality offers a relatively straightforward analysis in such cases. §4.1 demonstrates how avoidance of syllable-final moras promotes general weight-sensitivity, §4.2 how avoidance of prosodic word-final moras promotes sensitivity to the weight of prosodic word-final syllables, and §4.3 how avoidance of foot-final moras promotes rhythmic lengthening. §4.4 examines the difficulties confronting extrametricality analyses.

A fairly common type of weight-sensitivity is the type where stress avoids light syllables. It has been addressed, for example, using the Obligatory Branching Parameter (**Hayes 1980**) of classical metrical theory and the PEAK–PROMINENCE (**Prince and Smolensky 1993**) and STRESS–TO–WEIGHT (**Hammond and Dupoux 1996**; **Lorentz 1996**) constraints of Optimality Theory. As **Hyde (2006**, **2007b)** demonstrates, non-finality offers an alternative: when syllable-final moras cannot be stressed, stress cannot occupy a monomoraic syllable. Head-based non-finality prohibits stress on syllable-final moras by prohibiting the head mora of a foot from being final in a syllable. Grid-based non-finality prohibits foot-level gridmarks from occupying syllable-final moras.

The clearest examples of stress avoiding light syllables generally are found in quantity-sensitive unbounded stress systems. Murik (**Abbott 1985**) and Aguacatec (**McArthur and McArthur 1956**) are typically used to exemplify the default-to-same-side variety.[4] As (14) illustrates, Murik avoids stressing a light syllable whenever possible. If a heavy syllable is available, Murik stresses the leftmost. Murik stresses a light syllable, also the leftmost, only in those cases where heavy syllables are absent. Note that in Murik heavy syllables are syllables with long vowels. All others are light.

(14)   *Murik forms*

   a.   'LL   'damag   'garden'
   b.   'LLL   'dakʰanimp   'post'
   c.   LLL'H   anənpʰa'rɛːtʰ   'lightning'
   d.   LL'HL   numa'roːgo   'woman'

As (15) illustrates, Aguacatec stresses the rightmost heavy syllable when one is available. Otherwise, it stresses the rightmost light syllable. As in Murik, heavy syllables in Aguacatec are syllables with long vowels.

(15)   *Aguacatec forms*

   a.   L'L   kaʔ'pen   'day after tomorrow'
   b.   LL'L   tʃinhoj'lih-ts   'they search for me'
   c.   L'H   ʔin'taː   'my father'
   d.   'HL   'miːtuʔ   'cat'

The type of weight-sensitivity found in unbounded stress systems emerges when avoidance of syllable-final moras takes precedence over directional orientation. In Murik, as (16) illustrates, non-finality in the syllable takes precedence over leftward orientation. Stress appears over the leftmost heavy syllable, rather than a light syllable, even if it does not occur exactly at the left edge.

(16)   *Non-finality preferences in the syllable*

                 x   x
    μ   μ   μμ   μ >>   μ   μ   μμ   μ
    nu . ma . roo . go   nu . ma . roo . go

Similarly, the Aguacatec pattern would emerge when non-finality in the syllable takes precedence over rightward orientation.

Moraic non-finality constraints applied to the syllable domain, then, have the same effect as Obligatory Branching, PEAK–PROMINENCE and STRESS–TO–WEIGHT. One point that favors the non-finality approach over the others is that non-finality constraints are motivated by their usefulness in a much wider range of contexts – the avoidance of stress on final syllables (§2) and feet (§3), for example – many of which have nothing to do with syllable weight.

4.2 Weight-sensitivity in word-final syllables

In this section, we examine the situation where stress is sensitive to the weight of prosodic word-final syllables only. To make stress sensitive to the weight of prosodic word-final syllables, all that is necessary is to require that prosodic word-final moras be stressless. When word-final moras cannot be stressed, stress can occupy a heavy final syllable, but it cannot occupy a light final syllable.

One situation where stress is sensitive to the weight of prosodic word-final syllables only arises in syllabic trochee systems.

Consider the case of Wergaia (**Hercus 1986**), where heavy syllables are syllables with long vowels (typically limited to initial position), syllables with diphthongs (limited to initial or final position), and closed syllables. As (17) illustrates, Wergaia stress is largely weight-insensitive. It falls automatically on every odd-numbered syllable counting from the left, except the final syllable. Stress falls on final syllables only if they are odd-numbered and heavy, as in (17f) and (17g). It avoids final syllables if they are light, as in (17d) and (17e).

(17) *Avoidance of final light syllables in Wergaia*

a.	'LL	'wuru	'mouth'
b.	'HL	'ŋaːri	'oak tree'
c.	'LH	'ŋarau	'wild turkey'
d.	'HLL	'maːbila	'to tell lies'
e.	'LHL	'daguŋa	'to punch someone'
f.	'LL,H	'buna,dug	'broad-leaved mallee'
g.	'LL,H	'waŋa,gai	'catfish'
h.	'LL,LL	'buna,mala	'fine-leaved mallee'
i.	'LL,LH	'wureg,wuraŋ	'speaking together, gabbing'

In **Hyde's (2007b)** grid-based non-finality approach, the Wergaia pattern emerges when it is more important that foot-level gridmarks avoid prosodic word-final moras than it is that feet contain a stressed syllable. When the final syllable of an odd-parity form is light, stress cannot occur on the final syllable without occurring on the final mora, so the final foot emerges without a stress, as in (18).

(18) *Moraic non-finality preferences in the prosodic word*

```
( x       )( )    ( x      )(x)
μμ   μ  μ  >>    μμ   μ  μ
maa . bi . la      maa . bi . la
```
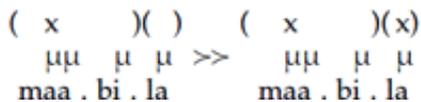
When the final syllable is heavy, however, stress can occupy the final syllable without occupying the final mora, so the final foot emerges with a stress, as in (19).
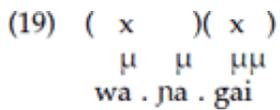
(19) ```
(x   )(x)
μ   μ   μμ
wa . ŋa . gai
```

The same result can be produced in a more standard structural framework when non-finality in the prosodic word takes precedence over the constraints that require syllables to be parsed into feet. Odd-parity forms with a light final syllable would emerge with the final syllable unparsed and stressless. Odd-parity forms with a heavy final syllable would emerge with the final syllable parsed and stressed. The result can also be produced with head-based non-finality by prohibiting the head mora of a foot from being final in the prosodic word.[5]

## 4.3 Rhythmic lengthening

Non-finality can be used not only as a simple detector of syllable weight – the use focused on in §4.1 and §4.2 – but also as a trigger to increment syllable weight. When stress would fall on an underlyingly light syllable, non-finality can force the syllable to become heavy on the surface. Rhythmic lengthening is an example of this effect. It results from avoidance of stress on foot-final moras or syllable-final moras.

There are two types of rhythmic lengthening: iambic lengthening and trochaic lengthening. The former adds a mora to the stressed syllable of an iamb; the latter adds a mora to the stressed syllable of a trochee. The iambic type appears to occur more frequently than the trochaic type (**Hayes 1985, 1987**, **1995**; **Kager 1993**; CHAPTER 44: THE IAMBIC—TROCHAIC LAW), but both are well attested. Iambic lengthening can be found in Carib (**Hoff 1968**), for example. As (20) illustrates, Carib lengthens even-numbered syllables counting from the left, but not the final syllable, producing a fairly typical iambic pattern.

(20)  *Iambic lengthening in Carib*

|   |            |                       |               |
|---|------------|-----------------------|---------------|
| a. | tonoro     | → tono:ro             | 'large bird'  |
| b. | kurijara   | → kuri:jara           | 'canoe'       |
| c. | woturoporo | → wotu:ropo:ro        | 'cause to ask'|
| d. | woturopotake | → wotu:ropo:take    | 'I shall ask' |

Trochaic lengthening can be found in Chimalapa Zoque (**Knudson 1975**), a dual stress language based on trochaic footing. In Chimalapa Zoque, stress occurs on the initial syllable and the penult, with the stress on the penult being primary. As (21) illustrates, every stressed syllable must be heavy on the surface. When an underlyingly light syllable is stressed, the syllable is made heavy by lengthening its vowel.

(21)  *Trochaic lengthening in Chimalapa Zoque*

|   |                   |                        |                             |
|---|-------------------|------------------------|-----------------------------|
| a. | 'kosaʔ           | → 'ko:saʔ              | 'scold (IMP)'               |
| b. | ˌhu'kuti          | → ˌhu:'ku:ti           | 'fire'                      |
| c. | ˌwiti hu'kuti     | → ˌwi:ti hu'ku:ti      | 'big fire'                  |
| d. | ˌwituʔpaj'niksi   | → ˌwi:tuʔpaj'niksi     | 'he is coming and going'    |

Under a non-finality approach, rhythmic lengthening is just a special case of stress avoiding light syllables. To avoid stressing a light syllable, which would mean stressing a domain-final mora, the vowel of the syllable lengthens, making it heavy. Consider first the situation where non-finality prohibits stress on the final moras of feet (**Kager 1995**; **Hyde 2007b**), a head-based approach by prohibiting the head mora of the foot from being final in the foot and a grid-based approach by prohibiting foot-level gridmarks from occupying the foot-final mora. In this situation, stress must avoid light foot-final syllables, making it necessary for such syllables to lengthen if they are going to carry a stress.

When avoidance of stress on foot-final moras takes precedence over the prohibition against mora insertion, the result is iambic lengthening, as (22) illustrates.

(22)  *Moraic non-finality preferences in the foot*

```
       x                    x
  μ    μμ    >>        μ     μ
( CV . CVV )        ( CV . CV )
```

Avoidance of foot-final moras cannot, however, produce lengthening in trochees. Since there is no danger of a stress occupying the final mora in a trochaic foot, lengthening would be gratuitous.

Now consider the situation where stress avoids syllable-final moras. In this situation, stress must avoid a light syllable whether it is final in the foot or initial. When it takes precedence over prohibitions against mora insertion, then, as (23) illustrates, avoidance of syllable-final moras produces lengthening in both iambs and trochees.

(23) *Non-finality preferences in the syllable*

a. *Iambic foot*

```
        x                    x
   μ    μμ    >>        μ     μ
 ( CV . CVV )        ( CV . CV )
```

b. *Trochaic foot*

```
    x                    x
  μμ    μ  >>        μ     μ
( CVV . CV )       ( CV . CV )
```

The non-finality approach meets the primary burden for an account of rhythmic lengthening, in that it produces both iambic lengthening and trochaic lengthening, but it has an additional advantage in that it predicts the greater frequency of lengthening among iambic systems. Non-finality in the syllable and non-finality in the foot both produce iambic lengthening, but only non-finality in the syllable produces trochaic lengthening. Since there are two sources of pressure for lengthening in iambic feet but only one for lengthening in trochaic feet, we would expect lengthening to occur with greater frequency among iambic systems, all else being equal.

For further discussion of rhythmic lengthening and related issues, see CHAPTER 44: THE IAMBIC—TROCHAIC LAW.

4.4 The obstacle to an extrametricality approach

As **Hayes (1995)** observes, there are significant obstacles from a structural standpoint to the implementation of mora extrametricality. For an extrametricality approach to produce the types of effects discussed in §4.1—§4.3 it must uniquely exclude the extrametrical mora from some higher prosodic structure. It is not clear, however, how moras can be excluded from higher prosodic structure in a way that produces the desired effects without abandoning syllable integrity (**Prince 1976**) or preventing extrametrical moras and their associated segments from being syllabified.

For example, in the Wergaia case discussed in §4.2, word–final moras are invisible to stress assignment. This prevents stress from falling on light final syllables but still allows it to occupy heavy final syllables. There are only two ways in which this type of effect might be produced under an extrametricality approach. The first is to assume that the final mora is extrametrical and that extrametrical moras cannot be footed. When the final syllable is light, as in (24a), excluding the final mora from the foot level effectively excludes the final syllable, rendering it unstressable. When the final syllable is heavy, however, as in (24b), excluding the final mora does not entirely exclude the final syllable, allowing it to support stress.

(24) a. *Light final syllable*   b. *Heavy final syllable*

```
      (       x)                    ( x       )(  x)
       μ    μ   ⟨μ⟩                  μ    μ   μ⟨μ⟩
      [CV] [CV] [CV]                [CV] [CV] [CVC]
```

The problem is most obvious in (24b). Uniquely excluding the final mora of a heavy syllable from the final foot means that the foot must split the syllable in violation of syllable integrity. Hayes explicitly rejects this possibility. Abandoning syllable integrity would make it possible for stress to occur on codas (**Hayes 1995**), and it would make it possible for multiple stresses to occur within a single syllable (**Hyde 2007a**).

The second option is to assume that the final mora is extrametrical and that extrametrical moras cannot be syllabified. When the final mora is unsyllabified in CV–final words, as in (25a), no syllable can be built on the final vowel, so no stress is possible in this position. When the final mora is unsyllabified in CVV– or CVC–final words, however, as in (25b), there is still a mora on which a final syllable can be constructed. Though what would otherwise form a heavy syllable only forms a light syllable, the syllable can still be footed, allowing stress to occur in final position.

(25) a. *Final CV*   b. *Final CVC*

      i. *Preceding consonant stray*

```
          ( x       )                   ( x       )(  x)
           μ    μ   ⟨μ⟩                  μ    μ   μ ⟨μ⟩
          [CV] [CV] CV                  [CV] [CV] [CV] C
```

      ii. *Preceding consonant as coda*

```
          ( x       )
           μ    μ   ⟨μ⟩
          [CV] [CVC] V
```

Hayes does not actually consider this second option and, therefore, does not reject it explicitly. Its rejection is implied, however, by his assumption that extrametricality never prevents syllabification. Unfortunately, he only justifies the assumption as it relates to extrametrical consonants, but there do seem to be good reasons for applying it to extrametrical moras as well.

The analysis presents some fairly obvious problems in CV–final words. When the final mora and its associated vowel remain unsyllabified, there are essentially two options for dealing with any consonants that would otherwise be part of the final vowel's onset. First, they might be left stray, as in (25a.i), in which case they would be subject to Stray Erasure and deleted (see §6.3). The result would be a language where final CVC and CVV sequences are preserved and their vowels stressed but final CV sequences have their consonants deleted and their vowels left stressless. To my knowledge, such an outcome is unattested. Second, preceding consonants might be incorporated into the preceding syllable as a coda, as in (25a.ii). The result would be a language where final CVV and CVC sequences always have their consonants syllabified as onsets and their vowels stressed but final CV sequences always have their consonants syllabified as codas and their vowels left stressless. To my knowledge, this outcome is also unattested.[6]

There is an additional, primarily theoretical, reason for rejecting extrasyllabic moras, not only in the particular situation under consideration, but in all situations. Moras are unique in that the primary motivation for including them in the prosodic hierarchy in the first place is to provide an effective representation of syllable weight, a function that cannot be performed outside the syllable.

Neither of the options that might be used to achieve the desired results under an extrametricality approach, then, appears to

be viable.

5 Final consonants

Evolved from proposals by **Mohanan (1979)** and **Hayes (1980)**, traditional consonant extrametricality rules prevent word-final consonants from having moraic status and, therefore, from contributing to the weight of final syllables. The result is that final syllables that end in a consonant are lighter than we would otherwise expect. As (26) illustrates, final CV and CVV are unaffected. Final CVC, CVVC, and CVCC, however, are all lighter than they would be otherwise. Final CVC, normally bimoraic, emerges as monomoraic and counts as light. Final CVVC and CVCC, normally trimoraic, emerge as bimoraic and count as heavy.

(26) *Weight contrasts under consonant extrametricality*

    a. *Light syllables*

        i.   μ   ii.   μ
            CV   CV⟨C⟩

    b. *Heavy syllables*

        i.   μμ   ii.   μμ   iii.   μμ
            CVV   CVV⟨C⟩   CVC⟨C⟩

Among the languages that have been argued to exhibit consonant extrametricality are English (**Hayes 1982**), various dialects of Arabic (**McCarthy 1979**; **Hayes 1995**), Ancient Greek (**Steriade 1988**), Spanish (**Harris 1983**), and Estonian (**Hint 1973**; **Prince 1980**). Examples from Estonian are provided in (27).

(27) *Final syllables in Estonian*

    a. 'kava,latt   'cunning'
    b. 'pahe,mait   'worse (PART PL)'
    c. 'pimestav   'blinding'
    d. 'pimes,tavale 'blinding (ILL SG)'

Like Wergaia, Estonian automatically stresses every odd-numbered syllable except the final syllable. Final syllables are stressed only if they are heavy, as in (27a) and (27b). When a final syllable is light, as in (27c) and (27d), it is unstressed. Since final CVV, CVVC, and CVCC are always stressed, they must pattern together in counting as heavy. Since final CV and CVC are always stressless, they must pattern together in counting as light. This is exactly the division predicted by consonant extrametricality.

Since moras are not stress peaks, non-finality cannot directly prohibit moras from associating with final consonants. Non-finality can only affect a final consonant's moraic status by referring to a stress peak that coincides with moras. The success of a non-finality approach, however, depends crucially on the representation of stress peaks. Under head-based non-finality, no stress peak coincides with moras generally. A mora coincides with a stress peak only if it is a head mora, and banning head moras from final position does not ban all moras.[7] In contrast, assuming that moras map to the base-level of the grid, there are stress peaks that coincide with moras generally under grid-based non-finality. By prohibiting base-level gridmarks from occurring over prosodic-word final consonants, non-finality can prevent final consonants from associating with moras.

To illustrate, when it is more important for final consonants to avoid associating with base-level gridmarks than it is for coda consonants to be moraic, final consonants will give up their moraic status to avoid associating with base-level gridmarks. Final CVC syllables emerge as monomoraic and light, and final CVVC and CVCC syllables emerge as bimoraic and heavy, resulting in the same weight distinctions among final syllables as those created by consonant extrametricality.

(28) *Consonantal non-finality preferences*

a.
$$\begin{array}{ccc} \mathrm{x} & & \mathrm{x\,x} \\ \mu & \gg & \mu\mu \\ \mathrm{CVC} & & \mathrm{CVC} \end{array}$$

b.
$$\begin{array}{ccc} \mathrm{x\,x} & & \mathrm{x\,x\,x} \\ \mu\mu & \gg & \mu\mu\mu \\ \mathrm{CVVC} & & \mathrm{CVVC} \end{array}$$

c.
$$\begin{array}{ccc} \mathrm{x\,x} & & \mathrm{x\,x\,x} \\ \mu\mu & \gg & \mu\mu\mu \\ \mathrm{CVCC} & & \mathrm{CVCC} \end{array}$$

Given its parsability focus, then, the extrametricality analysis is the most straightforward for cases like Estonian. Since it makes final consonants invisible to the process of mora assignment, consonant extrametricality produces the desired weight distinctions in a fairly direct fashion. While it is also possible to provide a non-finality analysis, it is only possible to do so with a grid-based approach.

For additional discussion of this and other issues concerning final consonants, see chapter **36**: final consonants.

6 The classic arguments

We turn now to some of the classic arguments marshaled in support of extrametricality and briefly consider whether or not they also provide support for non-finality. Below we consider three of extrametricality's traditional uses: establishing trisyllabic stress windows, helping to capture generalizations about the stress patterns of different lexical classes, and helping to provide a general account of the deletion of unsyllabifiable segments.

6.1 Eliminating ternary foot templates

In many languages, a word's final three syllables form a domain that is crucial in creating the appropriate stress pattern. The most direct option for creating such a domain – establishing it with a trisyllabic foot – has the disadvantage of making it necessary to expand the foot inventory beyond the well-motivated binary templates to include less well-motivated ternary templates. As **Hayes (1980)** demonstrates, a less direct extrametricality approach allows us to maintain the smaller inventory. It allows the theory to create trisyllabic windows using a binary foot followed by an unparsed syllable.

Consider the stress pattern of Latin. In Latin words of at least three syllables, stress falls on either the antepenult or penult, depending on the weight of the latter. If the penult is heavy, it is stressed; otherwise, the antepenult is stressed.

(29) *Trisyllabic stress window in Latin*

a. L'HH   a'miːkus   'friend (nom sg masc)'
b. LH'HH   moneː'baːmus   'warn (1pl imperf indic act)'
c. L'LLH   ko'mitium   'the election site in the forum (nom sg)'
d. L'HLH   do'mestikus   'domestic (nom sg masc)'

Without extrametricality, the Latin pattern requires the quantity-sensitive ternary template ($\acute{\sigma}\,\mathrm{L}\,\sigma$) to establish the appropriate trisyllabic domain at the right edge. When the penult is light, the template is used to construct a ternary foot at the right edge of the word, resulting in antepenultimate stress. When the penult is heavy, however, the template allows only a binary foot, resulting in penultimate stress.

(30) *Ternary foot analysis*

		parsing
a.	do.mes.ti.kus	→	do('mes.ti.kus)
b.	mo.neː.baː.mus	→	mo.neː('baː.mus)

Extrametricality makes the ternary template unnecessary, allowing the trisyllabic domain to be formed with an unparsed syllable and a maximally disyllabic foot. The unparsed syllable is the result of syllable extrametricality. The maximally disyllabic foot is produced with the quantity-sensitive template ($\acute{\sigma}\,\mathrm{L}$). If the penult is light, as in (31a), the template allows for a disyllabic foot at the right edge. In combination with the extrametrical syllable, the result is stress on the antepenult. If the penult is heavy, however, as in (31b), the template only allows for a monosyllabic foot, resulting in stress on the penult.

(31) *Extrametricality analysis*

		extrametricality		parsing
a.	do.mes.ti.kus	→ do.mes.ti⟨kus⟩	→	do('mes.ti)⟨kus⟩
b.	mo.ne:.ba:.mus	→ mo.ne:.ba:⟨mus⟩	→	mo.ne:('ba:)⟨mus⟩

As **Prince and Smolensky (1993)** demonstrate, a head–based non–finality approach can also construct trisyllabic domains from a binary foot and an unparsed syllable. When it is more important for the head foot to avoid final position than it is for the head foot to occur as far to the right as possible, the desired pattern emerges.

(32) *Head-based non-finality analysis*

		non-finality	
a.	do('mes.ti)kus	>>	do.mes('ti.kus)
b.	mo.ne:('ba:)mus	>>	mo.ne:.ba:('mus)

With the head foot pushed back from the right edge by non–finality, a disyllabic foot positions stress on the antepenult when the penult is light, and a monosyllabic foot positions it on the penult when the penult is heavy.

In the case of Latin, extrametricality and head–based non–finality have a very similar effect. They both result in the final syllable being left unparsed. The similarity arises because the stress peak that must avoid final position in the non–finality analysis happens to be a foot, the head foot of the prosodic word. If the head foot must be the rightmost foot but cannot be final, then the final syllable must remain unfooted, the very situation demanded when a final syllable is made extrametrical.

Two points should be kept in mind, however. The first is that grid–based non–finality is unable to produce this same result. Since stress peaks do not double as prosodic constituents, grid–based non–finality cannot require that final syllables remain unfooted.[8] Second, as **Hyde (2008)** points out, even head–based non–finality does not offer a general approach to trisyllabic stress windows. It is unable to produce the stress window of Macedonian (**Comrie 1976**), for example. An alignment–based analysis actually provides a more successful general approach.

For a discussion of ternary stress intervals more generally, not just those limited to word edges, see CHAPTER 52: TERNARY RHYTHM.

6.2 Similarities between lexical classes

In many languages, one class of lexical items exhibits one stress pattern, while a different class exhibits a slightly different pattern. In many cases, the difference can be reduced to an extrametricality effect that one class exhibits and the other does not. Once the extrametricality effect is recognized, the similarities between the patterns become apparent, and it is possible to address both with a more unified approach. English (**Hayes 1982**), Spanish (**Harris 1983**), and Yawelmani (**Archangeli 1984**) are among the languages where extrametricality has played an important role in this context. English is used to illustrate below.

At first glance, English verbs and nouns seem to have very different stress patterns. In verbs, the position of stress depends on the shape of the final syllable. If the ultima is CVV, CVVC, or CVCC, the ultima is stressed. If the ultima is CV or CVC, the penult is stressed.

(33) *English verbs*

o'bey   de'velop
a'tone   as'tonish
tor'ment

In nouns, the position of stress depends on the weight of the penult. If the penult is heavy, stress appears on the penult. Otherwise, it appears on the antepenult.[9]

(34) *English nouns*

a'genda   A'merica
e'litist   'discipline
Ari'zona   'labyrinth

As **Hayes (1982)** demonstrates, the difference between verbs and nouns is that they show the effects of two different types of extrametricality. The verb pattern is influenced by consonant extrametricality, the evidence being the characteristic weight distinctions among final syllables (see §5). The noun pattern is influenced by syllable extrametricality, the evidence being the

presence of a trisyllabic stress window (see §6.1).

Once we allow for the two different types of extrametricality, the correct patterns emerge for both verbs and nouns when we use the quantity-sensitive binary template (σ́ L) to construct a foot at the right edge. In verbs, the (σ́ L) template positions stress on the penult when the ultima emerges as light, once the effects of consonant extrametricality have been taken into account. It positions stress on the ultima when the ultima emerges as heavy.

(35) *English verbs and consonant extrametricality*

    a.
$$(x \qquad)$$
$$\mu \quad \mu \quad \mu \qquad \rightarrow \qquad \mu \quad \mu \quad \mu$$
de . ve . lo⟨p⟩   de . ve . lo⟨p⟩

    b.
$$(x \quad)$$
$$\mu\mu \quad \mu\mu \qquad \rightarrow \qquad \mu\mu \quad \mu\mu$$
tor . men⟨t⟩   tor . men⟨t⟩

Once syllable extrametricality excludes final syllables from the foot layer in nouns, the same (σ́ L) template positions stress on the antepenult when the penult is light. It positions stress on the penult when the penult is heavy.

(36) *English nouns and syllable extrametricality*

    a. $\rightarrow$ $(x \quad)$
       A . me . ri ⟨ca⟩   A . me . ri ⟨ca⟩

    b. $\rightarrow$ (x)
       a . gen ⟨da⟩   a . gen ⟨da⟩

Extrametricality, then, allows us to extract the aspects of the English verb and noun patterns that differ, in order to capture the similarities in a single general stress rule. The analysis consists of two independently motivated extrametricality rules, the source of the differences, and a single, general stress rule, the source of the similarities. If extrametricality were unavailable, we would be forced to incorporate its effects directly into separate stress rules for verbs and nouns, making both that much more complicated and obscuring the similarities between the patterns.

It is not a straightforward matter to reproduce the extrametricality analysis in this case with a non-finality analysis. As mentioned in §6.1, head-based non-finality can produce the type of stress window found in Latin and in English nouns, but grid-based non-finality cannot. As mentioned in §5, however, grid-based non-finality can reproduce the consonant extrametricality effect seen in English verbs, but head-based non-finality cannot. Although non-finality could, in principle, help to capture similarities between the stress patterns of different lexical classes, then, its success depends very much on the facts of the particular case.

6.3 Licensing segments

Itô (1986) puts extrametricality to a use that is quite different from those discussed thus far. In the types of effects discussed above, extrametricality makes a domain-final constituent invisible to rules that create prosodic structure. Itô, however, uses extrametricality to make domain-final segments invisible to Stray Erasure (Harris 1983), a rule that deletes unsyllabified segments. The result is a theory of syllabification that relies on general, rather than idiosyncratic, deletion rules.

As a simple illustration, consider deletions that occur as part of the syllabification process in Diola Fogny (Sapir 1965). Diola prefers not to syllabify obstruents as codas. As seen in (37a)—(37c), a medial obstruent that would otherwise be syllabified as a coda ends up being deleted instead. The preference to avoid obstruent codas seems to be thwarted at the right edge of the word, however, as seen in (37d). Final obstruents are not deleted, even though they cannot be syllabified as anything other than a coda.

(37) *Obstruent deletion in Diola Fogny*

    a. letkuɟaw → lekuɟaw 'they won't go'
    b. uɟukɟa   → uɟuɟa   'if you see'
    c. kobkoben → kokoben 'yearn, long for'
    d. kuɲilak   → kuɲilak 'the children'

Extrametricality accounts for the different treatment of final and medial obstruents. In the lexical phonology, Diola's coda condition prevents obstruents from being syllabified if they would syllabify as codas. Stray Erasure then deletes any segment

that remains unsyllabified and has not been designated as extrametrical. Since medial consonants cannot be designated as extrametrical – due to the Peripherality restriction – medial obstruents that fail to syllabify are always deleted, as in (38a). Since final consonants can be designated as extrametrical, however, final obstruents are invisible to Stray Erasure and escape deletion, as in (38b), even though they are not attached to a syllable. The extrametrical consonant is syllabified later in the post-lexical phonology where the coda condition does not apply.

(38)

	syllabification (lexical)		extra-metricality		stray erasure		syllabification (post-lexical)
a.	[le]t[ku][ɹaw]	→	[le]t[ku][ɹaw]	→	[le][ku][ɹaw]	→	[le][ku][ɹaw]
b.	[ku][ɲi][la]k	→	[ku][ɲi][la]⟨k⟩	→	[ku][ɲi][la]⟨k⟩	→	[ku][ɲi][lak]

In this case, then, extrametricality accounts for an asymmetry in the deletion of medial and final obstruents, making it possible to avoid an idiosyncratic deletion rule that targets medial consonants specifically. Since it does not seem to be connected to stress peaks, at least not in any direct way, it is not immediately clear how a non-finality approach could replicate this type of segmental licensing effect.

7 The edge asymmetry

Shortly after extrametricality's introduction, it became clear that the vast majority of phenomena that might be analyzed in terms of extrametricality occur at the right edge of the relevant domain. It is for this reason that **Hayes (1980)** proposed the Edge Markedness restriction on extrametricality. As its name implies, the asymmetry is more absolute under the non-finality approach. In addition to the distributional evidence, two arguments have emerged to support this more absolute view. First, initial extrametricality and "non-initiality" do not have the same strong phonetic and rhythmic motivations as their right edge counterparts. Second, the inclusion of initial extrametricality or "non-initiality" in the grammar results in a significant decline in the accuracy of typological predictions.

7.1 Rhythmic and phonetic evidence

In searching for potential phonetic motivations, **Lunden (2007)** connects final stress avoidance to phonetic final lengthening. Since phonetic lengthening also occurs in initial syllables, we might expect stress to avoid initial syllables as well. Upon closer inspection, however, this expectation rests on very shaky ground. While the characteristics of final lengthening are more compatible with the characteristics of stresslessness, the characteristics of initial lengthening are in fact more compatible with the characteristics of stress.

First, consider the typical characteristics of final and initial lengthening. **Oller (1973)** and **Wightman *et al.* (1992)**, amongst numerous others, report that final lengthening typically affects all rhyme segments to some degree, is often associated with decline in amplitude and devoicing, and is often cumulative when multiple prosodic boundaries coincide. In contrast, **Oller (1973)** and **Keating *et al.* (2003)**, amongst others, report that initial lengthening is typically limited to the initial segment, is often associated with longer voice onset time and aspiration, and is less typically cumulative when multiple boundaries coincide.

Now consider the typical characteristics of stressed syllables. **Lieberman (1960)**, **Beckman (1986)**, and **Gordon (2002)**, amongst others, report that stressed syllables often exhibit increased duration in the rhyme, increased intensity in the rhyme, and fortition, lengthening, or aspiration of the onset. The fact that stressed syllables often have a longer rhyme might make them seem more compatible with final lengthening. The fact that intensity declines in the rhyme under phonetic final lengthening but increases under stress, however, suggests that this is really not the case. The increased intensity in the rhyme and the strengthening of the onset makes stress more compatible with initial lengthening.

Based on a parallel phenomenon in music (**Gabrielsson 1987, 1993**), **Hyde (2009)** suggests that different types of tempo changes at prosodic boundaries might account for the different characteristics of initial and final lengthening. Initial lengthening is the result of a strong attack and acceleration to medial tempo, while final lengthening is the result of a deceleration from medial tempo. An initial acceleration results in strengthening of initial segments and increased intensity in initial syllables, characteristics consistent with stress. A final deceleration results in declining intensity in final rhymes, a characteristic consistent with stresslessness.

7.2 Stress typologies

The second line of evidence against initial extrametricality and "non-initiality" is that they result in a decline in the accuracy of typological predictions (**Hyde 2002**; **Altshuler 2009**). Consider, for example, the iambic patterns of Aguaruna and Choctaw, discussed in §2. They emerge when rightward binary alternation of unstressed and stressed syllables is perturbed at the right edge of even-parity forms in order to avoid final stress. Aguaruna avoids final stress by shifting it one syllable to the left, and Choctaw avoids it simply by not assigning it.

(39) a. *Unattested*
σόόσόσ
σόσόσόσ

  b. *Aguaruna*
σόσόσσ
σόσόσόσ

  c. *Unattested*
σσόσόσ
σόσόσόσ

  d. *Choctaw*
σόσόσσ
σόσόσόσ

Although the trochaic mirror images of these patterns are both unattested, they would be predicted to occur if leftward binary alternation of unstressed and stressed syllables could be perturbed at the left edge in order to avoid initial stress.

Among the attested binary patterns in general, final stress avoidance is often a reason to perturb binary alternation, but initial stress avoidance is not. Including a principle of initial stress avoidance in the grammar, then, would only result in the prediction of unattested patterns.

The only requirement for initial syllables that produces attested patterns is a requirement that initial syllables be stressed. For example, in the trochaic Passamaquoddy (**LeSourd 1993**) and Garawa (**Furby 1974**) patterns, an initial stress requirement perturbs leftward binary alternation at the left edge.

(40) a. *Passamaquoddy*
όσόσόσ
όσόσόσσ

  b. *Unattested*
σόσόσό
σόσόσόσ

  c. *Garawa*
όσόσόσ
όσσόσόσ

  d. *Unattested*
σόσόσό
σόσόσσό

Not coincidentally, given the repulsion of stress by final syllables, the iambic mirror images of these patterns are both unattested.

Both final stresslessness and initial stress, then – the two aspects of the asymmetry suggested by the phonetic and rhythmic considerations discussed above – are confirmed by the typology of binary stress patterns.

7.3 Potential counterexamples

While the vast majority of extrametricality and non-finality effects have been found at the right edges of prosodic domains, a few languages have been argued to exhibit extrametricality effects at the left edge. In most such cases, however, alternative analyses are readily available.

Halle and Vergnaud (1987), for example, attribute the unstressability of initial vowels in Western Aranda to initial segment extrametricality. Subsequent research, however, has resulted in a number of alternative analyses of Western Aranda and similar languages, analyses that do not require initial extrametricality or non-initiality. Typically, they require the left edge of an appropriate prosodic structure to align with a consonant, preventing initial vowels from being included in that structure and, therefore, from being stressed. In **Goedemans (1996)**, for example, the left edges of feet must align with a consonant. This prevents the initial vowel from being footed and, therefore, from being stressed. In **Hyde (2007a)**, it is the left edges of head syllables that must align with a consonant; in **Downing (1998)**, it is the left edges of prosodic words. **Smith's (2002)** approach simply requires stressed syllables to have onsets.

As a second example, in the stress patterns of Winnebago (**Miner 1979**; **Hale and White Eagle 1980**) and Kashaya (**Oswalt 1961, 1988**; **Buckley 1992**) the primary stress in a form is the leftmost stress, but it typically does not appear until the third syllable. Since this ternary interval is characteristic of both even- and odd-parity forms, the most straightforward analysis is to establish a trisyllabic stress window at the left edge of the word. An initial extrametricality approach could establish the stress window by making the initial syllable extrametrical and then constructing a maximally disyllabic foot just to the right of the initial syllable. This is not necessarily strong evidence for initial extrametricality, however. As mentioned in §6.1, there are alternative approaches to trisyllabic stress windows in the literature, some of them addressing a greater variety of windows than is possible with extrametricality.

8 Summary

Extrametricality and non-finality have much in common. Both deal with peripheral positions in a domain, both deal primarily with the right edge of the domain, and both often result in final stresslessness. An important difference, however, is that extrametricality focuses on constituent parsability, while non-finality focuses on the position of stress peaks. Extrametricality rules typically prevent some domain-final constituent from being parsed into higher prosodic structure; non-finality constraints typically prevent a stress peak from occurring in some domain-final position. While they have been used to

address many of the same phenomena, the difference in focus ensures that they do not address all types with equal success.

In §2 and §3, we saw that extrametricality and non-finality provide equally effective analyses of situations where stress avoids larger final constituents like syllables and feet. In situations where stress is avoided on final syllables, an expected final stress either arrives early or is absent altogether. An extrametricality analysis achieves the desired effect by excluding the final syllable from the foot layer, a non-finality analysis by prohibiting head syllables in final position or by prohibiting foot-level gridmarks over final syllables. In situations where primary stress avoids final feet, the primary stress emerges as the penultimate stress. An extrametricality analysis excludes the final foot from the prosodic word; non-finality either prohibits head feet in final position or prohibits prosodic-word level gridmarks over final feet.

In contrast, extrametricality and non-finality do not perform equally well in accounting for phenomena involving smaller final constituents. In §4, we saw how the avoidance of stress on word-final moras makes stress sensitive to the weight of word-final syllables, how the avoidance of stress on foot-final moras results in iambic lengthening, and how the avoidance of stress on syllable-final moras results in general weight-sensitivity, iambic lengthening, and trochaic lengthening. In these cases, a non-finality analysis is much more straightforward than an extrametricality analysis. With its stress peaks focus, non-finality can prohibit stress on domain-final moras directly. With its parsability focus, however, extrametricality can only prohibit stress on domain-final moras by excluding them from some higher prosodic structure, a requirement that seems impossible to implement without either violating syllable integrity or requiring moras to remain unsyllabified.

In §5, we saw how the failure of final consonants to contribute to syllable weight affects the stressability of final syllables. Extrametricality achieves the desired result directly by making final consonants invisible to mora assignment. A grid-based non-finality approach achieves the desired result indirectly by prohibiting mora-level gridmarks – and, thus, the moras associated with them – from occurring over final consonants. A head-based non-finality approach, however, appears to be unable to capture the effect at all.

In §6, we examined some of the classic arguments for extrametricality, focusing on trisyllabic stress windows and segmental licensing, and we considered the possibility of non-finality approaches. While head-based non-finality offers analyses for some types of trisyllabic windows, grid-based non-finality does not. Recent alternative proposals for a general approach to stress windows, however, make non-finality's limitations in this area less problematic. With respect to segmental licensing, it is not clear that a non-finality approach is even possible.

Finally, §7 outlined the evidence for the edge asymmetry in extrametricality and non-finality formulations. First, the types of effects analyzable in terms of extrametricality or non-finality occur almost exclusively at right edges. Second, phonetic and rhythmic considerations motivate stresslessness in final positions, but they actually motivate stress in initial position. Third, the inclusion of initial extrametricality or non-initiality in the grammar negatively impacts the accuracy of typological predictions.

Notes

1   Liberman and Prince introduce the notion of extrametricality to account for the apparent invisibility to stress rules of final −y in English: "From our point of view, −y functions as a kind of 'extrametrical' syllable; it simply does not take part in the metrical calculation" (**Liberman and Prince 1977**: 293). Later in the same paragraph: "−y is effectually *hors de combat* in the basic determination of metrical structure."

2   **Hung (1994)** infers the position of stress from the absence of vowel reduction processes. Her account is based on **Payne's (1990)** description.

3   An alternative to leaving the final two syllables unparsed is to parse them into a stressless foot: (tʃi.'pi)(sa.li). See **Hyde (2002)** for discussion.

4   Languages presented as default-to-same-side systems often are not completely convincing in this classification. Since individual forms never contain more than one heavy syllable in Murik, for example, the significance of being the leftmost is less than clear. There is a similar problem with the classification of Aguacatec. McArthur and McArthur do not demonstrate the pattern for forms with more than one heavy syllable. For a more thorough discussion of non-finality's role in both default-to-same-side and default-to-opposite-side systems, see **Hyde (2006)**.

5   An alternative approach is to rely on a foot minimality requirement to distinguish between light and heavy final syllables. This is essentially the approach adopted by **Hayes (1995)**. As **Hyde (2007b)** points out, however, such an approach produces the same type of weight-sensitivity in non-final syllables, as well, where it is, unfortunately, unattested.

6   Similar arguments can be made against proposals that involve extrasyllabic moras acting as a sort of prosodic licenser for otherwise stray segments in order to protect them from deletion through Stray Erasure (**Downing 1993**; **Everett 1996**). Although such licensing has only been employed at the left edge, there would seem to be nothing to prevent it applying at the right edge, as well, leading to the results illustrated in (25).

7   As an anonymous reviewer points out, the claim that head-based non-finality cannot prevent final consonants from being moraic depends on the assumption that moras – unlike the higher prosodic categories – do not have heads. If moras have head segments, as argued by **de Lacy (1997)**, then final consonants might be prevented from being moraic by

prohibiting head segments from being final in the prosodic word. There are several arguments against this approach, however, one of which is that segments are not constituents of moras in the usual sense. It is often the case that multiple moras are associated with single segments. In such cases, not only would each mora have exactly the same single constituent, but it would also have exactly the same head. Neither situation is tolerated at higher prosodic levels, even in fairly permissive theories, like **Hyde (2002)**, that allow prosodic categories to share constituents.

8   As an anonymous reviewer points out, whether or not grid-based non-finality can prevent the final syllable from being footed depends on the particular structures that are assumed to be the constituents of feet. If feet are actually built on base-level gridmarks, rather than syllables, preventing the final syllable from mapping to a base-level gridmark would also prevent it from being footed. The grid-based non-finality approach presented here, however, assumes that metrical structure and prosodic structure are independent, so that feet are built on syllables. Under this approach, the failure of a final syllable to map to the grid would not prevent it from being footed.

9   This generalization applies to English nouns with a stressless final syllable. Nouns with final stress must be treated differently.

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