A New Century of Phonology and Phonological Theory

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The Footing of Dactylic Sequences in American English

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1 Introduction

This paper examines the footing of the third syllable in dactylic sequences in American English. A dactylic sequence consists of a stressed syllable followed by two stressless ones. These are exemplified by the last three syllables of such words as cápitai, cháriy, and América. We will refer to a dactylic sequence at the end of the word as a final dactyl. Dactylic sequences can also occur word initially before a stressed syllable. This is illustrated by the initial three syllable sequences of words such as Méditerráneo, Winnepasúke, and Kálamazúo. We will refer to these as nonfinal dactylic sequences. In this paper we will consider the footing of the third syllable of dactylic sequences. The main claim of this paper is that there is an asymmetry between final and nonfinal dactylic sequences. With final dactyls, as in cápitai, and América, the third syllable is adjoined as part of a foot with the preceding syllables. On the other hand, in words like Méditerráneo and Winnepasúkeee the third syllable of the nonfinal dactylic sequence is adjoined to the following foot and does not normally belong in a foot with the preceding syllables. Our evidence for this asymmetrical footing of final and nonfinal dactyls comes from a consideration of how processes sensitive to the foot in American English apply (or not apply) to the third syllable of a dactylic sequence. In particular, we will consider flapping, aspiration, and expletive infixation. We focus only on the word-internal environments for these processes. While not all recent discussions on these phenomena consider them to be foot-based, they are nonetheless commonly argued to be foot-based. For example, both Kiparsky (1979) and Harris (1994) consider flapping to occur in foot-internal position. The analysis of American English aspiration as occurring in foot-initial position can be found
in such works as Nespor & Vogel (1986), Iverson & Salmons (1995) and Davis & Cho (2003), among others. That English expletive inflexion might be a foot-sensitive process was expressed by McCarthy (1982). Expletive inflexion involves the insertion of an expletive word such as ‘frickin’ inside the English word as in the example fan-frickin-tastic. (In this paper, examples of expletive inflexion will be illustrated with the common American English expletive substitute ‘frickin’.) As will be discussed later, we consider the location site of the inserted expletive to be foot-sensitive. In Section 2 of this paper we consider the application of these processes to final dactylic sequences and in Section 3 we consider their application to nonfinal dactylic sequences. Section 4 considers two types of nonfinal dactylic sequences where the evidence suggests that the third syllable of the nonfinal dactyl adjoins to a preceding foot rather than to the following foot. One case concerns a vowel-initial third syllable and the other case involves a paradigm uniformity effect with respect to foot structure. Section 5 concludes the paper.

2 Final Dactylic Sequences

Let us consider the words in (1) that have a final dactylic sequence.

(1) cápital charity sérendipity
    Connécticut América Oédius

In the metrical stress literature on English, the words in (1) are typically analyzed with a trochaic foot built from the right edge but with the final syllable being extrametrical so that primary stress falls on the antepenultimate syllable in (1), given that the penultimate syllable is light. The initial footing for (1) is shown by the example in (2) where the final syllable is not incorporated into the foot.

(2) cápital
    \[
    \begin{array}{c}
    F \\
    \sigma_s \\
    kæ pə Dæl
    \end{array}
    \]

For the words in (1), the issue arises as to whether on the surface the final syllable (i.e. third syllable of a final dactylic sequence) should be incorporated into the preceding foot. Some researchers such as Kager (1989) leave the final syllable unfooted. However, when we consider the character of the final syllable it has properties of a foot-internal syllable. This is most notable for the words in the first row in (1) where the /t/ at the beginning of the final syllable is clearly flapped. This strongly suggests that the /t/ is foot internal given the understanding of the English flapping process as occurring in a foot-internal environment. Moreover, Van Dam and Weaver (2001) show that the voiceless stops /p/ and /k/ at the beginning of the final syllable of words in the second row in (1) are lightly aspirated and do not have the degree of aspiration that accompanies a foot-initial voiceless stop. We take the flapping of the /t/ of the words in the first row in (1) and the lack of strong aspiration on the voiceless stops at the beginning of the final syllable in the words in the second row in (1) as indicative that these final syllables in (1) are foot-internal. This third syllable of the final dactylic then is included into a foot with the preceding syllables. Such footing can be found in Hayes (1981), Davis (1987), and McMahon (2002). For our purposes here, we adopt the surface ternary foot structure in (3) illustrated for the word capital, though our discussion is compatible with the foot structure of Hayes (1981) where the final syllable is adjoined as a right member of a superfoot.

(3) capital
    \[
    \begin{array}{c}
    kæ \\
    pə \\
    Dæl
    \end{array}
    \]

The foot structure in (3) is supported by the observation that expletive inflexion cannot apply between the penultimate and final syllables for any of the words in (1) (e.g. *capi-frickin-tal). If we understand expletive inflexion as applying at foot boundaries, along the lines of McCarthy (1982), then expletive inflexion supports the foot structure in (3). We thus conclude that the third syllable of a final dactyl is incorporated on the surface as the final member of a preceding foot.
3 Nonfinal Dactylic Sequences

Let us consider the monomorphemic words in (4) that have a nonfinal dactylic sequence.

(4) a. Méditerránean Návratilóva
    b. lőlispalóza péripatéic Winnipesáukee Winnpegegónís
    c. ábracadábra Nēbucadnēzzar

As Pater (2000) notes, the issue of the footing of the third syllable of the nonfinal dactyl has been largely neglected in the literature on English metrical phonology. In (5), we show the initial footing of ábracadábra in (4c) where the third syllable is not footed.

(5) ábracadábra

If we assume that all syllables are footed on the surface then the third syllable of a nonfinal dactyl can either be the final member of a foot with the preceding syllables or an initial member of a foot with the following syllables. A third possibility is that it forms a degenerate foot on its own. We will not consider this possibility given that the third syllable in these words is clearly stressless, pronounced with a reduced vowel. The literature that discusses the footing of the third syllable of a nonfinal dactyl is conflicting. Hayes (1981) and McCarthy (1982) include the third syllable of a nonfinal dactyl as an adjoined member of the preceding foot, maintaining consistency with the footing of a final dactylic sequence. We show this in (6) where the nonfinal dactyl has the same structure as the final dactyl in (3).

(6) ábracadábra

An alternative footing is shown in (7). This was posited by Withgott (1982) based on the observation that the /t/ fails to flap in Méditerránean suggesting that it is not foot-internal. More recently, this foot structure has been adopted by Jensen (2000), Davis & Cho (2003) and is suggested by Pater (2000).

(7)

In (7), the initial syllable of the dactylic sequence is adjoined as the first syllable of a superfoot and does not group with the preceding syllables. That is, (7) reflects an asymmetry between the footing of the final dactyl in (3) and the nonfinal dactyl in (7). Given the conflicting foot structures in (6) and (7), we will consider the data in (4) with respect to flapping, aspiration, and expletive infixation. As will be shown, when these are applied to nonfinal dactylic sequences of the words in (4) they support the foot structure in (7).

Let us consider the application of flapping to the data in (4a). First, as specifically noted by Withgott (1982), flapping fails to occur in the third syllable of the word Méditerránean in (4a). Steriade (2000) has suggested that the lack of flapping in this word is just an exception. However, there is also a lack of flapping of the /t/ in the third syllable of the name Návratilóva. This suggests that the lack of /t/ flapping at the beginning of a third syllable of a nonfinal dactyl constitutes a regular pattern. This would not be predicted with the foot structure in (6) where the nonfinal dactyl has the same footing as the final dactyl. The absence of flapping is compatible with the foot structure in (7) where the /t/ would be foot-initial.

With respect to aspiration, there are virtually no acoustic studies focusing on whether or not the voiceless stop consonant at the beginning of the third syllable of a nonfinal dactyl is aspirated. That is, in (4) are the voiceless stops at the beginning of the third syllable aspirated? The aspiration of these stops would support the foot structure in (7) given the generalization that aspiration in American English occurs in foot-initial position. While the
beginning of the third syllable of a nonfinal dactylic sequence is not one of the environments mentioned in the traditional generative works discussing English aspiration (e.g., neither Kahn 1976 not Selkirk 1982 mention it), both Jensen (2000) and Pater (2000) independently contend that a voiceless stop in that position is indeed aspirated in American English. Their impressionistic contention finds support from the preliminary phonetic study of Van Dam and Weaver (2001). In their study they considered the voice onset time of the voiceless stop at the beginning of the third syllable in the words Winnipegosis, Méditerranéan, and Nabuchadnezzar. They found that these stops had an average voice onset time of more than 50 milliseconds. This is quite aspirated given that the third syllable is stressless. This should be compared to words like muppets and moccasins where the voiceless stop at the beginning of a stressless syllable occurs immediately after the stressed syllable. These foot-internal voiceless stops have very short voice onset times. Consequently, the fact that the voiceless stops are aspirated at the beginning of the third syllable in words like in (4) provides support for the foot structure in (7) where the third syllable of the nonfinal dactylic sequence is adjoined as the initial syllable of a superfoot and not as the last syllable of the preceding foot.

Further evidence for the superfoot structure in (7) comes from words like potáio, tomáio, and candory that have a voiceless stop at the beginning of an initial stressless syllable. When such syllables have an initial voiceless stop they surface as aspirated. This suggests that these words have the foot structure shown in (8) where the initial syllable forms the first syllable of a superfoot.

```
(8)  
    potato  
    \   / 
   /   \  
  σw  σ2  σw  
    \    \    
     po te Do 
```

The superfoot in (8) has the same structure as the superfoot shown in (7). This makes clear that the third syllable of a nonfinal dactyl as in (4) is more like the initial stressless syllable of a word like potáio than like the third syllable of a final dactyl as in (1). With the superfoot structure shown in (7) and (8), the generalization regarding English aspiration is that voiceless stops are aspirated in foot-initial position, be it the superfoot or the trochaic foot.

An additional piece of evidence for the foot structure proposed in (7) comes from expletive inflexion. McCarthy (1982) observed that words like Winnepesu doe k (in 4) show variation with respect to expletive inflexion as seen in (9).

```
(9)  
    Expletive inflexion of Winnepesu doe k  
    a. Winn-e-frickin-pesauke  
    b. Winn-pe-frickin-sauke 
```

McCarthy's observation regarding the variant forms of expletive inflexion in (9) appears correct and robust. Such variation seems applicable to all the words shown in (4). Given the foot structure in (7), one can make a clear generalization accounting for the variant forms of expletive inflexion illustrated in (9), namely, that the expletive occurs before a foot boundary. This can either be before a superfoot or the trochaic foot. Notice that the foot structure in (6) would not easily account for the variation in expletive inflexion seen in (9). (Expletive inflexion is reminiscent of inserted sequences found with language games in that both provide evidence for prosodic constituents; see, for example, Haraguchi's (1991) discussion of the Japanese babibu game.)

In this section we have provided evidence that that foot-sensitive processes treat the third syllable of a nonfinal dactyl as if it is foot initial: a voiceless stop at the beginning of such a syllable is aspirated, it is not flapped if it is h', and expletive inflexion can occur before it. These are properties that are not shared with the third syllable of a final dactyl. This supports the asymmetry in the footing of the third syllable of dactylic sequences: in a final dactyl it is footed with the preceding syllables as in (3), but in a non-final dactyl it is initial in a superfoot with the following syllables as in (7).

4 Exceptional Nonfinal Dactylic Sequences

In the preceding section, we presented evidence that the third syllable of a nonfinal dactyl in words such as (4) constitutes the initial syllable of a superfoot. It is not footed with the preceding syllables. In this section we discuss two types of cases where we maintain that the third syllable of a
nonfinal dactyl is footed with the two preceding syllables, symmetrical to a final dactyl as in (3). One case that to my knowledge has not been previously discussed is when the third syllable of the nonfinal dactyl begins with a vowel. The other case which has been discussed in the literature involves complex words with a nonfinal dactyl that show a paradigm uniformity effect.

There are very few words with a nonfinal dactyl in which the third syllable begins with a vowel. Two relatively familiar words are given in (10).

(10) a. *Indianápolis
    márionétté

The question arises as to the footing of the vowel-initial third syllable of the nonfinal dactylic sequence in (10). Since the syllable begins with a vowel there is no evidence from aspiration or flapping. However, expletive infixation cannot apply to these words. This is illustrated in (11) for *Indianápolis.

(11) a. *Indi-frickin-anopolis
    b. India-frickin-nopolis

In (11a) we see that expletive infixation cannot occur between the second and third syllable of the nonfinal dactylic sequence if the third syllable begins with a vowel. This suggests a surface footing as in (12) where the first three syllables are footed like the final dactyl in (3) and not as in (7).

(12) Indianapolis

```
  F     F
     \  /  \\
  \  /  /  \\
    σ₁ σ₃ σ₃
    |    |    |
In di e næ pæ læs
```

While we argued in the previous section that the third syllable of a nonfinal dactyl normally forms the initial syllable of a superfoot with the following syllables as in (7), it is not surprising that an exception to this would involve a syllable beginning with a vowel. Downing (1998) has specifically observed that cross-linguistically vowel-initial syllables have exceptional prosodic properties. This includes their inertness to stress in some Australian languages and their exceptional tone patterns in some Bantu languages. The English case above constitutes another example where a vowel-initial syllable has exceptional prosody. Moreover, the English case is interesting because vowel-initial syllables frequently do occur in foot-initial position. One can understand the footing in (12) from a perspective of a theory that allows for violable constraints such as Optimality Theory. Under such a theory English would have a low ranking constraint disallowing vowels from being foot-initial. The constraint is almost always dominated by other relevant constraints so its force is not usually felt. However, in this one marginal case of footing, where the third syllable of a nonfinal dactyl begins with a vowel, the low ranking constraint disallowing a vowel-initial foot has an effect forcing the vowel-initial syllable into the preceding foot.

The example just discussed regarding a vowel-initial third syllable in a nonfinal dactylic sequence is not the only case where some overriding factor or constraint can push the third syllable of the dactylic sequence into a foot with the preceding syllables. Another such case involves a paradigm uniformity effect where the third syllable of a nonfinal dactyl of a complex word reflects the footing of a final dactyl in its simplex counterpart. Consider the word cæpitallistic and its simplex base cæpitall. As noted by Withgott (1982) the /t/ at the beginning of the third syllable in cæpitallistic is unexpectedly flapped. The expectation is that it would be aspirated like the words in (4). The flapping of the /t/ can be understood if the first three syllables of cæpitallistic is footed like the final dactyl of cæpitall shown in (3).

That is, there is a paradigm uniformity effect with respect to prosodic structure between cæpitall and cæpitallistic; the flapping of the /t/ follows from it being foot-internal. This is interesting in light of the fact that the suffix complex -llistic reflects level one suffixation and level one suffixes in English do not normally preserve the prosodic structure of its base. In order to see why cæpitallistic differs from the other words in (4), compare the foot structure in cæpitallistic in (13) with that for abracadabra in (14) where in each word we leave the third syllable of the nonfinal dactylic sequence unfooted.
(13) capitalistic

\[
\begin{array}{c}
\sigma_s \\
\sigma_w \\
\text{kæ po tə lis tk}
\end{array}
\]

(14) abracadabra

\[
\begin{array}{c}
\sigma_s \\
\sigma_w \\
\text{æ bra kə de bra}
\end{array}
\]

Normally, the footing of the third syllable of a nonfinal dactyl would go with the syllables that follow, forming the initial syllable of a superfoot. This is what happens with (14) whose complete footing is shown in (7). However, as was discussed in the first part of this section, the footing of the third syllable of a nonfinal dactylic sequence may be influenced by other constraints or factors that normally do not play a role, such as if it is vowel-initial, as argued for in (10)-(12) regarding the footing of the vowel-initial third syllable in 'Indianapolis'. In capitalistic the influencing factor is that it has the base form capital with the footing in (3) repeated in (15).

(15) capital

\[
\begin{array}{c}
\sigma_s \\
\sigma_w \\
\text{kæ po Dəl}
\end{array}
\]

Thus, we see here an effect of paradigm uniformity on foot structure even though with level one suffixation prosodic structure is not normally preserved. Capitalistic then has the foot structure in (16) with the third syllable incorporated into the first foot, reflecting the footing of capital. Flapping occurs to the /t/ at the beginning of the third syllable because it is foot internal.

(16) capitalistic

\[
\begin{array}{c}
\sigma_s \\
\sigma_w \\
\text{kæ po tə lis tk}
\end{array}
\]

The foot structure in (16) is further supported by the application of expletive inflexion. When it is applied to capitalistic, only the form capata-frickin-

The form capata-frickin-tastic seems possible with the expletive after the foot-final third syllable. The form capata-frickin-tastic seems not possible, especially if one were to maintain the flapping of the /t/ of the original third syllable.

We have shown in this section that factors that do not normally play a role in prosody can effect the footing of the third syllable of a nonfinal dactylic sequence. These factors include whether or not that syllable is vowel-initial and whether or not paradigm uniformity with a base can be maintained even if level one suffixation is involved. One can ask why do these factors play a role only with a third syllable of a nonfinal dactylic sequence. The reason has to do with the uniqueness of the two consecutive stressless syllables of a nonfinal dactyl. This is the only situation in English where there are two consecutive stressless syllables internal to the word where neither is at a word boundary. Clearly the first of these two stressless syllables forms a foot with the preceding stressed syllable. The second of these two stressless syllables (i.e. the third syllable of the nonfinal dactylic sequence) normally is footed with what follows on the pattern of the footing for a word like potato in (8) with an initial stressless syllable followed by a stressed one. However, as we have shown, this footing can be overridden if other factors are at issue such as paradigm uniformity or the syllable being vowel-initial.

5 Conclusion

In this paper we have examined the footing of the third syllable in dactylic sequences in American English. We have argued that there is an asymmetry between final and nonfinal dactylic sequences. With final dactyls, the third syllable is adjoined as part of a foot with the preceding syllables as in (3). With nonfinal dactyls the third syllable is normally adjoined to the following
foot forming the initial syllable of a superfoot; however, as discussed in Section 4, other factors that normally do not play a role in English prosody can influence the footing of the third syllable of a nonfinal dactyl. These factors include paradigm uniformity with respect to level one suffixation and whether or not the third syllable of the nonfinal dactyl begins with a vowel. Our finding is counter to Hayes (1981) and Steriade (2000) who assume a symmetry between final and nonfinal dactylic sequences. Evidence supporting the basic asymmetry between final and nonfinal dactylic sequences comes from processes such as flapping, aspiration, and expletive infixation which are sensitive to the foot structure within the word. We leave to future work an examination of other evidence that might bear on the footing of dactylic sequences.

References