Stress and Syntax-Phonology Mismatches: Tonal Domains in Danyang and Shanghai

San Duanmu
Massachusetts Institute of Technology

This paper analyzes tonal domains in Danyang and Shanghai by applying stress rules cyclically through syntactic bracketing. Section 1 presents the data, followed by the analysis in section 2. In section 3, I discuss how Danyang and Shanghai relate to recent debates on the relation between prosodic rules and syntax, particularly how independent the former are from the latter, and how syntax-phonology mismatches may arise.[1]

1. The Data

Both Danyang (DY) and Shanghai (SH) are members of the Wu family, a major dialect family of Chinese. Data on DY are from Lü (1980). Data on SH are mainly from Xu et al (1981-83) and Selkirk & Shen (1990), as well as from my own informants.

Many Wu languages exhibit 'phrasal sandhi', whereby the tonal pattern of a phrasal domain is determined by the underlying tones of the initial syllable. We show this with SH[2]

(1) fu 'fire' tso 'car' lo 'old'
MH HL LH

(2) a. fu tso --> fu tso --> fu tso 'train (fire-car)'
MH HL MH M H

b. lo fu tso --> lo fu tso --> lo fu tso 'old train'
LH MH HL LH L H (L)

The underlying tones of each syllable are given in (1). (2) shows phrasal sandhi:

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[2] This variety of Shanghai is spoken by younger people. Older people speak a different variety, sometimes called 'Old Shanghai', described by Sherard (1972) and Shen (1981).

first, tones on noninitial syllables are deleted; then the second tone of the initial syllable is shifted to the second syllable; finally, a toneless syllable gets L as default.

The prasal sandhi in DY is, in essense, the same as that in SH, in that, first , the underlying tones of noninitial syllables are deleted, then the underlying tones of the initial syllable spread over the entire phrase in some way.[3] We will, however, not dwell on the underlying tones and the ways of spreading in DY. Instead, we will focus on how a tonal domain is determined.

Tonal domains in DY and SH are sensitive to two factors, namely, syntactic relations and word length. In syntactic [Head Nonhead] relations, there is always a domain break between the two constituents, while in syntactic [Nonhead Head] relations, there is not always a domain break. For example, [V N] tso ve 'to fry rice' always forms two domains, but [A N] la~ ve 'cold rice' always forms one. Some syntactic [Nonhead Head] structures CAN form two domains, and this depends on the word lengths of the constituents. For example, in [A N] structures, [1 2] (monosyllabic + bisyllabic) and [1 1] (monosyllabic + monosyllabic) always form one domain, as in tie? si-tsz 'iron lion' and la~ ve 'cold rice', but [2 1] and [2 2] may form either one or two, as in n^{y}e?-sz bin 'hot-water bottle' and za~-he tso-ze 'Shanghai Station'. For reason of space, we will only discuss syntactic [Nonhead Head] structures in this paper.

Below we summarize the domain patterns in bisyllabic through quadrisyllabic phrases. The data is in DY from Lü, who does not discuss longer phrases.[4] Data in SH will be noted when it differs from DY, or when a certain pattern is missing from DY. Transcription is given in the Pinyin system. In all examples, the word order in DY and SH is the same as that in English. The syllable sign 'σ' is used only for convenience; nothing is implied for the view that metrical structures are constructed on syllables (cf. Halle & Vergnaud (1987), who argue that metrical and syllabic structures lie on separate plane).

(3) Multisyllabic morphemes form one domain ($\sigma\sigma$...)

[piao-liang]	($\sigma\sigma$)	'pretty'
[ka-fei]	($\sigma\sigma$)	'coffee'
[bai-lan-di]	($\sigma\sigma\sigma$)	'brandy'
[a-si-pi-lin]	($\sigma\sigma\sigma\sigma$)	'aspirin'

(4) [1 1] forms one domain ($\sigma\sigma$)

[re shui]	($\sigma\sigma$)	'hot water'
[hong hua]	($\sigma\sigma$)	'red flower'
[tao hua]	($\sigma\sigma$)	'peach flower'

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[3] Danyang has two styles of speech, literary and colloquial. 'Phrasal sandhi' occurs only in colloquial speech.

[4] Some patterns may have a few exceptions. We will focus on the dominant cases. For example, in DY most multisyllabic morphemes form one domain, but some form two domains, with the final syllable being a separate domain, e.g., (gao-er)-(fu) 'golf'. We may assume that in these morphemes the last syllable is marked extrametrical. When another syllable is added to such words, the extrametricality disappears. Thus, in (gao-er-fu) (qiu) 'golf ball', fu is no longer extrametrical, and gao-er-fu forms one domain. In addition, we will not discuss idiomatic phrases, nor what Lü calls 'flat structures', such as cai mi you yan 'firewood, rice, oil, salt (daily necessities)' and dong nan xi bei 'east, south, west, north (everywhere)'.

(5) [1 2] forms one domain (σσσ)
[tie shi-zi] (σσσ) 'iron lion'
[ni pu-sa] (σσσ) 'clay Buddha'
[ye [kuai che]] (σσσ) 'night fast-car (express)'
[xin [bei men]] (σσσ) 'new north gate'

(6) [2 1] forms (σσ)(σ) or (σσσ)
[[ci-gu] pian] (σσ)(σ) arrowhead slice
[[re shui] ping] (σσ)(σ) hot water bottle
[[jin shi] yan] (σσσ) 'short-sighted eye'
[Shang-hai ren] (σσσ) 'Shanghai person'
[[yang mao] shan] (σσσ) 'sheep-wool sweater'
[[xiao zi] bao] (σσσ) 'small-character poster

(7) [1 [1 2]] forms (σσσσ)
[ye [bai ju-hua]] (σσσσ) 'wild white daisy'
[zhen [jin jie-zhi]] (σσσσ) 'real gold ring'
[fu [zhong zhi-hui]] (σσσσ) 'vice general director'

(8) [1 [2 1]] forms (σσσσ) or (σσσ)(σ)
[lao [huo-che zhan]] (σσσσ) or (σσσ)(σ)
'old train station'
[jiu [jao-ta che]] (σσσσ) or (σσσ)(σ)
'old foot-pedal car'
[xin [ti-yu guan]] (σσσσ) or (σσσ)(σ)
'new Phy.Ed. hall (gym)'

(9) [[1 2] 1] forms (σσσ)(σ) or (σσσσ)
[[qing gong-ye] ju] (σσσσ) or (σσσ)(σ)
'light industry bureau'
[[hu luo-bo] si] (σσσ)(σ)
'foreign radish (carrot) shred'
[[qiu hai-tang] hua] (σσσ)(σ)
'fall crabapple flower'

(10) [[2 1] 1] forms (σσ)(σ)(σ) or (σσσ)(σ)
[[re-shui ping] dan] (σσ)(σ)(σ)
'hot-water bottle liner'
[[yu-gan you] wan] (σσ)(σ)(σ)
'fish-liver oil ball'
[[zi-lai shui] bi] (σσσ)(σ)
'fountain water pan'

(11) [2 2] forms (σσσσ) or (σσ)(σσ)
[Shanghai che-zhan] (σσσσ) or (σσ)(σσ) 'Shanghai Station'
[Kailuan mei-kuang] (σσσσ) or (σσ)(σσ) 'Kailuan coal-mine'
[zi-ran ke-xue] (σσσσ) 'natural science'
[be-jing da-xue] (σσσσ) 'Peking University'
[wei-xin zhu-yi] (σσσσ) 'ideal-ism'
[dian-deng kai-guan] (σσ)(σσ) 'lamp switch'
[she-hui ke-xue] (σσ)(σσ) 'social science'
[wei-wu zhu-yi] (σσ)(σσ) 'material-ism'

(12) [3 1] forms $(\sigma\sigma\sigma)(\sigma)$ or $(\sigma\sigma\sigma\sigma)$

[a-er-tai shan]	$(\sigma\sigma\sigma)(\sigma)$	'Altai Mountain'
[qiao-ke-li tang]	$(\sigma\sigma\sigma)(\sigma)$	'chocolate candy'
[gao-er-fu qiu]	$(\sigma\sigma\sigma)(\sigma)$	'golf ball'
[e-mi-tuo fu]	$(\sigma\sigma\sigma\sigma)$	'Amitayus Buddha'

The only quadrisyllabic pattern not given by Lü is [1 3]. From his remark that [1 3] forms one domain (p.109), and the fact that [1 3] forms one domain in SH, we add this pattern below

(13) [1 3] forms $(\sigma\sigma\sigma\sigma)$

[bei ai-er-lan]	$(\sigma\sigma\sigma\sigma)$	'Northern Ireland'
[da tuo-la-si]	$(\sigma\sigma\sigma\sigma)$	'big trust'
[bai fan-shi-lin]	$(\sigma\sigma\sigma\sigma)$	'white vaseline'

(6), and (8)-(12) each has two domain patterns. In (6), some phrases prefer one pattern, and some prefer the other. In (11), some prefer one, some prefer the other, and some prefer both. In (8) both patterns are equally preferred. One may ask why, in each of these structures, not both patterns are equally preferred by all phrases. I have no good explanation for this, except pointing that in SH, all expressions in (6) and (8)-(12) may form both patterns. I will therefore consider all domain patterns in (6) and (8)-(12) to be proper ones.

2. The Analysis

In this section, we propose an analysis of the data in section 1. For reason of space, we will give our proposal directly. We will discuss alternative analyses only briefly in section 3.

Our analysis is based on stress metrics. There are three reasons for taking this approach. First, as Lü points out (p.89), in each domain, the initial syllable is stressed. Initial stress is also noted in SH (Xu et al). Second, it often happens that lack of stress may lead to tone loss; for example, in the Mandarin words di(HL) fang(H) --> di(HL) fang 'place', huang(MH) gua(H) --> huang(MH) gua 'cucumber', and xiao(HL) hua(HL) --> xiao(HL) hua 'joke', the second syllable in each word is unstressed and loses its underlying tone, to become the so-called 'neutral tone'. That lack of stress may lead to tone loss is easy to understand: if stressless vowels may lose height and frontness and reduce to schwa, they may also lose their tonal features. The fact that in DY and SH, noninitial syllables lose their underlying tones may thus be attributed to their lack of stress. Third, tonal domains can be changed if one puts additional stress on certain words, such as happens in contrastive speech. Consider a case in SH (parentheses indicate tonal domains)

(14) a. (bo?-jing da-Ho)
Peking big school
'Peking University'

b. (bo?-jing zong-Ho)
Peking middle school
'Peking Middle School'

c. (bo?-jing) (DA-Ho), (ve?-zi) (bo?-jing) (ZONG-Ho)
Peking BIG school not Peking MIDDLE school
'Peking UNIVERSITY, not Peking MIDDLE school'

Normally, bo?-jing da-Ho 'Peking University' and bo?-jing zong-Ho 'Peking Middle School' each forms one domain, as in (14a,b). But when da and zong are contrasted, as in (14c), they receive extra stress, and each starts a new tonal

domain.

Our proposal includes three general assumptions, given in (15), and three rules for DY and SH, given in (16)

(15) a. Stress Equalization Convention (SEC): On each cycle, add asterisks to the newly introduced element, so that it has the same number of asterisks as the highest column of the previous cycle.
b. Clash Rule: On each cycle, if the highest column of asterisks is adjacent to a lower column, remove the lower column.
c. Column Lowering: On each cycle, if there is only one column of asterisks, delete all the asterisks except the top one.

(16) In DY and SH:
a. Assign left-headed stress cyclically, starting from each morpheme.[5]
b. Stress Reduction (noncyclic): optionally delete the lowest line of asterisks.
c. The tonal domain starts from a stressed sylable and includes all stressless syllables to the right, up to just before the next stressed syllable.

For (15a) and versions of (15b), I refer the reader to Halle & Vergnaud (1987). For (15c), we note that although many languages contrast stressed and stressless monosyllables, no language contrasts different degrees of stress on a monosyllable, such as <1> (highest stress), <2> (secondary stress) and <3> (ternary stress), in addition to <0> (no stress). Similarly, although on bisyllabic words, a language may contrast <1 2> (primary + secondary) with <1 0> (primary + stressless), no language that contrasts <1 0> (primary + stressless) with <2 0> (secondary + stressless). Such phenomena must be due to the fact that stress is relative, not absolute. (15c) reflects this fact, and will be shown to play an important role in DY and SH. Finally, (16b) is a language particular rule that obliterates weaker stresses. Just as extrametricality does not apply to a monosyllable, (16b) does not apply when there is only one line of stress, otherwise there will be no stress left.

We are now ready to derive the patterns in (3)-(13). Consider multisyllabic morphemes first, which forms one domain[6]

(17) (*)
[ka-fei] --> ($\sigma\sigma$) 'coffee'

The word <u>ka-fei</u> has no internal bracketing, so it undergoes just one cycle, on which (16a) assigns an asterisk to the initial syllable, and by (16c), the word forms one tonal domain.

Next, consider [1 1] in (4), shown by <u>re shui</u> 'hot water'

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[5] In fact, left-headed stress is assigned to the morpheme, but on higher cycles stress is assigned to the syntactic Nonhead. Thus, in a syntactic [Head Nonhead] structure, stress goes to the second constituent, and so there is always a domain break between the two constituents, as mentioned in section 1. Since in this paper we only discuss syntactic [Nonhead Head] structures, left-headed stress is in effect assigned on all cycles.

[6] For brevity, my metrical notation below differs slightly from that of Halle & Vergnaud. However, this is immaterial to the conclusion we draw.

(18)
```
( *    )          ( *    )
( *)( * )         ( *)            ( *      )
[re shui]   -->  [re shui] --> [re shui] --> (σσ)
                  Clash        C.L.
```

First, each morpheme forms an independent cycle, and each gets an asterisk. On the final cycle, another asterisk is assigned to re. Now both syllables have stress, triggering the Clash Rule, which removes stress from shui. Finally, Column Lowering removed the lower asterisk from re. The result is one tonal domain.

(17) and (18) show that two monosyllabic morphemes [1 1] give the same output as a bisyllabic morpheme. This is achieved by the Clash Rule and Column Lowering.

We next look at [1 2] in (5), which forms one domain

(19)
```
                          (*     )          (*     )
(*)(*  )        (*)(*  )        (*)
[σ [σ σ]] -->  [σ [σ σ]] --> [σ [σ σ]] -->
                                Clash
 (*     )
 [σ [σ σ]] -->  (σσσ)
     C.L.
```

The first syllable gets an asterisk on its own cycle. Whether the innner [σ σ] is a bisyllabic morpheme or two monosyllabic morphemes will give the same result, as seen in (17)-(18). On the final cycle, the first syllable gets another asterisk, then the Clash Rule removes stress from the second syllable. Finally, Column Lowering removes the lower asterisk from the first syllable. The result is one domain.

Next consider [2 1] in (6), which may form either (σσ)(σ) or (σσσ)

(20) a.
```
(*     )
(*  )(*)
[[σ σ] σ] -> (σσ)(σ)
```

b.
```
(*     )
(*  )(*)     (*     )
[[σ σ] σ] -> [[σ σ] σ] -> (σσσ)
```

The derivation of the inner [σ σ] is as in (17)-(18). The third syllable gets an asterisk on its own cycle. On the final cycle, the first syllable gets another asterisk. Now the Clash Rule cannot apply, since the two stresses are not adjacent. Nor can Column Lowering apply, since there are two columns of asterisks. However, since the highest column has more than one asterisk, Stress Reduction may apply. If it does, we get one domain, as in (20b); other wise we get two domains, as in (20a).

Next consider [1 [1 2]] in (7), which forms one domain

(21)
```
(*       )
(*)(*     )       (*       )
[σ [σ [σ σ]]] --> [σ [σ [σ σ]]] --> (σσσσ)
```

The derivation of the last three syllables is as in (19), and the first syllable gets an asterisk on its own cycle. On the final cycle, the first syllable gets another asterisk, followed by the Clash Rule and Column Lowering, giving one domain.

Next consider [1 [2 1]] in (8), which may form (σσσσ) or (σσσ)(σ)

(22)
```
      (*     )          *  (*     )
   (*) (*  )(*)      (*) (*  )(*)
   [σ [[σ σ] σ]] -> [σ [[σ σ] σ]] ->

   (*          )       (*         )
    *  (*     )         *
   (*) (*  )(*)      (*)      (*)
   [σ [[σ σ] σ]] -> [σ [[σ σ] σ]] -> a. (σσσ)(σ) no S.R.
                       Clash          b. (σσσσ) after S.R.
```

The derivation of the last three syllables is as in (20a); Stress Reduction does not apply here, since we are still in the cyclic domain. On the final cycle, the Stress Equalization Convention first adds an asterisk to the first syllable (which already has one from its own cycle), then the first syllable gets another asterisk. Next the Clash Rule applies, removing the column from the second syllable. Column Lowering cannot apply, since there are still two asterisk columns. However, Stress Reductioncan may apply here; if it does, we get (22b), otherwise (22a).

Next we look at [[1 2] 1] in (9), which may form (σσσ)(σ) or (σσσσ)

(23)
```
      (*          )
      (*    ) (*)
   [[σ [σ σ]] σ] --> a.   (σσσ)(σ)  no S.R.
                          b.   (σσσσ)  after S.R.
```

The derivation of the first three syllables is as in (19). On the final cycle, the first syllable gets another asterisk. If we apply Stress Reduction, we get (23b), otherwise (23a).

Next consider [[2 1] 1] in (10), which may form (σσ)(σ)(σ) or(σσσ)(σ)

(24)
```
                        (*         )
     (*     )      (*     ) *
     (*  )(*)(*)      (*  )(*)(*)
   [[[σ σ] σ] σ] -> [[[σ σ] σ] σ] -> a. (σσ)(σ)(σ) no S.R.
                                       b. (σσσ)(σ) after S.R.
```

The derivation up to [[σ σ] σ] is as in (20a). On the final cycle, the Stress Equalization Convention adds an asterisk to the fourth syllable (which already has one from the morpheme level), then the first syllable gets another asterisk. Now the last two syllables are stressed, but since neither contains the primary stress, the Clash Rule (15b) does not apply. Finally, if Stress Reduction applies, we get (24b), otherwise (24a).

Next we look at [2 2] in (11), which may form (σσ)(σσ) or (σσσσ)

(25)
```
      (*         )
      (*  ) (*    )
   [[σ σ] [σ σ]] -->      a.   (σσ)(σσ)    without S.R.
                          b.   (σσσσ)      after S.R.
```

The derivation for each inner [σ σ] is as in (17)-(18). On the last cycle, the first syllable gets another asterisk. Without Stress Reduction, we get (25a), otherwise (25b).

Next consider [3 1] in (12), which forms (σσσ)(σ) or (σσσσ)

(26)
```
        (*          )
        (*      )(*)
[[σ σ σ] σ] -->   a.    (σσσ)(σ) without S.R.
                  b.    (σσσσ) after S.R.
```

Again, the alternation comes from Stress Reduction; without it we get $(\sigma\sigma\sigma)(\sigma)$, otherwise $(\sigma\sigma\sigma\sigma)$.

Finally, we consider [1 3] in (13), which forms $(\sigma\sigma\sigma\sigma)$.

(27)
```
(*          )       (*          )
(*)(*     )   (*)                 (*          )
[σ [σ σ σ]] --> [σ [σ σ σ]] --> [σ [σ σ σ]] --> (σσσσ)
                          Clash       C.L.
```

The derivation is similar to that of [1 2] in (19), and we get $(\sigma\sigma\sigma\sigma)$ as predicted. This completes our analysis of (3)-(13).

To summarize, we have shown that tonal domains in DY and SH may be derived by applying stress rules cyclically from the morpheme up through the entire phrase. Alternative patterns are due to Streess Reduction (16b), which optionally deletes the lowest line of asterisks. The asymmetry between [1 2] and [2 1] is attributed to the Clash Rule (15b). We also assumed Column Lowering (15c) to ensure that a bisyllabic morpheme gives the same result as two monosyllabic morphemes, that a trisyllabic morpheme gives the same result as [1 2], etc. Without Column Lowering, we cannot always derive alternative patterns. To see this, compare [[re shui] ping] 'hot-water bottle' and ci-gu pian 'arrowhead slice'

(28) a.
```
        ( *         )
        ( *   ) ( *)
[[ci-gu] pian] --> i.   (σσ)(σ) without S.R.
                   ii.      (σσσ) after S.R.
```

b.
```
        ( *     )                   ( *     )
        ( *)( *)  (*)         ( *)        (*)
[[re shui] ping] --> [[re shui] ping] -->

        ( *           )
        ( *      ) *
        ( *)       (*)
[[re shui] ping] --> (σσ)(σ) with or without S.R.
```

In (28a), there are two morphemes, ci-gu and pian. On the morpheme level, ci and pian each gets an asterisk. On the final cycle, ci gets another asterisk. Without Stress Reduction, we get (28a.i); with Stress Reduction, we get (28a.ii).

(28b) has three morphemes, each of which gets an asterisk on its own cycle. On the cycle re shui, re gets another asterisk, followed by the Clash Rule, removing the asterisk from shui. On the final cycle, Stress Equalization Convention adds an asterisk to ping, then re gets another asterisk. Now whether Stress Reduction applies or nor, we will get $(\sigma\sigma)(\sigma)$; we cannot get the other pattern $(\sigma\sigma\sigma)$. In other words, although both (28a,b) are [2 1], without Column Lowring we cannot get the same results for them. Thus, Column Lowering is not a trivial rule.

3. Discussion

There has been much recent debate as to how much syntactic information is available to prosodic phonology (cf. Inkelas & Zec 1990 for a review). At one extreme is the 'Prosodic Hierachy' theory, advanced by Nespor & Vogel (1986) and earlier works of Selkirk, and summarized by the following words from Hayes

> 'A central claim of the (Prodosic Hierachy) theory is that direct-syntax rules do not exist.' (Hayes 1990,87)
>
> '(M)etrical rules NERVER refer to syntactic bracketing, only to prosodic bracketing. In other words, syntax has effects in metrics only insofar as it determines the phrasing of the Prosodic Hierachy.' (Hayes 1989,224)

To see whether this position is correct, one must clarify what a 'prosodic' rule is, and how prosodic domains are determined. For example, English word stress rules do not constitute a counter-example. First, one can argue that word stress rules are not prosodic rules. Second, one can argue that word stress only looks at 'morphological' bracketing, not 'syntactic' bracketing.

Hayes (1990,107) offers seven 'Diagnostics for True Phrasal Phonology', one of them being 'spreading...over multiple syllables'. By this standard, phrasal sandhi in DY and SH, shown in (1)-(2), must be a true phrasal process. But does phrasal sandhi in DY and SH depend on syntax? In a sense it doess not, since one may say that it refers only to stress domains. But if stress domains refer to syntax, as we have proposed in section 2, then the independence of phrasal sandhi from syntax becomes trivial. In addition, the stress rule (16a) is, arguably, itself a 'true phrasal rule', since it operates on entire phrases.

There are two solutions to the problem. First, one may suggest a different way of forming tonal domains in DY and SH, without using (15)-(16). One alternative is the 'end-based' analysis of Selkirk & Shen (1990), who suggest that tonal domains in SH start from the left-end of every lexical word or compound, and the left-end of every lexical XP (NP, AP, and VP). However, this analysis cannot account for the 'word length' effect, such as the asymmetry between [1 2] and [2 1], in a simple way. For example, consider

(29)	a.	[tie [shi-zi --> $*(\sigma)(\sigma\sigma)$	'iron lion'
	b.	[ci-gu [pian --> $(\sigma\sigma)(\sigma)$	'arrowhead slice'

If (29a,b) each contains two words, then according to Selkirk and Shen, (29a,b) should each form two domains, since there are two left-ends of words. But (29a) forms just one domain. We achieved this by the Clash Rule, as shown in (19). Selkirk & Shen cannot readily employ the Clash Rule, since their analysis is not based on stress.

The second solution, suggested by Selkirk (peronal communication 1991), is that all the examples in (4)-(13) are 'compound words', and so we are not discussing prosodic phonology after all, but merely word level phonology. The cost of this suggestion is that Selkirk & Shen must revise their analysis of SH, since if all expressions in (4)-(13) are compounds, they should all form just one domain. The gain of the suggestion, though, is that the Prosodic Hierarchy theory still stands.

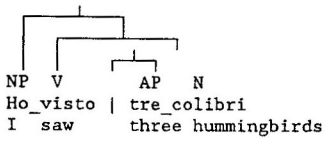
The distinction between a compound and a phrase in Chinese is controversial, and we cannot go into it here. Nonetheless, there are expressions that are clearly not compounds, yet they still show the 'word length' effect. Consider a few cases in SH

(30) a. se pa~ ($\sigma\sigma$) 'three pounds'
b. se a~-sz ($\sigma\sigma\sigma$) 'three ounces'
c. se-ze? pa~ ($\sigma\sigma\sigma$) or ($\sigma\sigma$)(σ) 'thirty pounds'
d. se-ze? a~-sz ($\sigma\sigma\sigma$) or ($\sigma\sigma$)(σ) 'thirty ounces'

In our analysis, (30a-d) are respectively [1 1], [1 2], [2 1], and [2 2], and their domains are derived in (18)-(20) and (25) respectively. According to Selkirk & Shen, each phrase in (30) contains two words, so (30a-d) should each form two domains, which is wrong.

A important argument for Prosodic Hierarchy comes from 'syntax-phonology mismatches' (SMP). Consider a case in Italian

(31)



There is consonant gemination (Raddoppiamento Sintattico) between Ho visto and between tre colibri, but not between visto tre. According to Nespor & Vogel (1986,170-2), (31) is evidence that phonological rules do not follow syntax, since neither Ho visto nor tre colibri forms a syntactic domain. Rather, Ho visto and tre colibri are 'phonological phrases', which exist independent of syntax.

However, not all SMPs are evidence for Prosodic Hierarchy. For example, [[1 2] 1] in (9) forms ($\sigma\sigma\sigma$)(σ), but [1 [2 1]] may form ($\sigma\sigma\sigma$)(σ). In the former there is no SPM; the first three syllables form a tonal domain as well as a syntactic domain. But in the latter there is SPM; the first three syllables in [1 [2 1]] form a tonal domain but not a syntactic domain. But we already saw that such SPMs simply follow from the cyclic application of stress rules, and the fact that tone is related to stress.

There is an alternative analysis for (31), too. Cinque (1990) argues that, universally, phrasal stress is assigned in such a way that the more deeply embedded constituents have greater stress than the less deeply embedded ones.[7] In (31), Ho and tre are more deeply embedded (with higher X-bar levels) than visto and colibri, so Ho and tre have greater stress than visto and colibri. Now if the Italian consonant gemination occurs between a stressed word and an unstressed one, in that order, then the result in (31) simply follows. In other words, the 'phonological phrases' in (31) could be an artifact of a syntax-dependent stress assignment.

Prosodic rules evidently have their independence. For example, the Clash Rule and the Stress Equalization Convention do not, it seems to me, follow from clear syntactic motivation. The interaction of such rules may thus lead to prosodic domains that differ from syntactic domains, or SPM. However, the independence of prosodic rules and their ability to refer to syntax need not mutually exclude each other.

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[7] This stress assignment is very close to that proposed by Duanmu (1990), who suggests that in a syntactic [Nonhead Head] or [Head Nonhead] relation, stress is assigned to the syntactic Nonhead. Duanmu calls his stress assignment Nonhead Stress (NHS). Fort both Cinque and Duanmu, phrasal stress is assigned cyclically through syntactic bracketing, and the direction of stress on a certain cycle is determined solely by syntactic relations.

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