

Ambisyllabicity versus Foot in English Segmental Phonology

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Hwang, Yoon-Ah. 2004. Ambisyllabicity versus Foot in English Segmental Phonology. *SNU Working Papers in English Language and Linguistics* 3, #-#. There have been controversies in English Phonology that center around the raison d'être of ambisyllabicity in accounting for English phonological processes. The goal of this thesis is to argue that ambisyllabicity provides a more rigorous account of English phonological phenomena. Specifically, it is shown in this thesis that ambisyllabicity-based approach explains flapping, glottalisation, /l-velarisation, and palatalisation more accurately than foot-based approach. This thesis claims that the existence of ambisyllabicity is well justified while foot-boundaries are not well defined in foot-based approach. In sum, this thesis reveals that foot-based approach cannot substitute ambisyllabicity-based approach. The notion of ambisyllabicity is necessary because ambisyllabicity-based approach has the explanatory adequacy. This thesis illustrates how ambisyllabicity is incorporated into Optimality Theory. (Seoul National University)

Keywords: Ambisyllabicity, Foot, /l-Velarisation, Flapping, Glottalisation, Aspiration, Palatalisation

1. Introduction

Syllable is evidently an essential concept in linguistic theory. Indeed, the syllable is the smallest phonological unit. The syllable is used as the basic element to which a phonological rule or a constraint refers. Yet, a number of researchers still doubt the requirement of using such an 'ambiguous' notion as ambisyllabic segment within phonological theory, from Selkirk (1982) to Jensen (2000), whose main argument is that the property of ambisyllabic segment is not distinct from that of a syllable-final one. In this way, it has been argued that foot-based approach can account for a full coverage of many English phonological processes without the notion of ambisyllabicity. This thesis, however, will show that foot-based approach cannot replace ambisyllabicity-based approach. The conclusion I reach is that the notion of ambisyllabicity

is indispensable to explain English phonological processes.

2. Ambisyllabicity and English Phonological Processes

2.1 *l*-Velarisation

The lateral sound *l* can be velarised or light. Let us first consider following velarised *l* examples:

(1) Velarised *l* (Dark *l*)

- a. in words: *feel, milk, help, mill, bell, belt, battle, walk, fill, peel, capital, travel*
- b. in word-medial: *almost, always, battling, shoulder, walking, Billy*
- c. in phrases: *tell me, feel the enemy, sell goods by retail, all night, call down*

The words in (1a) contain dark-lin words. Both foot-based approach and ambisyllabicity-based approach can illustrate this dark-*l* clearly. Foot-based approach accounts for dark-*l* because *l* is in foot-final position in [feel]. Ambisyllabicity-based approach explains dark-*l* because *l* is in a coda of a syllable in [feel]. The words in (1b) show dark-*l* in word-medial. In *battling*, foot-based approach predicts clear-*l* in minimal foot-initial [ling] but dark-*l* in maximal foot-medial [battling]. According to ambisyllabicity-based approach, *l* is onset of following syllable [ling] and, at the same time, coda of preceding syllable [battl]. Due to coda ambisyllabicity, *l* is velarised. In *battling*, there is dark-*l*. The words in (1c) show dark-lin phrase. In *tell Tom*, foot-based approach predicts dark-*l* both in maximal foot-medial [tell me] and in minimal-foot [tell]. In following (2c), however, *tell it* can have light-*l* or dark-*l* according to minimal or maximal foot application. Foot-based approach arbitrarily applies minimal foot to explain light-*l* in [ll it] and maximal foot to account for dark-*l* in [tell me]. Ambisyllabicity-based approach predicts dark-*l* in *tell me* because *l* is in coda of preceding syllable [tel].

The lateral sound can be light, as exemplified in (2).

(2) Clear [l]

- a. Words: *leave, like, leap, liquor, ludicrous, lavatory...*
- b. Word-medial: *miller, million, telling, silly, oily, failure, college, filling, value...*
- c. Phrases-medial: *will you, all over, all of them, sell ourselves, Call Andy...*

In this case, the word-initial in (2a) show light-*l* in words. There is no Velarisation. When *l* is in an onset of and in foot-initial position, both foot-based approach and ambisyllabicity-based approach can explicitly account for light-*l*. Foot-based approach explains light *l* in *leave* because *l* in foot-initial [*like*]. ambisyllabicity-based approach explains light *l* in *like* because *l* is in the onset position of a syllable [*lea*]. The group (2b) shows light-*l* in word-medial. There is no velarisation. In *dealing*, foot-based approach ambiguously explains that dark-*l* is in maximal foot medial [*deal*ɪŋ] and the clear *l* is in minimal foot initial [*li*ŋ]. In *leave*, minimal foot is composed of two syllables. In *dealing*, minimal foot is made up by one syllable. The limit of minimal foot is also ambiguous. According to ambisyllabicity-based approach, *dealing* obviously has light-*l* because *l* is in the onset position of the following syllable [*li*ŋ]. The words in (2c) show light-*l* phrases. In contrast, there is no Velarisation. *l*-Velarisation analysis is incorrectly predicted by Jensen's (2000) foot-based approach infers dark *l* in maximal foot-medial [*call Andy*] and light-*l* in minimal foot-initial [*l Andy*]. To avoid this, he suggested adopting the minimal foot [*l Andy*] instead of maximal foot [*call Andy*]. There is no criterion to distinguish the application of minimal foot boundary from that of maximal foot boundary. Ambisyllabicity-based approach predicts light-*l* in phrase *call Andy* because the coda *l* of preceding syllable [*call*] is belonging to the onset the following syllable [*An*]. In *call Andy*, there is onset ambisyllabicity.

In sum, in foot-medial position, foot-based approach incorrectly predicts that light-*l* is dark-*l* or that dark-*l* is light-*l*. Lightness or darkness of *l* depends on the application of minimal foot or maximal foot boundary. According to ambisyllabicity-based approach, light-*l* in syllable-initial (onset) and dark-*l* in syllable-final (coda) are illustrated by its position. Ambisyllabicity-based approach accounts for light-*l* in coda and dark-*l* in onset by adopting onset ambisyllabicity and coda ambisyllabicity respectively. Because of ambisyllabic *l*, *l*-Velarisation

applies to words in (1) while *l*-Velarisation does not apply to words in (2). Ambisyllabicity makes possible light *l* in (2), but there is dark *l* in (1). If we use ambisyllabicity, we can explain all of the above examples. If we use only minimal and maximal foot, we cannot explain the light *l* in word-medial or phrase-medial position. We need ambisyllabicity to explain phonological processes like *l*-Velarisation precisely.

2.2 Flapping

Here we call intervocalic flapping of dental stops as weakening. The segment /t/ or /d/ shows up as a flap if it is both preceded by a vowel or glide within the same foot for purposed of lenis sound and syllable-initial. This lenis sound can be defined by the fact that the sound is weaker than plosive or stop sounds. That means that the sonority is weakened. That is, sound changes from left to right on the stop-fricative-approximant dimension are known as weakening (lenition) while from right to left are strengthenings (fortition). Many systems restrict weakening to contexts in which a vowel follows as well as precedes: for instance, there is intervocalic Flapping of dental stops in many English dialects.

- (3) a. Flapping in words [ɾ coda ambisyllabicity
 : *abracadabra, acidic, atom, atomic, bedding, betting, Betty, bidder, bitter, butter, capital...*
- b. Flapping in phrases [ɾ onset ambisyllabicity
 : *about Ann, about it, at ease, at eleven, ate up, a tub, by Tom, by tomorrow, get a car...*
- c. Flapping in sentences [ɾ onset ambisyllabicity
 : *Although that was not the first camel he rode, it was most certainly the last one...*
- d. No Flapping: *Hittite, latex, satire...*

The group (3a) is flapping in words. According to foot-based approach, /t/ is flapped in maximal foot-medial [*potato*] or minimal foot-medial [*tato*]. Non-flapped /t/ exists in the smallest minimal foot-initial [*to*] in *potato*. Ambisyllabicity-based approach explains that the onset *t* of following syllable [*to*] is belonging to the coda of preceding syllable [*tat*].

There is coda ambisyllabicity. Also, *potá* is related to stress. The second *t* is flapped between a stressed V and an unstressed V while the first *t* is aspiration. Foot-based approach explains that the second *t* of *potato* is flapped but first *t* of *potato* is aspirated. Foot-based approach can analyze *potato* in four ways according to the boundary limits of minimal or maximal foot. i The two flapped *ts* are in the maximal foot-medial [*potato*]. ii The first *t* is aspirated and the second *t* is flapped in minimal foot-initial [*tato*]. iii The first *t* is flapped in maximal foot-medial and the second *t* is aspirated in minimal foot-initial [*pota*[*to*]]. iv The first *t* is flapped in maximal foot-medial and the second *t* is also flapped in minimal foot-medial [*po*[*tato*]]. Such analysis is so complex. The example (3b) reflects flapping in phrases. Foot-based approach analyzes *t* of *by tomorrow* into Flapping in maximal foot-medial [*by tomorrow*] or into aspiration in the minimal foot-initial [*tomorrow*]. Ambisyllabicity-based approach explains that *t* of *by tomorrow* is flapped due to coda ambisyllabicity; *t* in onset of following syllable [*to*] is belonging to coda of preceding syllable [*by t*]. The words in (3c) illustrate flapping in sentences. Foot-based approach cannot explain the flapping in foot-medial position. Especially, the exact position of the maximal foot boundary has not been determined. In [[*It's* [*late*.]] [*I'm* [*leaving*]]], the maximal foot can be [*late*], [*It's late*], or [*It's late. I'm leaving*]. The sound [*t*] of [[*It's late*.][*I'm leaving*]] is in maximal foot-medial [*It's late. I'm leaving*] or minimal foot-final position [*It's late*]. The sound *t* can be analyzed flapping or non-flapping respectively. According to ambisyllabicity-based approach, *t* in *It's late. I'm leaving* can be correctly predicted. Flapped *t* is in *It's late. I'm leaving* due to onset ambisyllabicity; *t* in the coda of the preceding syllable [*late*] is belonging to the onset of the following syllable [*l*]. The group (3d) is non-flapped examples. In *satire*, *t* is in maximal foot-medial position but it is not flapped. It is not consistent with Jensen's (2000) approach that Flapping occurs in foot-medial position. If we apply minimal foot boundary [*tire*] to *satire*, *t* of *satire* is in minimal foot-initial and non-flapped. Foot-based approach applies maximal foot to explain flapped *t* of *party* (3a) and minimal foot to illustrate non-flapped *t* of *satire*. There is no criterion to apply this minimal foot boundary to *satire*. Ambisyllabicity-based approach explains non-flapped *t* of *satire* by adopting coda ambisyllabicity; *t* in onset of following syllable [*tire*] is belonging to coda of preceding syllable [*sat*].

2.3 Aspiration

This section is devoted to the discussion on Aspiration which does not happen in ambisyllabic segments. Example (4) shows Aspiration in word-medial and phrase-medial.

- (4) a. Aspiration in word-medial [t^h]: *attack, atomic, creativity, latex, p[ph]otato*
b. Aspiration in phrase-medial [t^h]: *a tease, me too, my turn, saw Ted*

The words in (4a) are aspirated in word-medial. For example, *t* of *creativity* is aspirated. Foot-based approach accounts for *t* of *creativity* either Aspiration in minimal foot-initial [*tion*] or non-Aspiration in maximal foot-medial [*creativity*]. Ambisyllabicity-based approach illustrates *t* of *creativity* Aspiration since *t* is in syllable initial position (onset of [*ti*]). The words in (4b) are aspirated in phrase-medial. In *a tease*, *t* is aspirated. According to foot-based approach, *t* of *a tease* can be Aspiration in minimal foot-initial [*tease*] or non-Aspiration in maximal foot-medial [*a tease*]. The example (4b) also allows us to explain why Jensen (2000) did not suggest a clear criterion to apply these minimal and maximal foot boundary. The arbitrary application of foot boundary blocks the validity of Jensen's (2000) foot-based approach. According to ambisyllabicity-based approach, *t* of *a tease* is aspirated because *t* is in initial position of a syllable [*tease*].

In word-medial positions, voiceless stops are unaspirated, as seen in (5).

- (5) a. ambisyllabic /p/: *April, capable, capo, happier, happy, harpy, opportunity...*
b. ambisyllabic /t/: *actress, after, atom, bottom, butter, city, factor, filter, forty, hat rack, ketene, later, motto, Patrick, Peter, petrol...*
c. ambisyllabic /k/: *Atkins, baker, Bulky, bunker, echo, equal, falcon, Heckler...*

The words in (5a) contain an unaspirated stop p. Foot-based approach

illustrates that *p* of *capable* is aspirated in minimal foot-initial [*pable*] or that *p* is not aspirated in maximal foot-medial [*capable*]. Ambisyllabicity-based approach predicts that *p* of *capable* is not aspirated due to coda ambisyllabicity (*p* in onset of following syllable [*pa*] is belonging to coda of preceding syllable [*cap*]). Similarly, the words in (5b) show an unaspirated *t* in a word. According to foot-based approach, *t* of *fraternal* is aspirated in minimal foot-initial [*ternal*] or unaspirated in maximal foot-medial [*fraternal*]. Ambisyllabicity-based approach analyzes *t* of *fraternal* is unaspirated because *t* of *fraternal* has coda ambisyllabicity which *t* in onset of following syllable [*ter*] is belonging to preceding syllable [*frat*]. The segment *k* in (5c) is unaspirated in a word. Foot-based approach shows that *k* of *falcon* is aspirated in minimal foot-initial [*con*] or unaspirated in maximal foot-medial [*falcon*]. Put in this way, foot-based approach often incorrectly predicts aspiration by the arbitrary application of minimal or maximal foot boundary. In a word analysis, minimal foot boundary application correctly explains aspiration of (5) while maximal foot boundary application correctly accounts for non-Aspiration of (6). According to ambisyllabicity-based approach, *k* of *falcon* is unaspirated due to coda ambisyllabicity (*t* in onset of following syllable [*con*] is belonging to onset of preceding syllable [*falc*]). The *lk* in coda of preceding syllable [*falc*] satisfies the sonority principle and coda requirement.

In phrases or sentence-medial positions, voiceless stops are unaspirated, as illustrated in (6) below.

- (6) a. /p/: *He's going to help all of us*
 b. /t/: *got about, got on the bus, it is, put it, There was a thick mist all round*
 c. /k/: *Ask a question, took[g] a leaf*

The words in (6a) show an unaspirated /p/ in a sentence. For instance, foot-based approach explains that *p* of *He's going to help all of us* is aspirated in minimal foot-initial [*p all of us*] or unaspirated in maximal foot-medial [*He's going to help all of us*]. According to ambisyllabicity-based approach, *p* of *He's going to help all of us* is unaspirated since *pis* in coda of [*help*]. Likewise, the group (6b) illustrates an unaspirated /t/ in a phrase or a sentence. According to foot-based approach, *t* of *There was a thick mist all round* is aspirated in minimal

foot-initial [*t all round*] or unaspirated in maximal foot-medial [*There was a thick mist all round*]. Ambisyllabicity-based approach explains that *t* of *There was a thick mist all round* is unaspirated because *t* is in coda of [*mist*]. The words in (6c) have an unaspirated /k/ in a phrase or a sentence. Foot-based approach explains *k* of *Ask a question* is aspirated in minimal foot-initial [*k a question*] or unaspirated in maximal foot-medial [*Ask a question*]. Ambisyllabicity-based approach accounts for *k* of *Ask a question* as an unaspirated segment because *k* of *Ask a question* is in syllable-final position (coda) of [*Ask*].

There are aspiration and non-aspiration phenomena in the same sound.

(7) *mist*[r *ake* versus *miss-t*^h*ake*

The preceding /s/ in *mistake* must be tautosyllabic to bar Aspiration of *t*. There is no Aspiration. In *miss-take*, there is the aspirated *t*. Foot-based approach illustrates that *t* of *mistake* is aspirated in minimal foot-initial [*take*] or unaspirated in maximal foot-medial [*mistake*]. Ambisyllabicity-based approach explains that *t* of *mistake* is unaspirated since *t* is eligible for coda ambisyllabicity which *t* in onset of following syllable [*take*] is belonging to coda of preceding syllable [*mist*].

2.4 Glottalisation

Glottalisation phenomena have been regarded as typical ambisyllabicity, as seen in (8).

- (8) a. /p/: *Capri, cypress, happen, happy, viper*
 b. /t/: *Atkins, atlas, bottle, butler, button, lately, matriculation, mattress, partner, patrol, ultra*
 c. /k/: *acrid, harken, Nike, okra, picky, reluctant*

The group (8a) is glottalised /p/s. For instance, *p* of *cypress* is glottalised. Foot-based approach explains that *p* of *cypress* is glottalised in minimal foot-final [*cyp*] or unglottalised in maximal foot-medial [*cypress*]. Ambisyllabicity-based approach illustrates that *p* of *cypress* is glottalised because *p* of *cypress* is coda ambisyllabicity which *p* in onset of following syllable [*press*] is belonging to coda of preceding syllable [*cyp*]. The words in (8b) show glottalised /t/s. Foot-based approach

explains that *t* of *matriculation* is glottalised in minimal foot-final [mat] or unglottalised in maximal foot-medial [matriculation]. Ambisyllabicity-based approach shows that *t* of *matriculation* is glottalised due to coda ambisyllabicity which *t* in onset of following foot [trication] is belonging to coda of preceding foot [mat]. The different realization of glottalised versus flapped /t/ before a syllabic nasal and liquid, as in *but*[tʔ]ton versus *bott*[ʔ]er, is evidence for the recognition of ambisyllabicity in phonology. The group (8c) exemplifies glottalised /k/s. Foot-based approach shows that *k* of *picky* is glottalised in minimal-foot final [pic] or unglottalised in maximal foot-medial [picky]. Ambisyllabicity-based approach explains that *k* of *picky* is glottalised due to coda ambisyllabicity which *k* in onset of following syllable [cty] is belonging to coda of preceding syllable [pic]. Since whenever /t/ is ambisyllabic it becomes a flap, and glottalized in exclusive coda position, this contrast seems parallel to the glottalised/unglottalised alternation in *happ*[pʰ]en/copp[p]er or *hark*[kʰ]en/hack[k]er.

2.5 Schwa Insertion

The Schwa Insertion examples in (9) are below.

- (9) a. [ɛə *care, caring, Mary*
 b. [ɪə *hear, Liberia*
 c. [uə *cure, Puritan*
 d. [ayə ə ~ [a:]: *hierarchy, tire*
 e. [awə ə ~ [a:]: *dowry, hour*

In (9a), foot-based approach can explain schwa insertion only in maximal foot [caring]. In minimal foot [ca][ring], there is no schwa insertion because a long vowel *a* is not followed by *r* within the same foot. Ambisyllabicity-based approach explains *caring* has schwa insertion that inserts the schwa under the second mora position of a long vowel *a* and ambisyllabic *r* follow in the coda.

In (10), there are examples of schwa insertion and non-schwa insertion.

non-palatalisations in minimal foot boundaries like [atroc][ious], [resid][ual], and [perpet][ual]. In the minimal foot application for palatalisation, the stress cannot be in the closed syllable. Foot-based approach violates the stress rules. Ambisyllabicity-based approach correctly explains palatalisation due to onset ambisyllabicity. The segment *c* of *atrocious*, *d* of *residual*, and *t* of *perpetual* in coda of preceding syllable [atroc], [resid], and [perpet] are belonging to onset of following syllable [cious], [dual], and [tual]. In those following syllables, palatalisation can take place.

In a phrase, *t*, *d*, and *s* are palatalised.

- (12) a. 't' ambisyllabicity [tʃ : do not you, got it, got you]
 b. 'd' ambisyllabicity [dʒ : send you, had you]
 c. 's' ambisyllabicity: does|ʒ ə you

In (12), *do not you* is palatalized like [donatʃ]. Foot-based approach can explain palatalisation if maximal foot [donatʃ] is applied to *do not you* while palatalisation is not accounted for in minimal foot [do] [not] [you]. According to ambisyllabicity-based approach, *do not you* has onset ambisyllabicity. The segment *tn* in coda of preceding syllable [not] is belonging to onset of following syllable [you]. Hence, through palatalisation examples (12), I present that ambisyllabicity-based approach is more widely applicable than foot-based approach.

There is spirantisation rule which is that the postvocalic context is the most typical environment for the change from stop to fricative. It is unclear whether spirantisation is properly viewed as assimilation of the open position of the neighboring vowel and hence whether vowels are properly viewed as [+continuant]s.

- (13) a. *Christ, divide, part, president, space*
 b. *Christian, division/z/, partial/s/, presidential...*

(13a) has no Spirantisation while (13b) has Spirantisation. Foot-based approach explains (13b) is non-spirantisation in minimal foot [part][ial] or Spirantisation in maximal foot [partial]. Ambisyllabicity-based approach shows that *partial* is spirantisation because *t* in the coda of the preceding syllable [part] is belonging to the onset of the following syllable [tial]. That is onset ambisyllabicity.

2.7 Nasal Allophones

Let us look at the examples (14) below. There is the stress conditioned nasal assimilation which has ambisyllabicity. There is // -deletion. Additionally, there are ambisyllabic *g*, *c*, and *k*. Ambisyllabic *g* is in the first three. Ambisyllabic *c* is in the fourth. Ambisyllabic *k* is in the last three.

- (14) a. [ŋ] *có ŋress, có ŋrous, có ŋuer, có ŋord...*
b. [n]: *congré ion.al, congrú y, concú ..*

In (14), the 'n' of 'congress' is assimilated to 'ŋ' before velar *g* since the segments are in tautosyllabic like [congress]. But the 'n' in 'congressional' is not assimilated to 'ŋ' because the syllable boundary is inserted between the two segments like [[con][gressional]]. According to foot-based approach, maximal foot boundary is applied in [congress] and minimal foot boundary is applied in [con][gressional] to take into account the assimilation. In the previous discussion, maximal foot is generally applied in words. Minimal foot is applied in phrases. In the same words category, the maximal foot is applied to congress and the minimal foot is applied to congressional. That is the same problem in *l*-Velarisation in failure where clear *l* exists in word-medial position. We must apply minimal foot boundary in this word. There are opposite cases as well. In phrase *feel it*, I have to apply the maximal foot boundary. The application of foot boundary is so arbitrary. Jensen (2000) insists that foot is simpler than ambisyllabicity even though the arbitrary foot approach just gives us numerous confusions. According to ambisyllabicity-based approach, ambisyllabic *n* exists in *congress* but it does not exist in *congressional* so only congress has onset ambisyllabicity [ŋ] That is, *n* in coda of preceding syllable [con] is belonging to following syllable [ngress]. In [ngress], *n* is assimilated to *g* and *n* is changed to allophone [ŋ]

To put the matter more generally, foot-based approach has three problems. It deviates from the stress rules. It does not allow lenis. The application of minimal and maximal foot boundaries is so arbitrary. If we accept the notion of ambisyllabicity, we can explain nasal allophones simply. This ambisyllabicity can satisfy the maximal onset principle and

coda principle.

3. Ambisyllabicity in Optimality Theory

This chapter shows a formation of ambisyllabicity-based approach to English segmental phonology with the framework of Optimality Theory, capturing the generalizations discussed in chapter 3. It will also be shown that the motivating forces of the processes are the syllabic requirement of prohibiting onsetless syllables and the markedness principle favoring unmarked segments over marked alternatives. Optimality theoretic analysis combined with ambisyllabicity-based approach in analyzing English phonological processes has not been done by either Rubach (1996) or Jensen (2000). In this sense, this analysis can make a small contribution to English Phonology and Optimality Theory. In previous chapters, I have dealt with seven phonological processes. Among these, I will analyze four notable ambisyllabic processes in the OT frame work, *l*-Velarization, Flapping, Aspiration, and Glottalisation.

First, I will begin with ambisyllabic *l*-Velarization in OT analysis. The prosodic word dealing and phonological phrase call Andy will be represented in the following tableaux in (31) and (32) respectively. In *dealing*, there is light *l* because of onset ambisyllabicity. This ambisyllabicity can be shown in the OT frame work as in the example below. Now let us consider the cases of surface variations of /l/. As it is argued in Prince and Smolensky (1993) and other OT literature, *l*-Velarisation hierarchy motivates universally accepted segmental markedness constraints like those in (15) below.

- (15)
- a. ONS: *[V('Syllables must have onsets.')
 - b. ALIGN-R (stem, σ): The right edge of stem must non-crisp aligned with the right edge of the syllable.
 - c. *Ambi-: Dark lateral *l* must be linked uniquely to a syllable.
 - d. *Coda/l: Clear laterals must not appear in a coda position.
 - e. IDENT-IO[-back]: Backness in input and output must be identical.

The word *dealing* and phonological phrase *call Andy* will be represented in the following tableau (16). The following tableau shows a contrast between an optimal ambisyllabic light *l* candidate and an ambisyllabic dark *l* candidate. Among the candidates in (16), the second ambisyllabic light *l* candidate (16b) is chosen as an optimal one by the three constraints ONS, ALIGN-R, and *Ambi-. The candidates in (16a, d) are immediately ruled out since they violate the highest constraint ONS. Other candidates pass ONS. They move to the next constraint, i.e., ALIGN-R. The candidates in (16e, f) fail ALIGN-R. And then, the competitor candidate (16c) is ruled out by the constraint *Ambi-. The candidate in (16b) is optimal. The ranking schema that leads to this situation is the following.

(16) ONS >> ALIGN-R >> *Ambi- >> *Coda/l >> IDENT-IO[-bk]

<i>dealing</i> /dɪl+ l f/	ONS	ALIGN-R	*Ambi-	*Coda/l	IDENT-IO[-bk]
	*!				*
				*	
			*!		*
	*!			*	
		*!			
		*!			*

The next phonological phrase '*Call Andy*' in (17) has ambisyllabic light *l* between two words. The clear *l* appears in the syllable final position because of onset ambisyllabicity. The phrase '*call Andy*' can be shown in the OT framework as in the tableau below. The winner with ambisyllabic light *l* (17b) satisfies the constraint ONS, while the

l-velarised (17a) violates it. (17a) is immediately ruled out even though the winner violates the lower-ranked **Coda/l*.

(17) ONS>> ALIGN-R>>**Coda/l*>> IDENT-IO[-bk]

<i>call Andy</i>	ONS	ALIGN-R	<i>*Coda/l</i>	IDENT-IO[-bk]
	*!			*
			*	

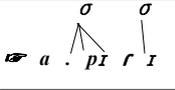
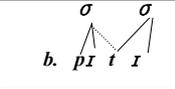
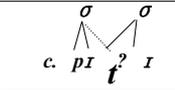
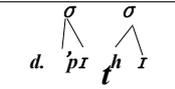
Let us now turn to the second OT analysis that Flapping is included to ambisyllabic lenis. Lenis constraint is that a stop must not be fortis in syllable medial position, as exemplified in (18d). In (19), *'Pity'* has a flap because of coda ambisyllabicity. In *pity*, Lenis is satisfied in the output for it becomes [-tns] to /r/. It is predicted from the ranking since what is blocked at onset position is not [-tns] stop but [glot], thus the general Lenis still holds force to produce a nonglottalized lenis variant /r/. Unfortunately /p/ and /k/ do not have such an alternative and are not realized as non-lenis alternants, violating Lenis. Following Kiparsky (1979), I assume both glottalised stops and flap to be derived from a process of lenis, though the notion of derivation is weakened in OT. When described in terms of output constraints, glottalisation and flapping are both the result of Lenis dominating the faithfulness of tenseness of a consonant. Now the tableau below illustrates the interaction. I will use the constraints of (18) in the tableau (19) below.

- (18) a. MOP (Maximal Onset Principle): ONSET requires as much material as possible to be put into an onset This MOP corresponds to Hammond's (1999) ONSET.
 b. MC (MAX-CODA): Codarequires as much material as possible to be put into a coda.
 c. **[[glot]*: In an obstruent coda cluster, the second one is [coronal].
 d. Lenis: **[... ..]* (A stop must not be fortis in syllable medial position.)

- e. IDENT-IO (tns): Let α be a segment in the input, and β be a correspondent of α in the output. If α s [a nse], then β s [β nse].

The illustration is seen in (19). The word *pity* is represented in the following tableau. Candidate (19a) is predicted to be the winner by MOP>> IDENT-IO (tns) since it incurs minimal violation. This candidate violates the constraint in the lowest position of hierarchy, while other candidates violate highly ranked constraints. Since the third candidate in (19) violates MOP, it receives a fatal violation mark. The fourth candidate violates MC and the second candidate violates Lenis. Thus, the first ambisyllabic Flapping candidate is selected as the optimal output in spite of the violation mark on the lowest constraint.

(19) MOP, MAX-CODA, *[glot]>>Lenis>>IDENT-IO(tns)

<i>Pity</i>	<i>MOP</i>	<i>MC</i>	*[glot]	<i>Lenis</i>	<i>IDENT-IO(tns)</i>
a. 					*
b. 				*!	
c. 	*!				*
d. 		*!		*	

Compare this with the case where /t/ is ambisyllabic, and [glot] is prohibited: *Data* has a flap because of coda ambisyllabicity. But the difference is that *t* of *data* is between stressed vowel and unstressed vowel. The first candidate is eliminated since the position of /t/ is not foot-initial therefore Aspiration must not occur. I need another constraint IDENT-IO (vce) to explain *Data*.

(20) IDENT-IO (vce): The specification for the feature [voice] of an input

segment must be preserved in its output correspondent.

Constraint evaluation is illustrated in (21). MOP and *[[g]lot] dominate IDENT-IO(vce). The proposed ranking among MOP, *[[g]lot], and IDENT-IO(vce) predicts candidate (21b) to be the winner and (21a, c) to be losers since (21a) violates MOP and (21c) violates Lenis. Thus, they are relegated to a trivial, insignificant position. The optimal candidate, (21b), satisfies the higher-ranked markedness constraint MOP and Lenis. Thus, it shows a violation of the lower-ranked constraint IDENT-IO (vce). In contrast, candidate (21c) violates Lenis and incurs no violation of IDENT-IO (vce). The ranking of MOP and Lenis over IDENT-IO (vce) correctly predicts the winner (21b). No ranking among MOP, *[[g]lot], and Lenis are justified here, which is represented by a dotted line.

(21) MOP, *[[g]lot], Lenis >> IDENT-IO(vce) >> IDENT-IO(tns)

<i>Data</i> /déytə/	<i>MOP</i>	<i>*[[g]lot]</i>	<i>Lenis</i>	<i>IDENT-IO(vce)</i>	<i>IDENT-IO(tns)</i>
 a. <i>D e y tə</i>	*!				*
 b. <i>d e y t ə</i>				*	*
 c. <i>d e y t ə</i>			*!		

Consequently, the reason that /t/ is realized as a flap in ambisyllabic position is that Lenis preempts the faithfulness of [tns] feature, and this does not violate the top ranking *[[g]lot]. Flapping in exclusive final position is prevented for the sake of faithfulness in voicing.

4. Conclusion

The present study investigates ambisyllabicity versus foot in English segmental phonology to claim the necessity of ambisyllabicity. This thesis shows a critical review of foot-based approach. This thesis also shows an Optimality-theoretic account of ambisyllabicity, by appealing to universally motivated constraints.

Ambisyllability-based approach is defended in Optimality Theory by its adequacy to predict the correct output forms in English segmental phonology. The interaction of faithfulness constraints and markedness constraints results in *l*-velarisation, flapping, aspiration, and glottalisation. This thesis has examined an Optimality-Theoretic account of ambisyllability, by appealing to universally motivated constraints. The account covers four notable phenomena which take place in apparently similar environments, ambisyllability. The OT account demonstrates that the seemingly independent phenomena are explained through some well-motivated phonological constraints. The significance of this thesis is also the incorporation of ambisyllability with OT.

Finally and most remarkably, this thesis has proven that foot-based approach cannot replace ambisyllability-based approach. It is illustrated that a greater generality will be gained by adopting ambisyllability-based approach over foot-based approach. It is demonstrated that ambisyllability is significant to account for some representative English phonological processes pretty effectively. It reveals the flaws of foot-based approach. Thus, this thesis might give a contribution to phonology.

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