Subsidiary Stress Assignment of Derived Words in English

A Dissertation

Submitted to Fukuoka University

In Partial Fulfillment of the Requirements for

the Degree of

Doctor of Philosophy in Linguistics

Sha LIU

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Abstract

This dissertation discusses subsidiary stress assignment in English words, within the framework of the Positional Function Theory. The thesis first presents a critical review of pioneer theories, especially rule-based theories, and points out problems in them. It is then showed that word stress patterns that pioneer theories have failed to provide satisfactory explanations for seem to be accountable by use of proposals in this thesis. For example, in order to explain variant stress patterns of words, a new concept is proposed: default variant and alternative variant. It is proposed that one stress pattern of a word as the default and all other variants as alternatives; and alternatives are obtained by setting Positional Functions as parameters differently from the default. The discussion of rule ordering is also referred to in this dissertation, since it appears to be an unavoidable topic for rule-based theories. Firstly, the two principles governing rule ordering in

Chomsky (1967) are discussed; then the necessity of rule ordering is proved in this thesis; and finally ordering relations in the Positional Function Theory are discussed.

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Introduction

0.0   Introduction to the Present Study

With respect to the discussion of stress assignment in English, *The Sound Pattern of English* (Chomsky and Halle (1968); henceforth *SPE*) must be referred to, since it lays down the foundation for generative phonology (Kenstowicz and Kisseberth (1979), Schane (1973)). In *SPE*, stress assignment rules, which are mainly composed of the Main Stress Rule, the Stress Adjustment Rule, the Compound Rule, the Nucleus Stress Rule, etc., are ordered and applied in a cyclic manner (Chomsky and Halle (1968)); and those rules are not only meant for words, but also for compounds and phrases.

Although *SPE* was described by McCarthy (1982) as the most comprehensive phonological theory, its segmental approach to stress is claimed to be abstract and inadequate (Hays (1984), Liberman (1975)). Due to the claimed inefficiency of *SPE* theory, alternative theories have been proposed, such as Metrical Theory (hereafter MT). The main difference between MT and *SPE* lies in that MT "deals with the specification of nodes," while *SPE* "deals with the specification of segments" (Liberman (1975: 205)). MT was first proposed by Liberman (1975) and Liberman and Prince (1977), and then developed in a number of directions (Halle and Vergnaud (1987), Gupta and Touretzky (1994)).

SPE and MT will be respectively reviewed in Chapter 2 and 3 of this dissertation and problems in these two theories will be illustrated with concrete examples. By way of example, with respect to *SPE*, firstly, I will review its Main Stress Rule, Auxiliary

Reduction Rule, Stress Adjustment Rule, et al. Secondly, I will demonstrate problems in the application of these rules, such as: the optional application of the rule that weakens secondary stress immediately preceding primary stress to tertiary stress;[1] the failure of *SPE* to account for stress patterns of certain derived words; the doubts in the treatment of the words *condensation* and *information*. As mentioned before, MT developed in a number of directions after its first introduction. I will only review the version of MT in Liberman (1975) and Liberman and Prince (1977) and the version in Halle and Vergnaud (1987), since it is impossible to fit every single version of MT into this one dissertation. MT was proposed due to the claimed insufficiency of *SPE* theory. Thus one of key tasks for MT is to explain stress patterns of words that have posed problems for *SPE*. In the review of both versions of MT, I will apply rules in MT to words that have called *SPE* into question, and show that these words are still unaccountable within the framework of MT. Along the discussion, I will also show that there are other problems in the two versions of MT. To name a few, with regard to the version of MT in Liberman (1975) and Liberman and Prince (1977), I will highlight ambiguities in the conditions of stress rules. With respect to the version of MT in Halle and Vergnaud (1987), I will specify the lexical treatment of the rule of *Stress Enhancement* and the rule of *Stress Deletion*, and the rule of *Stress Conflation*.

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[1] The Rule, which weakens secondary stress immediately preceding primary stress to tertiary stress, has no title in *SPE*. It is firstly termed as the Rule (108) in Chapter Three of *SPE* according to its numbering and later labeled as the Rule (117) in the same chapter. In Chapter Five of *SPE*, *Summary of Rules*, where a list of all rules is given, the rule is still just referred to with its numbering. As a result, the present dissertation will also name the rule under discussion with its numbering and term it the Rule (9) in Chapter 2 of this dissertation.

Following the above discussion, it seems that a new theory is needed. This dissertation examines a new theory, Positional Function Theory (henceforth PFT). PFT, proposed by Yamada (2010a, 2010b, 2012, 2013), is aimed at examining the mechanism of subsidiary stress assignment in English by use of Positional Functions. Yamada (2010a, 2010b, 2012, 2013) presents an elaborate discussion about definitions of Positional Functions with relevant exemplifications and conditions for their application. However, he neither elaborates on the theoretical motivation for PFT nor goes into detail about certain issues, such as how to account for variants of words and ordering relations among Positional Functions. The lack of concrete description of the theoretical motivation behind PFT may leave the theory in an embarrassing situation: even though Yamada (2010a, 2010b, 2012, 2013) shows that PFT can provide explanations for word stress patterns, this kind of success can be attributed to pure opportunism. Without proper justification, PFT may be under serious doubt. Consequently, one of the urgent tasks of this dissertation is to probe into the theoretical motivation behind PFT. Other issues that Yamada (2010a, 2010b, 2012, 2013) has yet to discuss include the way to account for variants of words, ordering relations, etc. It seems to be the case that these issues are unavoidable topics for phonological theories, and thus must be articulated in this dissertation as well. For the explanation of variants of words, the treatment that is needed is not an ad hoc one, but a systematic one; and for this reason a new concept of default variant and alternative variant will be proposed to explain variants. Debates over the validity of ordering relations between rules may never end. Indeed, even scholars who argue ordering relations exist disagree over the issue of what kind of relations exists between rules. In this dissertation, I will join this debate and seek to articulate that

ordering relations seem to exist. Along this line of reasoning, I will also try to capture the exact relations between rules.

In short, the specific goal of this dissertation is to deeply understand the subsidiary stress assignment mechanism in English words, and to develop a reasonable and systematic explanation for it. The focus of exemplifications will be given to those examples that present problems that seem to be insurmountable by use of pioneer theories.

Before I proceed to detailed discussions, one clarification is necessary: in this dissertation, my attention will be exclusively attributed to subsidiary stress assignment of words in British English. I will refrain from being distracted by main stress or primary stress assignment discussions due to two reasons. The first reason is that stress assignment in English is a huge topic. Instead of referring to each aspect of this topic superficially, I decided to choose one specific perspective and discuss it profoundly and thoroughly, and finally I settled on the issue of subsidiary stress assignment in English words. The second reason is that PFT, as discussed above, is mainly concerned with subsidiary stress assignment in English words. Consequently, throughout this dissertation, the focal point will always be subsidiary stress assignment. I also limit my discussions to British English based on three reasons. The first reason is that there are numerous accents of English, such as American English, Australian English, British English, Canadian English, so on and so forth. If every accent of English is incorporated into this dissertation, it will only introduce complexity and disorder; as a result, I think it will be more logical and consistent if I concentrate on one specific accent of English. The second reason is that Yamada (2010b) used American English data to propose PFT; as a result I must choose another English accent in this study and examine whether PFT can offer explanations for it. The third reason is that, from the beginning of my research, I have

chosen *Longman Pronunciation Dictionary* (Wells (2000)) as the main reference book and CELEX Lexical Database 2 (Baayen, Piepenbrock and Gulikers (1995)) as the database. Since both of them are based on data in British English, finally I decided to focus on British English.

0.1 Structure of the Dissertation

This dissertation is composed of four parts, which are Introduction, Part I, Part II, and Conclusion. I will outline them briefly in the following.

Part I, which comprises Chapter 2 and Chapter 3, presents a review of past theories and the situation in the field which motivates further study of the subject. As noted in Section 0.0, I will mainly refer to *SPE* and MT in this part and elaborate on problems in them respectively.

After reviewing *SPE* and MT in Part I, in Part II I will move on to a presentation of how I explain stress assignment in English words. I will firstly introduce a new theory in Chapter 4, the Positional Function Theory (hereafter PFT) and then, in Chapter 5 to Chapter 7, examine whether PFT can offer solutions for problems highlighted in *SPE* and MT.

Chapter 4 will lay out an introduction to PFT and its Positional Functions with related examples, especially those for which *SPE* and MT have failed to provide a satisfactory explanation.

The justification of a phonological theory seems to be a compulsory task; and this is why Chapter 5 will be devoted to a discussion of the motivation behind Positional Functions. I will reveal the motivation in terms of the parameters of English stress

assignment and English data.

Chapter 6 will go into another obligatory topic related to stress assignment, or more broadly, related to phonology theories, which is how to account for variant stress patterns of words. In order to offer a more explanatory mechanism for variants, I will propose a new concept of my own in this chapter: default variant and alternative variant. Chapter 6 will firstly point out that similarities exist among all variant stress patterns of one word. In other words, certain relations are present among all variants of one word. Following this logic, in Chapter 6, I will propose that one stress pattern of a word is the default variant and all other stress patterns, termed as the alternative variants, are accounted for by setting parameters differently from the default variant. In this way, I will present a more systematic way to explain variant stress patterns of words.

Phonological theories are meant to account for all the phonological patterns of world languages. With respect to the explanation of phonological phenomena, two devices generally are available for these phonological theories, i.e. constraints and rules. Generative phonological theory, with *SPE* as the classical work, holds the concept that grammar is composed of linearly ordered re-write rules that map substrings onto other substrings (Chomsky and Halle (1968), Frampton (2008), Frawley (2003), Mascaró (2011), Odden (2011)). Rules, instead of being random, are ordered because ordering can simplify grammars and express linguistic generalizations more fully (Mascaró (2011)). PFT is one theory that makes use of rules. Following this discussion, a new task emerges, that is, the discussion of rule ordering. Consequently, in Chapter 7, I will study ordering relations among Positional Functions by use of the two principles in Chomsky (1967). My intent in this chapter is firstly to develop an answer to the question as to whether ordering relations between rules are valid or not. If the answer is yes, I will

proceed to a discussion of exactly what kind of relation is present between rules. I may not be able to grant Chapter 7 originality, since study of ordering relations among rules has a long history in the phonological field, but discussion of ordering relations among Positional Functions may help the understanding of ordering relations among rules more deeply.

Chapter 1

Stress

1.1   The Definition of Stress

Stress is defined by Jones (1960: 245) as "the degree of force with which a sound or syllable is uttered." Here, the word "force" implies an energetic articulation involving related articulatory organs. Ladefoged (2006: 243) presents a similar description and states that "[s]tressed sounds are those on which the speaker expends more muscular energy. This usually involves pushing out more air from the lungs by contracting the muscles of the rib cage…. There may also be increases in the muscular activity involved in the articulatory movements." Schane (1973: 14) states that "stress is one of the prosodic elements associated with syllables and most often with particular vowels.… [A] considerable muscular effort lengthens the period during which the articulatory organs maintain appropriate configuration."

1.2   The Relation between Stress and Vowel Reduction

In addition to the above acoustic properties, such as increased duration and greater intensity, stress may also affect segment and syllable structures. For instance, stressed syllables of English may contain any vowel except schwa; therefore, schwa may never be stressed and is limited to unstressed syllables. This phenomenon is described as "the

reduction of unstressed vowels to schwa" in English by Halle and Vergnaud (1987: 239). *The Sound Pattern of English* (Chomsky and Halle (1968: 112); hereafter *SPE*) also presents a similar description that "[a] vowel belongs to the category [+stress], and thus is immune from [v]owel [r]eduction." Analogous discussions can as well be witnessed in Crosswhite (2001, 2004), Gordon (2011), etc. To put this phonetic property in simple words, it means: (a) vowel reduction is stress-dependent; (b) unstressed vowels will be reduced to schwa; (c) stressed vowels will fail to be reduced. The relation between stress and vowel reduction implicates that stress is of significant importance for syllables, especially vowels in syllables. For example, for the stress pattern of the word *ìnformátion* (2010)[1] in Wells (2000), the failure of reduction of "i" in the syllable "in" can be taken as being blocked by the secondary stress on it and the reduction of "o" in "for" to schwa as being unstressed.

1.3 Levels of Stress

There are four different levels of stress, no stress, primary or main stress, secondary stress, and tertiary stress, which are sometimes respectively marked as 0, 1, 2 and 3.[2]

It seems that no controversy is stirred up over the validity of primary stress and secondary stress, but tertiary stress is not recognized by all linguists. Some linguists only distinguish primary stress and secondary stress from unstressed syllables. However, the

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[1] In this dissertation, I use the following numbers to indicate stress: 0 = no stress, 1 = primary stress, 2 = secondary stress, and 3 = tertiary stress. Details will be given in the latter part of Section 1.3.

[2] In this dissertation, by following *SPE* and Halle and Vergnaud (1987), I use the term *primary stress*, instead of *main stress*, to indicate the strongest level of stress.

fact that some unstressed vowels are not reduced asks for a more complex hierarchy of stress. In order to prove that tertiary stress does exist, related pieces of evidence will be listed here.

Firstly, Bérces (2008) and Hirst and Cristo (1998) claim that any syllable which lacks a primary or secondary stress but contains a full vowel is predictably tertiary stressed. For example, in the transcription of the word *exportation*, [ˌeks pɔː ˈteɪʃᵊn], the subscript vertical line is on the syllable "ex" and the superscript vertical line on "ta" (Wells (2000)). To put it another way, the secondary stress is on the syllable "ex" and the primary stress on "ta," which explains the failure of reduction of vowels in "ex" and "ta." The two syllables which do not bear stress signs on them are "por" and "tion." The syllable "tion" will not pose a problem since the lack of stress on it accounts for its vowel reduction. However, problems might arise with regard to the syllable "por": if the syllable "por" is considered as unstressed, the quality of the vowel "o" in it will be opposite to what has been discussed about vowel reduction, since "o" in "por" is not reduced. Thus, it seems reasonable to determine that "por" bears stress. As has just been illustrated, the recognition of only three levels of stress, namely, no stress, secondary stress, and primary stress, fails to capture the whole empirical facts. Similar examples are numerous, e.g. *delegate* is both a noun and a verb. The transcription of its verb form is [ˈdel ɪ geɪt] in Wells (2000). The vowel "a" in the final syllable "gate" in the verb "delegate" is not reduced. Labeling the verb *delegate* as (100) stress pattern is in contradiction to the relation between stress and vowel reduction. Instances such as *ámplify*, *ánecdote*, *décorate*, and *mánifest* are analogous to *délegate* (verb), with the final underlined vowels bearing neither primary stress nor secondary stress, and still being full vowels. This fact calls for another level of stress to be added to the hierarchy of stress

which only distinguishes between no stress, primary stress, and secondary stress; in other terms, this fact appears to support the argument that tertiary stress should be included into the hierarchy of stress. *SPE* (Chomsky and Halle (1968: 59)) takes a similar standing and states that "stress contours in English have at least four (and probably five or more) perceptual levels." Similar to the description in *SPE*, "in the American Structuralist tradition, four … degrees [of stress] are usually distinguished," namely, primary stress, secondary stress, tertiary stress, and weak stress (Crystal (2008: 455)). By use of the hierarchy of four-level stress, the unreduced vowels in exemplifications just mentioned, *ámplify̱*, *ánecdo̱te*, *décora̱te*, *mánife̱st*, and *délega̱te* (verb), are explicable, since tertiary stress is on related syllables. In *Longman Pronunciation Dictionary* (1990) "a distinction was made between secondary (ˌ) and tertiary (ₒ) stress" (Wells (2000: 741)). For instance, *absenteeism* is transcribed as /ˌæb sᵊn ˈti: ₒɪz əm/ and *Darwinism* as /ˈda: wɪn ₒɪz əm/, where the sign "ₒ" stands for the tertiary stress.

Secondly, in IPA transcriptions primary stress is indicated with a superscript vertical line (ˈ) placed before the stressed syllable, and secondary stress with a subscript vertical line (ˌ). Although tertiary stress is not indicated in IPA transcriptions with tick marks, IPA does use accent marks to indicate finer degrees of stress: the acute accent (´) indicates primary stress; the circumflex (^) indicates secondary stress; and the grave accent (`) indicates tertiary stress (Jensen (2004)).

The above supporting proof for tertiary stress appears to provide me with justification to conclude that a syllable which contains a full vowel, but does not bear primary stress or secondary stress, can be considered as bearing tertiary stress.

In this section, I have provided evidence to testify to the validity of tertiary stress. In this dissertation, the following marks and numerals will be used to indicate stress: (´)

= primary or main stress, (`) = secondary stress, (^) = tertiary stress; 0 = no stress, 1 = primary or main stress, 2 = secondary stress, and 3 = tertiary stress. For example, "*còndênsátion* (2310)" bears secondary stress on the first syllable "con," tertiary stress on the second syllable "den," primary stress on the third syllable "sa," and no stress on the fourth syllable "tion."

In the next two chapters, I will show how *SPE* and MT treat stress patterns of words and point out latent problems in their respective proposals.

Part I

Previous Studies

Two theories will be referred to in this part: *SPE* Theory and MT. Two reasons lead to the final decision of including these two theories into the dissertation. The first reason is that the present dissertation is only concerned with rule-based theories and thus it seems reasonable to refer to rule-based theories in previous study review section. The second reason is that Yamada (2010b) did not review *SPE* and MT in his dissertation for the proposal of PFT.

In *SPE*, stress rules are ordered and applied in a cyclic manner (Chomsky and Halle (1968)). Those stress assignment rules are mainly composed of the Compound Rule, the Main Stress Rule, the Stress Adjustment Rule, etc. They are not only meant for words, but also for compounds and phrases.

Although *SPE* is described by McCarthy (1982) as the most comprehensive phonological theory and is thought to have laid the foundation for generative phonology, its segmental approach to stress is claimed to be abstract and inadequate (Hays (1984), Liberman (1975)). Due to the inadequacy of *SPE* theory, alternative theories have been proposed, such as MT.

In the following two chapters, Chapter 2 and Chapter 3, both *SPE* and MT will be discussed with exemplifications, and various drawbacks in them will be pointed out.

Before proceeding to Chapter 2 and Chapter 3 to review *SPE* and MT, one statement needs to be made: Optimality Theory (henceforth OT) is not included in this dissertation. The reason is that OT makes use of constraints to explain phonological phenomena, while this dissertation focuses on theories that utilize rules. I limit my discussions to rule-based theories, so that I may have a deep and thorough analysis of related topics. If I include both rule-based theories and constraint-based theories, I may only be able to have a shallow discussion concerning both of them. However, it is worth mentioning that OT scholars have been trying to offer explanations or propose new treatments for stress patterns of words. By way of example, Zamma (2013) examined the relation between suffixes and stress preservation in derived words. Zamma (2013) claimed that the behavior of suffixes can be satisfactorily accounted for by use of Partial Ordering Theory proposed by Anttila (1997) within the framework of OT. Tanaka (2014) proposed a new concept, Turbid Optimality Theory, as "a general framework for transparent and opaque grammar," and claimed that constraints can be "categorized into … three types…, based on the sensitivity of the output representations" (Tanaka (2014: 614)). These treatments proposed by OT scholars and proposals of other theories that have not been referred to in this dissertation will be concerns for future study.

Chapter 2

Stress Rules in *SPE*

2.0 Introduction to *SPE*

Whenever the topic of phonology is referred to, *The Sound Pattern of English* (Chomsky and Halle (1968); hereafter *SPE*) must be mentioned, since this masterpiece of Chomsky and Halle lays down the basis for generative phonology. *SPE* theory assumes that "the grammar of the language is the system of rules" that specifies the correspondence between "an ideal phonetic form and an associated intrinsic semantic interpretation," where rules are defined as linearly ordered re-write rules that map substrings onto other substrings (Chomsky and Halle (1968: 3), Frampton (2008), Mascaró (2011), Odden (2011), Williams (1974)). *Re-write* indicates that rules are statements which alter substrings by mapping underlying representations into surface representations; in other words, a rule implies a certain change (Odden (2011)).

Several kinds of linear ordering relation among stress rules can be witnessed in *SPE*, e.g. conjunctive ordering, disjunctive ordering, and so on. The most commonly used and the most outstanding one is disjunctive ordering, which implies that the application of one rule disqualifies other rules within the same block of rules from being applied. Another vital character of phonological rules in *SPE* is that these rules are applied in a cyclic manner, which is termed as *transformational cycle* (Chomsky and Halle (1968)). Transformational cycle implies that phonological rules are first applied to

the innermost constituents; then, they will be applied to the next innermost strings which contain no internal brackets; the triggering of phonological rules will go on until all the internal brackets are erased.

Stress assignment rules in *SPE* mainly include *the Compound Rule*, *the Nucleus Stress Rule*, *the Stress Adjustment Rule*, and so on. Liberman and Prince (1977: 252) state that an important innovation of generative phonology "has been the development of a formalism for expressing stress-assignment rules … in an explicit and precise fashion." In *SPE*, these stress assignment rules are not just put forward for stress assignment of words, but also for stress assignment of compounds and phrases. For example, the Compound Rule is for stress assignment of compounds and the Nuclear Stress Rule for phrases. In this dissertation, the focus will be on words; thus, the Compound Rule and the Nuclear Stress Rule will not be involved.

SPE mainly distinguishes four levels of stress, 1, 3, 4, in decreasing strength, and 0.[1] *SPE* adopts the convention that "when primary stress is placed in a certain position, then all other stresses in the string under consideration at that point are automatically weakened by one" (Chomsky and Halle (1968: 16-17)). This convention, companied by the idea of cyclic reassignment of the primary stress, is addressed by Liberman and Prince (1977: 252) as "[a]n essentially novel contribution of generative phonological theory." Flawless as it appears to be, criticisms leveled at *SPE* and its stress assignment rules are not rare. The details of these stress rules and latent problems in them will be laid out in this chapter.

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[1] In *SPE*, there is no secondary stress in the final stress contour of words, except for compound words. Details will be presented with the instance of *condensation* in footnote 13 of this chapter.

2.1 Stress Rules in *SPE*

In *SPE*, the general principle guiding rule application is the transformational cycle (Chomsky and Halle (1968), Chomsky, Halle, and Lukoff (1956), Chomsky and Miller (1963)), whose definition is presented in the following:

(1) Transformational Cycle (Chomsky and Halle (1968: 15))

[T]he phonological rules first apply to the maximal strings that contain no brackets, and that after all relevant rules have applied, the innermost brackets are erased; the rules then reapply to maximal strings containing no brackets, and again innermost brackets are erased after this application; and so on, until the maximal domain of phonological processes is reached.

Consider in this regard the word *condensation*. *Condensation* is derived from the verb *condense*, and as a result *condensation* is represented as $[_N[_VkɔN=deNs]_VAt+i\check{V}n]_N$ in *SPE* (Chomsky and Halle (1968: 116)). In order to account for its stress pattern, stress rules will be firstly activated on the innermost constituent $[_VkɔN=deNs]_V$, then to the maximal domain $_N[kɔN=deNsAt+i\check{V}n]_N$. During the process, the Main Stress Rule, The Rule (9), Auxiliary Reduction Rule, and the Stress Adjustment Rule will be utilized. All of these rules will be specified below according to their application order.[2] Firstly, the Main Stress Rule in (2) will be applied to $[_VkɔN=deNs]_V$ to explain its primary stress.

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[2] The Rule (9) is termed as the Rule (108) in *SPE* in accordance with its numbering. Since this rule is numbered as nine in this dissertation, it will be titled as the Rule (9) here. The Rule (9) weakens secondary stress that immediately precedes the primary stress to tertiary stress. For details about this rule, refer to footnote 11 in this chapter.

(2) Main Stress Rule (Chomsky and Halle (1968: 110))[3]

$$V \rightarrow [1\ \text{stress}] \Big/ [X\!-\!\left\{ \begin{array}{l} C_0 \begin{bmatrix} -\text{tense} \\ \gamma\text{stress} \\ V \end{bmatrix} C_0^1 \begin{bmatrix} \alpha\text{voc} \\ \alpha\text{cons} \\ -\text{ant} \end{bmatrix}_0 \qquad (i) \\[2em] C_0 \qquad\qquad\qquad\qquad\qquad (ii) \end{array} \right.$$

$$\Big/ \!-\! \left\{ \begin{array}{ll} +C_0 \begin{bmatrix} -\text{stress} \\ -\text{tense} \\ V \end{bmatrix} C_0]_{\text{NSPVA}} & (a) \\[3em] \begin{bmatrix} -\text{stress} \\ -\text{tense} \\ V \end{bmatrix} C_0]_{\text{NSP}} & (b) \\[3em] (+\vartheta) \begin{bmatrix} -\text{seg} \\ <-\text{FB}> \end{bmatrix} C_0\ [\beta\text{stress}]\ C_0 <V_0 C_0>]_{\text{NSPVA}} & (c) \\[2em] (+\vartheta)\ C_0\ [\beta\text{stress}] C_0]_{\text{NSP}} & (d) \\[1em]] & (e) \end{array} \right.$$

where X contains no internal # boundary, $\gamma = 2$ or weaker, $\beta = \left\{ \begin{array}{c} 2 \\ 1 \end{array} \right\}$

Before addressing the issue of how to trigger the Main Stress Rule in (2) on the verb *condense*, the ordering relation between rules in (2) will be analyzed. In *SPE*, "the

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[3] In *SPE*, "[f]or any feature complex X, the symbol X_m^n stands for a string of no less than m and no more than n occurrences of X. Thus C_0^1 stands for one occurrence or zero occurrences of C, and C_1^1 stands for exactly one occurrence of C" (Chomsky and Halle (1968: 61)).

ordering abbreviated by the use of parentheses is disjunctive" (Chomsky and Halle (1968: 61)), with "the first rule applying first and application of one rule excluding application of the other rule" (Mascaró (2011: 1742)). For the Main Stress Rule (2), "case (i) and case (ii) apply disjunctively, in that order, under the conditions (a)-(e); either (c) or (d) may follow either (a) or (b) within a single cycle; otherwise, the ordering is fully disjunctive" (Chomsky and Halle (1968: 109)). For example, to apply rule (2) to a certain string x, firstly whether the string x meets condition (2a) will be examined, that is, whether the string x is a noun, a stem, a prefix, a verb, or an adjective, with a final monosyllabic formative containing a lax and unstressed vowel.[4] If string x does not meet condition (2a), whether it meets condition (2b) will be gone over. Here, just as an illustration, suppose string x meets condition (2a), so the form of the string x should be as follows:

$$(3) \quad x = y + C_0 \begin{bmatrix} - \text{stress} \\ - \text{tense} \\ V \end{bmatrix} C_0]_{\text{NSPVA}}$$

In the next step, whether string y falls under case (2i) will be examined. If it does, then primary stress will be assigned in accordance with (2ai). Accordingly, case (2ii) will be skipped in accordance with the disjunctive ordering relation between (2i) and (2ii). If

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[4] "+" in (2a) stands for a formative boundary (henceforth *FB*) in *SPE*, which "appears between the final segment of one formative and the initial segment of the following formative" (Chomsky and Halle (1968: 66)). The symbol "+" indicates the feature complex [–segment, +FB, –WB], where *WB* refers to word boundary. Several kinds of boundaries can be witnessed in *SPE*. To name a few, "#" stands for [–segment, –FB, +WB], and "=" equals to [–segment, –FB, –WB]. In this dissertation, only boundaries "+" and "=" will be specified in the discussion.

string *y* does not fall under case (2i), then primary stress will be assigned in line with (2ii), since condition (2ii) will always be met. I will suppose that case (2i) is satisfied in the string *y*; accordingly, case (2ii) will be overlooked. After the application of (2ai) to the string *x*, whether condition (2c) is met in the string *x* will also examined, due to the reason that the condition (2a) and the condition (2c) are conjunctively ordered. If the condition for the application of (2c) cannot be satisfied, whether condition (2d) is met in the string *x* will also be examined.

Following the discussion in the above paragraph, it can be inferred that the Main Stress Rule (2) abbreviates a sequence of ten rules, which apply in line with the order as presented in (4):

(4) (2ai), (2aii), (2bi), (2bii), (2ci), (2cii), (2di), (2dii), (2ei), (2eii)

The subsequence (2ai) and (2aii) are disjunctively ordered; thus, if (2ai) is triggered, (2aii) will be skipped; so is true with the subsequence (2bi) and (2bii), (2ci) and (2cii), and so on. However, the ordering relation between condition (2a) and (2c) is conjunctive, which means that the triggering of (2a) will not disqualify (2c) from being applied. The same ordering relation also exists between (2a) and (2d), (2b) and (2c), and (2b) and (2d).

I will now move on to the example of *condensation*, with the representation of [$_N$[$_V$kɔN=deNs]$_V$At+iV̌n]$_N$. Firstly, the Main Stress Rule (2) will be activated on the innermost constituent [$_V$kɔN=deNs]$_V$.[5]

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[5] "=" stands for the feature complex [–segment, –FB, –WB] in *SPE*. In order to prevent case (2i) of the Main Stress Rule (under condition (2e)) from being applied to forms as *condénse*, *detér*, *permít*, a readjustment rule which "adds an identifying feature to the internal boundary" in those verbs is proposed (Chomsky and Halle (1968: 94)). "Since

Condition (2a) asks for the related string to be a noun, a stem, a prefix, a verb, or an adjective, with a final monosyllabic formative containing a lax and unstressed vowel, which is indicated by the boundary "+". Although *condense* is a verb, it does not end with a final monosyllabic formative containing a lax and unstressed vowel. Instead, it contains a lax and unstressed vowel in its final syllable, which is indicated with the sign "=". Consequently, the string [vkɔN=deNs]v does not meet condition (2a).

The string in question does not satisfy condition (2b) either, since condition (2b) asks for the related string to be a noun, a stem, or a prefix with a lax and unstressed vowel in its final syllable.

The string under discussion also fails in condition (2c). The expression *[βstress]* in condition (2c) indicates that the final syllable being stressed, with either secondary stress or primary stress on it, which condition is not met in the string [vkɔN=deNs]v.[6]

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these stems and prefixes are not, in general, independent words or even separate lexical items," "#", the sign for word boundary, will not be used (Chomsky and Halle (1968: 94)). Instead, the symbol "=" is chosen "as an informal abbreviatory notation for the feature set [−segment, −FB, −WB]" (Chomsky and Halle (1968: 94)). Due to the = boundary, case (2i) under condition (2e) is blocked from being activated on verbs as *condénse, detér, permít*.

[6] The requirement of condition (2c) is obviously more complex than a simple *[βstress]*. The angled brackets in (2c) indicate "two expressions—one in which all angled elements appear and another in which none of these elements appear" (Chomsky and Halle (1968: 77)). Following this convention, condition (2c) can be interpreted as a sequence of four rules, (2c'), (2c"), (2c'''), and (2c""):

(2c') $+ɔ \begin{bmatrix} -seg \\ -FB \end{bmatrix} C_0 \, [βstress] \, C_0 \, V_0 C_0]_{NSPVA}$

(2c") $+ɔ \, [-seg] \, C_0 \, [βstress] \, C_0]_{NSPVA}$

(2c''') $\begin{bmatrix} -seg \\ -FB \end{bmatrix} C_0 \, [βstress] \, C_0 \, V_0 C_0]_{NSPVA}$

(2c"") $[-seg] \, C_0 \, [βstress] \, C_0]_{NSPVA}$

The rule (2c') will be made use of as an illustration. It asks for the string under discussion to be a noun, a stem, a prefix, a verb, or an adjective ending with a complex form which is preceded by a boundary. The complex form should initiate with /ɔ/, followed by the form $C_0 \, [βstress] \, C_0 V_0 C_0$.

The condition (2d) calls for the related string to be a noun, a stem, or a prefix, which is as well unsatisfied in [ᵥkɔN=deNs]ᵥ. Thus, the string under discussion falls into condition (2e), which can always be met. After the application of (2e) to [ᵥkɔN=deNs]ᵥ, the residual is *kɔN=deNs*.

The next step is to examine whether the residual *kɔN=deNs* falls under case (2i). The expression (2i) asks for the string in question to satisfy the following condition:

(5)   Case (2i) (Chomsky and Halle (1968: 83)) (preliminary version)

[A] cluster … ends in a consonantal segment followed by a segment which is [−anterior] and in which the coefficients of the features "vocalic" and "consonantal" assume the same value.

A segment "which is [−anterior] and in which the coefficients of the features 'vocalic' and 'consonantal' assume the same value" refers to /r/, /w/, or /y/.[7] A cluster which contains "a consonantal segment followed by a segment which is [−anterior] and in which the coefficients of the features 'vocalic' and 'consonantal' assume the same value" is

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I will not go any further into (2c) in this dissertation, on the grounds that none of the instances in this chapter falls under condition (2c). Another reason that prevents me from analyzing (2c) thoroughly is that, even without a full understanding of (2c), it is still possible to decide whether condition (2c) is satisfied or not. For example, the unsatisfaction of the condition *[βstress]* already suffices to prevent condition (2c) from being applied to the string in question, that is, [ᵥkɔN=deNs]ᵥ.

[7] Explicitly, "[l]iquids are consonantal and vocalic; glides are nonconsonantal and nonvocalic. Thus liquids and glides are the categories that are identical in specification with respect to the features 'vocalic' and 'consonantal'" (Chomsky and Halle (1968: 83)). With respect to the feature [±anterior], "[l] is [+anterior], whereas [r] is [−anterior]. Glides, on the other hand, are [−anterior]" (Chomsky and Halle (1968: 83)). In summary, all glides and the liquid [r] meet the statement [αvoc, αcons, −ant]. This explains that a segment "which is [−anterior] and in which the coefficients of the features 'vocalic' and 'consonantal' assume the same value" implies /r/, /w/, or /y/.

defined as a weak cluster in *SPE* (Chomsky and Halle (1968: 83)).[8] Chomsky and Halle

(1968) later revised the definition of weak cluster a little bit; accordingly, the string in

case (2i) is reinterpreted as the following:

(6)   Case (2i) (Chomsky and Halle (1968: 104)) (final version)

[A] … cluster contain[s] a lax vowel with less than primary stress followed by

no more than a single consonant followed by an optional *r*, *w*, or *y*.

In the string *kɔN=deNs*, the final syllable "dense" fails to meet the requirement in (6) as

the "lax vowel with less than primary stress," namely /e/, is followed by two consonants,

/n/ and /s/, instead of being followed by no more than a single consonant followed by an

optional /r/, /w/, or /y/. Condition (2ii), with the expression $[X—C_0]$, assigns the primary

stress to the vowel before C_0, that is, a string of no less than zero occurrence of a non-

vowel. Accordingly, the primary stress is assigned to the final syllable by case (ii) of (2e).

In other words, in the first cycle, the primary stress is placed on the final string of the

underlying verb:

(7) $[_V kɔN{=}deNs]_V$

In the second cycle, the representation entering the word-level cycle is

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[8] *SPE* classifies clusters into two categories: strong cluster and weak cluster. A strong
cluster is defined as "a string consisting of either a vocalic nucleus followed by two or
more consonants or a complex vocalic nucleus followed by any number of consonants"
(Chomsky and Halle (1968: 29)).

[$_N$kɔN=deNs+At+iV̆n]$_N$. The Main Stress Rule (2) will be activated again. Condition (2a) asks the related string to be a noun, a stem, a prefix, a verb, or an adjective, with a final monosyllabic formative containing a lax and unstressed vowel. The string under discussion now ends with a syllable containing two vowels.[9] Consequently, the string [$_N$kɔN=deNs+At+iV̆n]$_N$ does not meet condition (2a). Condition (2b) requires the related string be a noun, a stem, or a prefix, with the last vowel being unstressed, lax, and followed with zero or more consonants. The string [$_N$kɔN=deNs+At+iV̆n]$_N$ is a noun; its last vowel /V̆/ is unstressed, lax and followed with one consonant. Consequently, the string under consideration satisfies condition (2b). As noted above, the ordering of (2a), (2b), and (2e) is disjunctive. Since (2b) has been met, (2e) will be simply overlooked.

The residual after the activation of (2b) is *kɔN=deNs+At+i*.

The next step is to go over case (2i). The statement in (6) addresses that (2i) asks for the string under discussion to end with a lax vowel with less than primary stress followed by no more than a single consonant followed by an optional /r/, /w/, or /y/. The residual *kɔN=deNs+At+i* satisfies the statement in (6), since the string ending with *i*, a final lax vowel which neither bears stress nor is followed by any segment. The primary stress in the second cycle will be placed on the string preceding –*i*, that is, on the string –*At*, in accordance with the case (2i). In *SPE*, "[t]he rules that determine stress contours are, for the most part, rules that assign primary stress in certain positions, at the

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[9] In *SPE*, the affix –*ion* is given "the underlying representation /iV̆n/, /V̆/ standing for the archi-segment 'lax vowel'" (Chomsky and Halle (1968: 87)). As a result, the affix –*ion* is considered to be containing two vowels in *SPE*.

same time weakening the stresses in all other positions by one" (Chomsky and Halle (1968: 64)). Consequently, after the primary stress is placed on "*At*," the primary stress on "deNs" will be reduced to the secondary stress. The stress contour now is as below:

(8) $[_N$kɔN=déNs+Át+iV̌n$]_N$[10]

Since condition (2b) and (2c) are conjunctively ordered, the next step should be the consideration of whether condition (2c) is met in string (8). As stated in footnote (6), condition (2c) is composed of a sequence of four rules, (2c'), (2c''), (2c'''), and (2c''''). As a result, firstly whether (2c') is met in string (8) should be examined. If (2c') is not satisfied, then whether (2c'') is met should be examined. Details of (2c) will not be discussed in this dissertation, on the grounds that none of the instances in this chapter falls under condition (2c). Another reason is that condition (2c) is in fact quite complex, and thus a full explanation of it may bring unnecessary complexity into this dissertation. Here, only condition (2c'''') will be used as an illustration. Condition (2c''''), which is *[−seg] C_0 [βstress] C_0]$_{NSPVA}$*, is not met in string (8), since the last element in string (8) does not meet the requirement *C_0 [βstress] C_0]$_{NSPVA}$*, where *[βstress]* refers to primary stress or secondary stress. Condition (2c) cannot be applied to string (8), so whether condition (2d) is met should be examined. Condition (2d) asks for the related string to be a noun, a

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[10] In *SPE*, generally speaking, the rules that determine stress contours are "rules that assign primary stress in certain positions, at the same time weakening the stresses in all other positions by one.… [A]fter every application of such a rule, all integral values for stress within the domain of this rule … are increased by one" (Chomsky and Halle (1968: 64)). In the second cycle, the Main Stress Rule assigns the primary stress to "−*At*" in (8); thus, the integral value for stress on "deNs" will be increased by one. Namely, the primary stress on "deNs" turns into the secondary stress.

stem, or a prefix, with the last vowel bearing secondary or primary stress, which is not met in string (8).

The next stress rule that will be utilized is listed in (9):

(9) (= the Rule (108) and (117) in *SPE*; Chomsky and Halle (1968: 116))

$$[2 \text{ stress}] \quad \rightarrow \quad [3 \text{ stress}] \quad / — C_0 \, [1 \text{ stress}]$$

The Rule (9) weakens stress that immediately precedes primary stress.[11] In the stress contour [$_N$kɔN=deNs+At+iV̌n]$_N$, the secondary stress is immediately ahead of the primary stress, consequently, the Rule (9) will weaken the pretonic stress and present the stress contour as follows:

(10) [$_N$kɔN=deNs+At+iV̌n]$_N$

The next stress rule that can be triggered is the Auxiliary Reduction Rule:

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[11] The Rule (9), unlike the Main Stress Rule, has no title in *SPE*. It is firstly termed as the Rule (108) in *SPE* according to its numbering and later restated as the Rule (117). In Chapter Five of *SPE*, *Summary of Rules*, where a list of all rules are presented, still it is just named with its numbering. This is not the only rule titled with its numbering in *SPE*. Other examples include the Rule (110) in *SPE*, which turns /t/ to /d/ within appropriate contexts (Chomsky and Halle (1968: 223)). This dissertation will also refer to the rule under discussion according to its numbering here and term it the Rule (9).

(11)   Auxiliary Reduction Rule (Chomsky and Halle (1968: 114))

$$\begin{bmatrix} - \text{ stress} \\ V \end{bmatrix} \rightarrow [2 \text{ stress}] \Big/ \# \left\{ \begin{array}{l} [-\text{ stress }]_0 - \left\{ \begin{array}{l} C_0 \begin{bmatrix} -\text{ tense} \\ V \end{bmatrix} C_0^1 \\ C_0 \end{array} \right\} \overline{C}_0 \begin{bmatrix} \overline{\alpha\text{stress}} \\ V \end{bmatrix} \overline{C}_0 [1 \text{ stress}] \quad \text{(a)} \\ \\ \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \text{(b)} \\ \\ C_0 \left\{ \begin{array}{l} - C_2 \\ \begin{bmatrix} \overline{\quad\quad} \\ +\text{tense} \end{bmatrix} \end{array} \right\} \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \text{(c)} \\ \\ \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \text{(d)} \end{array} \right.$$

where α is weaker than 2 and $\overline{C}$ is an informal abbreviation for a unit which is a

consonant or a boundary

Case (11a) asserts that "secondary stress is placed on a vowel preceding a weak

cluster … when the string under consideration falls under the condition — $V*C_0\overset{1}{V}$, $V*$

having stress weaker than two" (Chomsky and Halle (1968: 114)).   The string

$[_N k \mathfrak{d} N = de \overset{3}{N}s + A\overset{1}{t} + i \check{V}n]_N$ does fall under the condition — $V*C_0\overset{1}{V}$, as shown in the

following:

(12) $[_N k \mathfrak{d} N = de \overset{3}{N}s + A\overset{1}{t} + i \check{V}n]_N$

— $V*C_0 \overset{1}{V}$ (V* has stress weaker than two)

In (12), the string $-e\overset{3}{N}s\overset{1}{A}$ meets the condition — $V*C_0\overset{1}{V}$, where V* has stress weaker than

two. After the omission of the string $-eNsA$, the residual is "*cond–*". Case (11a) cannot

be applied to *cond–*, since the final cluster of *cond–* is composed of only one strong cluster,

while case (11a) requires the stress be placed on the lax vowel in the cluster immediately

preceding a weak cluster. Case (11b) addresses that the residual contains no less than zero consonant, which is satisfied in *cond–*; so case (11b) is applicable. Secondary stress is placed on *cond–* and the stress contour at this point is:

(13) $[_N$kɔN=deNs+At+iV̌n$]_N$
      (with stress marks: 2 over kɔN, 3 over deNs, 1 over iV̌n)

The last rule to be triggered is the Stress Adjustment Rule:

(14) Stress Adjustment Rule (Chomsky and Halle (1968: 90))

$$V \rightarrow [1 \text{ stress}] \quad / \quad [\#\#X \begin{bmatrix} \underline{\quad\quad} \\ 1 \text{ stress} \end{bmatrix} Y\#\#]$$

where *Y* contains no vowel with the feature [1 stress]

The Stress Adjustment Rule in (14) indicates that "[w]ithin a word, all nonprimary stresses are weakened by one" (Chomsky and Halle (1968: 84)). The Stress Adjustment Rule is non-cyclic, so it can be triggered only at the level of word boundary in the cycle. For instance, it is not applicable to the stress contour in (7), based on the fact that the whole cycle of stress assignment for *condensation* is yet to be completed at (7). After the activation of the Stress Adjustment Rule (14), the stress contour is as the following:

(15) $[_N$kɔN=deNs+At+iV̌n$]_N$
      (with stress marks: 3 over kɔN, 4 over deNs, 1 over iV̌n)

The derivation for the final stress contour will be given in the following:

(16) [N[VkɔN=deNs]VAt+iV̌n]N

		1		Main Stress Rule (2eii)
	2	1		Main Stress Rule (2bi)
	3	1		Rule (9)
2	3	1		Auxiliary Reduction Rule (11b)
3	4	1		Stress Adjustment Rule (14)

The final stress pattern [NkɔN=deNs+At+iV̌n]N (3410) of the word *condensation* also provides an explanation for the failure of reduction on syllables "con," "den," and "sa."[12] This phonetic property about the relation between stress and vowel reduction in English is described as "the reduction of unstressed vowels to schwa" by Halle and Vergnaud (1987: 239); namely, vowel reduction is stress-dependent: (a) unstressed vowels will be reduced to schwa; (b) stressed vowels will fail to be reduced. Similar descriptions are generalized in *SPE* as "stress contours in English have at least four (and probably five or more) perceptual levels… [A] vowel that is insufficiently stressed, in some sense, reduces to a mid or high central 'neutral' vowel," which is represented with the symbol [ə] (Chomsky and Halle (1968: 59)). Details are as follows (Chomsky and Halle (1968: 66)):

(17) [T]he optimal grammar of English is one in which stress is predicted by rule.…

Thus we are assuming, in effect, that one of the earliest rules of the phonological component is a rule R which assigns to each segment and boundary … the feature specification [–stress]. Various rules will then

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[12] A derivation and analysis similar to the one in (16) can also be found in Yamada (2015).

replace [−stress] in vowel segments, but not in boundaries or consonants, by integral values of stress, in certain positions…. Thus, when a rule assigns the specified feature [*n*stress], for some integer *n*, in a certain segment, this segment now belongs to the category [+stress] rather than the category [−stress]….

SPE goes on describing that a vowel belonging to the category [+stress] is immune from vowel reduction. The primary stress the vowel receives may be weakened by successive rules, but the vowel will still belong to the category [+stress] and will not be reduced. And "a vowel which has never received primary stress (and therefore retains the specification [−stress]) reduces" (Chomsky and Halle (1968: 112)). Consequently, if *SPE* can account for stress patterns of words, it can as well explain reduction of related vowels to schwa or failure of reduction. For example, if *SPE* is able to make an account of the stress pattern *ìnformátion* (2010) in Wells (2000), accordingly, it can interpret the failure of reduction of "i" in the syllable "in" as being blocked by the secondary stress on it and the reduction of "o" in "for" to schwa as being unstressed.

Returning to the word *condensation*, the syllables "con," "den," and "sa" all receive stress at some point during the derivation. For instance, the syllable "den" receives the primary stress in the first cycle in (7); "sa" in the second cycle in (8); and so on. The primary stress on "den" is firstly weakened to the secondary stress in (8), then to the tertiary stress in (10), and finally to the quaternary stress in (15). The secondary stress on "con" is also weakened to tertiary stress in (15). Although the stress assigned is later weakened at some point, syllables "con," "den," and "sa" still belong to the category [+stress] and are thus not reduced to schwa.

One comment needs to be made: *condensation* has two stress variants in Wells (2000), i.e. *còndênsátion* (2310) and *còndensátion* (2010).[13] In the variant *còndênsátion* (2310), [e] undergoes failure of reduction; however, in *còndensátion* (2010), [e] is reduced to schwa. According to *SPE*, in *cond[e]nsation*, "e" in the syllable "den" has "received stress in the antepenultimate syllable at an earlier stage of the cycle," that is, as a verb; consequently, "e" bears stress and is not reduced (Chomsky and Halle (1968: 112)). For the other variant, *cond[ə]nsation*, *SPE* argues that "our grammar generates [kādensAšən] for the normalized verb ('act of condensing') and [kādənsAšən] for the noun referring, e.g., to drops of water on the window pane (which, like *information*, does not have an underlying cycle for the contained verb)" (Chomsky and Halle (1968: 116)).

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[13] In *SPE*, after the application of a rule that assigns the primary stress, all integral values for stress within the domain of the rule will be increased by one; consequently, at the final representation of stress at a word level, there is no secondary stress. For example, in *condensation*, the secondary stress on the syllable "den" is weakened to tertiary stress by use of the Rule (9); the secondary stress on "con" is weakened to tertiary stress by use of the Stress Adjustment Rule (14). The final stress pattern obtained in (15) is *condensation* (3410), without secondary stress. The stress pattern obtained from *SPE* is different from that in Wells (2000), *còndênsátion* (2310) and *còndensátion* (2010), both of which have secondary stress. However, I will not go into details about the distinctive numerals for stress patterns adopted by *SPE* and Wells (2000) respectively, since it is simple to converse the stress pattern obtained from *SPE* into the one in Wells (2000). All that is needed is to reduce all integral values of subsidiary stress obtained from *SPE* by one. For instance, by reducing all integral values of subsidiary stress in *condensation* (3410) by one, I can gain the stress pattern *condensation* (2310), as what is indicated in Wells (2000). Sometimes in this dissertation, to avoid the misunderstanding that may be raised due to the numerals used to illustrate stress patterns, I may indicate unreduced vowels with letters and square brackets and reduced ones with [ə]. For example: (i) c[o]nd[e]ns[a]tion; (ii) c[o]nd[ə]ns[a]tion. In (i), "o" in the syllable "con," "e" in "den," and "a" in "sa" are not reduced as implied by letters and their respective square brackets. In (ii), "o" in the syllable "con" and "a" in "sa" are not reduced, while "e" in "den" is reduced to schwa as shown by "[ə]." The difference between the two stress patterns of *condensation*, that is, *còndênsátion* (2310) and *còndensátion* (2010), is on the syllable "den." Accordingly, to highlight the difference, I may just illustrate the two stress patterns as *cond[e]nsation* and *cond[ə]nsation*. The advantages of this method are: (a) the differences between the two stress patterns can be emphasized; (b) the dissimilarities in numerals used by *SPE* and Wells (2000) can be circumvented.

To put it another way, *SPE* articulates that the way to obtain *cònd[ə]nsátion* is similar to that of *information*. Since in *SPE information* is assumed to be a single noun presented as [N inform+At+iV̆n]N, *cònd[ə]nsátion* can accordingly be represented as [N condens+At+iV̆n]N, without the internal constituent "*condense*."

In the following, I will proceed to an illustration of how stress rules in *SPE* account for the stress pattern *cond[ə]nsation*. Firstly, the Main Stress Rule (2) will be triggered. Condition (2a) states that the related string should be a noun, a stem, a prefix, a verb, or an adjective, with a final monosyllabic formative containing a lax and unstressed vowel. The noun string [N condens+At+iV̆n]N ends with the formative "+iV̆n", which is a final monosyllabic formative containing two lax and unstressed vowels; namely, condition (2a) is not satisfied. As a result, condition (2b) will be examined. Condition (2b) requires the related string should be a noun, a stem, or a prefix, with the final string containing at least a lax and unstressed vowel. Thus, condition (2b) is met. With reference to condition (2b), the string [N condens+At+iV̆n]N can be represented as the following:

$$(18) \quad [\text{N} \text{condens+At+i}\text{V̆n}]_\text{N} = [\text{N} \text{condens+At+ i} \begin{bmatrix} - \text{stress} \\ - \text{tense} \\ V \end{bmatrix} C_0]_\text{NSP}$$

After deleting the context of (2b), the residual is "condens+At+i–". Next, case (2i) will be examined. As captured in (6), (2i) requires the string under discussion include a lax vowel with less than primary stress followed by no more than a single consonant followed by an optional /r/, /w/, or /y/. The residual "condens+At+i–" meets case (2i), since the

vowel "i" is a lax vowel without stress. The primary stress will be placed on the vowel immediately ahead of C_0:

$$\overset{1}{(19)} \quad [_N\text{condeNs+At+i}\check{V}\text{n}]_N$$

(19)   [_NcondeNs+At+iV̌n]_N

The next stress rule that will be utilized is the Auxiliary Reduction Rule (11).[14]

The string in question in (19) meets the condition — $V^*C_0\overset{1}{V}$. After the omission of the string *–eNsA*, the residual is "cond–". Case (11a) indicates that secondary stress should be placed on a vowel preceding a weak cluster. There is only one syllable in the residual *cond–*, so case (11a) cannot be applied. Case (11b) demands the residual contain no less than zero consonant, so case (11b) is applicable; and secondary stress is set on *cond–*. The stress contour at the present stage is:

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[14] Two points need to be explained here. The first is that, after the triggering of (2ai) in (19), in fact whether condition (2c) or (2d) is met in string (19) should be examined. Related discussions are omitted in the thesis for the ease of exposition. Neither condition (2c) nor (2d) can be satisfied in string (19). Take condition (2d) as an example. Condition (2d) asks the related string to be a noun, a stem, or a prefix, with the last vowel bearing secondary or primary stress, which is not met in string (19), since the last vowel in string (19) does not bear stress. Another explanation is related to the Rule (9). For the stress pattern *cond[e]nsation*, which is represented as [_N[_VkɔN=deNs]_VAt+iV̌n]_N in *SPE*, the primary stress on "deNs" from the earlier cycle of the verb is reduced to secondary stress after the primary stress is decided on "At" in (8). Then the Rule (9) weakens the secondary stress on "deNs" to tertiary stress, since the Rule (9) weakens secondary stress that immediately precedes the primary stress to tertiary stress. For the stress pattern *cond[ə]nsation*, after the primary stress is set on "At" in (19), "deNs" does not bear stress, since *SPE* takes *cond[ə]nsation* as a noun without an earlier cycle from verb. The Rule (9) cannot be triggered on the stress pattern in (19), based on the grounds that no syllable in (19) bears secondary stress.

(20) $\overset{2}{[}_{\text{N}}\text{conde}\overset{1}{\text{N}}\text{s+At+i}\check{\text{V}}\text{n}]_{\text{N}}$

Finally, the Stress Adjustment Rule (14), which weakens all nonprimary stresses by one, will be activated and present the final stress contour as in (21):

(21) $\overset{3}{[}_{\text{N}}\text{conde}\overset{1}{\text{N}}\text{s+At+i}\check{\text{V}}\text{n}]_{\text{N}}$

The derivation for the stress pattern of the variant *cond[ə]nsation* is illustrated in (22):

(22) $[_{\text{N}}\text{condeNs+At+i}\check{\text{V}}\text{n}]_{\text{N}}$

	1	Main Stress Rule (2bi)
2	1	Auxiliary Reduction Rule (11b)
3	1	Stress Adjustment Rule (14)

The final stress pattern is *condensation* (3010). The syllable "den" does not bear stress, which explains why it is reduced to schwa.[15]

    SPE does not only list *condensation*, with its two stress patterns *cond[e]nsation* and *cond[ə]nsation*, as an example for the above treatment, but also other instances. To name a few, *SPE* states that *presentation* also has two stress variants, *pres[e]ntation* and *pres[ə]ntation*. *Pres[e]ntation* is derived from the verb *present*; while *pres[ə]ntation* is derived "without a first cycle for the underlying verb, or with an artificial analysis

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[15] A derivation and analysis similar to the one in (22) is also presented in Yamada (2015).

[N[vpresent+At]vion]N" (Chomsky and Halle (1968: 161)). Consequently, the two stress patterns of exemplifications like *presentation* appear to be explicable in terms of the above treatment for the two variants of *condensation*.

The contrast between stress contours of 341 and 301 for words as *condensation*, *presentation*, and so on, is the contrast between the two stress patterns of one single word. In addition to those instances with two stress patterns, 341 and 301, *SPE* as well lists instances with only one stress pattern. Explicitly, *SPE* employs two groups of exemplifications with only one stress pattern: one group with the stress contour of 341, and the other group with the stress contour of 301. For instance, *att[e]station*, *dep[o]rtation*, etc., are given as examples of the stress pattern 341, where the pretonic vowels bear the quaternary stress and remain unreduced. *SPE* provides the following explanation: a*tt[e]station* is derived from *attést*, so the primary stress on the syllable "ttest" in *attest* accounts for the unreduced "e" in *attestation*. The interpretation for *dep[o]rtation* is analogous to that of *att[e]station*: the primary stress on the syllable "por" in the base form *depórt* explains the failure of vowel reduction on "o" of the syllable "por" in *dep[o]rtation*. For the stress pattern 301, *SPE* employs *comp[ə]nsation*, *inf[ə]mation*, and so on as exemplifications, where the pretonic vowels do not bear stress and are reduced.[16] For *compensation* (*comp[ə]nsation*), the base form *cómpensate* bears the primary stress on "o" in the syllable "com," not on "e" in the syllable "pen," which interprets the vowel reduction on "e" of the syllable "pen" in *compensation*. For

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[16] Other examples for the stress pattern 341 in *SPE* include *conductivity*, *connectivity*, *elasticity*, *objectivity*, and *relaxation*, where the pretonic vowels bear the quaternary stress and remain unreduced. For the stress pattern 301, more instances in *SPE* involve *adjectival* and *demonstration*, where the pretonic vowels do not bear stress and are reduced.

inf[ə]mation, *SPE* claims that "*information* is not the nominalized form of *inform*, but rather a single noun presumably represented as /inform+At+iVn/…. Correspondingly, the meaning of *information* is not derivable from that of *inform* by any regular process" (Chomsky and Halle (1968: 112)). In other words, *information* and *inform* are assumed as unrelated to each other in *SPE*. Following this line of logic, the primary stress on the syllable "for" in *infórm* is not relevant to the syllable "for" in *information*, which seems to provide an explanation for the vowel reduction on "o" of the syllable "for" in *information*.

In this part, a brief introduction to stress rules in *SPE* has been laid out with concrete exemplifications. The description seems to be coherent and flawless; however, a close look at the proposal in *SPE* may reveal that this is not quite the case. In the next part, I will move on to an analysis of possible weaknesses in *SPE*.

2.2   Problems in *SPE*

Section 2.1 illustrates how *SPE*, by use of related stress rules, accounts for stress patterns of words, especially words with the stress contours of 341 and 301.[17] The discussion seems to be reasonable; however, arguments against it still surface. Firstly, problems in the optional application of the Rule (9) will be addressed with examples of *elasticity*, *electricity*, and *condensation*. Secondly, the failure of *SPE* to explain stress patterns of derived words, in which vowels bearing primary stress in base forms are

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[17] Stress rules in *SPE* are not limited to these mentioned in this dissertation. Since it is impossible to exhaust every single rule in *SPE* in this dissertation, only stress rules that are closely related to stress assignment of examples in this dissertation are fully discussed.

reduced, will be considered. Thirdly, criticisms leveled at the treatment of *condensation* and *information* in *SPE* will be discussed.

2.2.1 Optional Application of the Rule (9)

According to *SPE*, the Rule (9) "is optional for certain classes of words"; when the Rule (9) "does not apply to a word with the stress contour –21…," then cases (a) and (b) of the Auxiliary Reduction Rule (11) "will not assign secondary stress to the initial minus-stressed vowel" (Chomsky and Halle (1968: 116)). The reason is as the following. Without secondary stress being reduced to tertiary stress by the Rule (9), the condition for the application of cases (a) and (b) of the Auxiliary Reduction Rule (11) that the pretonic vowel bears a stress weaker than secondary cannot be satisfied. Accordingly, it can be inferred that whether the Auxiliary Reduction Rule (11) can be applied depends on whether the Rule (9) is applicable or not. If the Rule (9) is not triggered, then the Auxiliary Reduction Rule (11) cannot be activated for the reason that the condition for its application is not satisfied. On the other hand, with the optional application of the Rule (9) to words with the stress pattern of –21…, "we may have either the contour -31-- or 341--" for words as *elasticity* and *electricity* (Chomsky and Halle (1968: 116)).

First of all, I will take the word *electricity* as an exemplification and examine whether the optional application of the Rule (9) can present correct results.

2.2.1.1　The Example *Electricity*

　　Electricity is derived from *eléctric*, so it can be represented as [$_N$[$_A$electriK]$_A$i+ti]$_N$.[18] To account for its stress pattern, I will start from the innermost constituent [$_A$electriK]$_A$. Firstly, the Main Stress Assignment Rule (2) will be made use of. Condition (2a) cannot be activated, because the boundary "+" in it shows that condition (2a) requires the related string be a noun, a stem, a prefix, a verb, or an adjective, with a final monosyllabic formative containing a lax and unstressed vowel. Although *electric* is an adjective, it does not have a final monosyllabic formative containing a lax and unstressed vowel. The string in question does not meet condition (2b) either, since condition (2b) applies to strings that are nouns, stems, or prefixes. Condition (2c) asks for the related string to bear secondary stress or primary stress. Since the string [$_A$electriK]$_A$ neither bears secondary stress nor primary stress, it does not satisfy the condition (2c). The string [$_A$electriK]$_A$ also fails for condition (2d), as (2d) demands the string under discussion be a noun, a stem, or a prefix. Accordingly, the string falls into condition (2e). After the triggering of condition (2e), the residual is *electriK*.

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[18] *Electricity* is represented as [$_N$[$_A$electriK]$_A$i+ti]$_N$, although the surface representation is *electri/s/ity*. *SPE* takes the underlying consonant as /k/ and then utilizes the rule (i) in the following to turn the underlying /k/ to /s/ in related environments.

(i)　(Chomsky and Halle (1968: 48))

$$\left\{ \begin{matrix} g \to \breve{j} \\ k \to s \end{matrix} \right\} / \underline{\quad} \left\{ \begin{matrix} i \\ e \end{matrix} \right\}$$

For example, after the derivation from *electric* to *electricity* is finished, the underlying /k/ in *electricity* is followed by /i/, which meets the environment for /k/ to turn into/s/; thus the surface representation in *electricity* is /s/. In this dissertation, I will not go into details about this phenomenon since it is not closely related to stress assignment, neither is it the main topic here.

In the next step, whether *electriK* satisfies case (2i) will be examined. Firstly, I will take a close look at the string in question. In *electriK*, the final syllable "tric" is composed of a lax vowel without stress followed by one consonant. Case (2i), as already stated in (6), asks for the string under discussion to include "a lax vowel with less than primary stress followed by no more than a single consonant followed by an optional *r*, *w*, or *y*." The requirement that "a lax vowel with less than primary stress" is met in *electriK*, since the lax vowel without stress here can be taken as "a lax vowel with less than primary stress." The next requirement that it be "followed by no more than a single consonant" is also satisfied since the lax vowel in "tric" is followed by one consonant /k/. The final requirement that "followed by an optional *r*, *w*, or *y*" is also met since this requirement is optional. In summary, the string *electriK* falls under case (2i). The primary stress is placed on the penultimate syllable. Since case (2i) has been triggered, case (2ii) will be skipped. The stress contour obtained now is:

(23) $[_A \overset{1}{\text{electriK}}]_A$

In the second cycle, the representation entering the word-level cycle is $[_N \overset{1}{\text{electriKi}}+\text{ti}]_N$. The Main Stress Rule (2) will be triggered again. Condition (2a) is satisfied this time, as $[_N \text{electriKi}+\text{ti}]_N$ is a noun with a final monosyllabic formative containing a lax and unstressed vowel. The residual entering case (2i) is "electriKi–". Case (2i) is met because the final syllable "Ki" in *electriKi–* is composed of a lax vowel without stress followed by zero consonant. Accordingly, the primary stress will be placed on the syllable

immediately preceding "Ki," namely the syllable "tri." The stress on "lec" will be reduced to secondary stress, accordingly. The stress contour now is as follows:

(24) $[_N$electri$\overset{2}{K}$i+$\overset{1}{t}$i$]_N$

Neither condition (2c) nor (2d) of the Main Stress Rule can be applied. Next attention will be turned to the Rule (9). As described at the beginning of Section 2.2.1, the Rule (9) is optional for this word, so I will examine stress patterns that will be obtained with and without the application of the Rule (9) respectively. Firstly, I will apply the Rule (9) to the representation $[_N$electri$\overset{2}{K}$i+$\overset{1}{t}$i$]_N$ in (25):

(25) $[_N$electri$\overset{3}{K}$i+$\overset{1}{t}$i$]_N$

The secondary stress on the syllable "lec" is reduced to tertiary stress after the triggering of the Rule (9). The string in (25) meets case (11b) of the Auxiliary Reduction Rule that the string under discussion falls under the condition — $V^*C_0\overset{1}{V}$, "V* having stress weaker than two." The secondary stress will be placed on the vowel preceding the syllable "lec," that is, the syllable with stress weaker than two. The stress contour now is:

(26) $[_N$e$\overset{2}{l}$ectri$\overset{3}{K}$i+$\overset{1}{t}$i$]_N$

At last, the Stress Adjustment Rule (14) will be triggered and give the final stress contour as below:

(27) [$_N$electriKi+ti]$_N$ with stress pattern 3 4 1

The derivation to obtain the final stress contour in (27) is demonstrated as follows:

(28) [$_N$[$_A$electriK]$_A$i+ti]$_N$

1		Main Stress Rule (2ei)
2	1	Main Stress Rule (2ai)
3	1	Rule (9)
2 3	1	Auxiliary Reduction Rule (11b)
3 4	1	Stress Adjustment Rule (14)

In (28), with the application of the Rule (9), the stress pattern obtained is 34100. Since *SPE* claims that the Rule (9) is optional for *electricity*, I will also inactivate Rule (9) and examine the stress pattern to be presented. The stress contour obtained immediately before the application of the Rule (9) is illustrated in (24), which will be repeated here as (29):

(29) [$_N$electriKi+ti]$_N$ (=(24)) with stress pattern 2 1

The Rule (9) will not be applied to the derivation in (29), so the secondary stress on the syllable "lec" will not be reduced to the tertiary stress. The inapplication of the Rule (9) disqualifies the Auxiliary Reduction Rule (11) from being activated, due to the fact that the condition for the application of cases (a) and (b) of the Auxiliary Reduction Rule (11) that the pretonic vowel bears a stress weaker than secondary stress is not met.[19] Then the Stress Adjustment Rule (14) is applied. The derivation is presented in (30):

(30) $[_N[_A \text{electriK}]_A i + ti]_N$

1	Main Stress Rule (2ei)
2 1	Main Stress Rule (2ai)
3 1	Stress Adjustment Rule (14)

In (30), with the inactivation of the Rule (9) and the subsequent inapplication of the Auxiliary Reduction Rule (11), the stress pattern presented is 03100. Remind ourselves here that the stress pattern 34100 is gained from (28) with the application of the Rule (9)

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[19] Neither case (c) nor case (d) of the Auxiliary Reduction Rule (11) is applicable either. Case (11c), which places secondary stress before the syllable ending with no less than two consonants, is not met in $[_N \text{electriKi} + ti]_N$, because no syllable in $[_N \text{electriKi} + ti]_N$ ends with no less than two consonants. Case (11d) puts the secondary stress before the syllable ends with a tense vowel, which is also not satisfied in $[_N \text{electriKi} + ti]_N$, since no syllable ends with a tense vowel in $[_N \text{electriKi} + ti]_N$. This is the first and the main reason that neither case (11c) nor case (11d) can be triggered. The second reason is that even *SPE* does not give out any concrete examples or detailed descriptions about the application of case (11c) and case (11d). *SPE* only states that "the situation is a bit more complex in this position, but we omit any more precise specification of the relevant context here" (Chomsky and Halle (1968: 118)). Additionally, *SPE* states that "there are many details and special cases that do not seem to fall under any large-scale generalizations and that shed little light on general questions of phonological theory or on the structure of English" (Chomsky and Halle (1968: 113)). It seems that *SPE* does not hold a clear idea about the exact conditions for the application of case (11c) and case (11d). Due to these two reasons, case (11c) and case (11d) will be withheld from being triggered here.

and the Auxiliary Reduction Rule (11). It looks like that I have arrived at the result expected, "either the contour -31-- or 341--."

The reality might not so be promising. The problem arising with *electricity* is that the optional application of the Rule (9) cannot present all the correct stress patterns. For example, the word *electricity* has three stress patterns in Wells (2000), *elèctrícity* (02100), *èlectrícity* (20100), and *èlêctrícity* (23100). In *SPE*, "within a word, all nonprimary stresses are weakened by one," thus the three stress patterns of *electricity* in Wells (2000) should be marked as 03100, 30100, and 34100, in accordance with *SPE* traditions.[20] Derivations in (28) and (30) only present two stress patterns, 34100 and 03100, leaving the stress pattern of 30100 unaccountable.

At the present stage, it still seems unfair to conclude that the optional application of the Rule (9) in *SPE* is problematic, since I have only discussed one instance. In the next subsection, I will turn to the example *elasticity*, another example in *SPE* for the optional application of the Rule (9), to have a closer look at the treatment.

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[20] The exact stress patterns of *electricity* in Wells (2000) should be *elèctrícitŷ* (02103), *èlectrícitŷ* (20103), and *èlêctrícitŷ* (23103). The tertiary stress on the final syllable "ty" is taken as derived from a rule outside the present discussion, i.e. the tensing rule in *SPE* and others. Since the tertiary stress on the final syllable is not the major concern in this dissertation, it will not always be indicated. For instance, in the next exemplification *elasticity*, the final syllable "ty" as well bears tertiary stress in Wells (2000), but this tertiary stress is not shown in this dissertation. As a matter of fact, the tertiary stress on "ty" in *electricity* is not indicated in *SPE* either.

2.2.1.2 The Example *Elasticity*

The word *elasticity* is derived from *elástic*, so it can be represented as [N[Aelastik]Ai+ti]N.[21] The derivation with the application of the Rule (9) is presented in (31):

(31)   [N[AelastiK]Ai+ti]N

<u> 1 </u>	Main Stress Rule (2ei)
2 1	Main Stress Rule (2ai)
3 1	Rule (9)
2 3 1	Auxiliary Reduction Rule (11b)
<u>3 4 1</u>	Stress Adjustment Rule (14)

In the first cycle, primary stress is assigned to the syllable "la" by case (i) under condition (2e). In the second cycle, the affix *–ty* causes primary stress to be assigned to the syllable "ti"; consequently, the primary stress on the syllable "la" is reduced to the secondary stress. Then the Rule (9) reduces the secondary stress on "la" to tertiary stress. Next case (b) of the Auxiliary Reduction Rule (11) assigns secondary stress to the initial syllable "e." Finally, the Stress Adjustment Rule (14) reduces all non-primary stresses by one. The stress contour obtained from (31) with the triggering of the Rule (9) is 34100.

In (32), the derivation without the activation of the Rule (9) will be given:

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[21] *Elasticity*, similar to *electricity*, is represented as [N[AelastiK]Ai+ti]N. Again *SPE* takes the underlying consonant as /k/.

(32) $[_N[_A\text{elastiK}]_A\text{i+ti}]_N$

<u> 1 </u>	Main Stress Rule (2ei)
2 1	Main Stress Rule (2ai)
<u> 3 1 </u>	Stress Adjustment Rule (14)

In (32), in the first cycle, the Main Stress Rule assigns primary stress to the syllable "la."

In the second cycle, primary stress is placed on the syllable "ti" and the primary stress on

"la" is reduced to secondary stress. Since the Rule (9) will not be activated in (32), the

Auxiliary Reduction Rule (11) cannot be triggered either. Finally, after the application

of the Stress Adjustment Rule (14), the stress contour gained is 03100.

As a result, the two stress patterns of *elasticity* obtained from (31) and (32) are

34100 and 03100, respectively. In Wells (2000), two stress patterns for *elasticity*,

èlâstícity (23100) and *elàstícity* (02100), can be found. These two stress patterns can be

represented as 34100 and 03100 according to the traditions in *SPE*. It appears that the

two stress contours obtained by use of related stress rules in *SPE* are both correct.

However, the instance *elasticity* will bring to the fore a new latent problem. In the

derivation for *electricity*, if the Rule (9) is not triggered, cases (a) and (b) of the *Auxiliary*

Reduction Rule (11) will not be activated on the grounds that the requirement that the

pretonic vowel bears a stress weaker than secondary stress cannot be satisfied. Neither

can case (c) nor case (d) of the Auxiliary Reduction Rule (11) be applied to *electricity*

either, as stated in footnote 19.   In the derivation for *elasticity*, if the Rule (9) is not

activated, cases (a) and (b) of the Auxiliary Reduction Rule (11) cannot be triggered either.

Neither can case (11c) which places secondary stress before the syllable finalizing with

no less than two consonants be activated, since syllables finalizing with no less than two

consonants do not exist in *elasticity*. However, it cannot be absolutely sure that case (11d) cannot be triggered. Case (11d) puts secondary stress before the syllable ending with a tense vowel. *Elasticity* is composed of five syllables, "e," "la," "sti," "ci," and "ti." The vowel /æ/ in the syllable "la" is not firmly impossible to be treated as a complex vowel in *SPE*, because *SPE* states that "we note many other cases where a weak cluster containing the vowel /æ/ is treated as strong" (Chomsky and Halle (1968: 152)), where s*trong* refers to a strong cluster. A strong cluster is defined as "a string consisting of either a vocalic nucleus followed by two or more consonants or a complex vocalic nucleus followed by any number of consonants" (Chomsky and Halle (1968: 29)). Consequently, it seems that /æ/ may be treated as a complex vocalic nucleus in *SPE*. If /æ/ is considered as a complex vowel, then case (d) of the Auxiliary Reduction Rule (11) is not decisively inapplicable. Namely, case (11d) might be able to put secondary stress before the syllable ending with a tense vowel, that is, to put secondary stress on the syllable before the syllable "la." The derivation would be demonstrated as follows:

(33) $[_N[_A\text{elastiK}]_A\text{i}+\text{ti}]_N$

<u> 1 </u>	Main Stress Rule (2ei)
2 1	Main Stress Rule (2ai)
2 2 1	Auxiliary Reduction Rule (11d)
<u>3 3 1 </u>	Stress Adjustment Rule (14)

The stress pattern obtained from (33) is 33100, which is incorrect. It has been pointed out at the end of Section 2.2.1.1 that, even with the optional application of the Rule (9), the stress pattern of 30100 of *electricity* is unaccountable. Consequently, it seems to be

the fact that the optional application of the Rule (9) cannot present satisfactory output for *elasticity* and *electricity*. Those two instances are utilized in *SPE* as exemplifications to certify the validity of the optionality of the Rule (9); however, both of their results are proven to be unsatisfactory here, which undermines the credibility of the proposal to an untrivial extent. In Section 2.2.1.3, the instance *condensation*, the outstanding example in Section 2.1, will be considered again to further examine the validity of the optionality of the Rule (9).

2.2.1.3   Optional Application of the Rule (9)

SPE only describes that the Rule (9) is optional for certain classes of words with the stress contour –21, but it does not state what exactly *certain classes of words* refer to. The only two concrete examples it presents are *elasticity* and *electricity*, both of which are nouns with the stress contour –21. Accordingly, it seems reasonable to conclude that the Rule (9) is optional, at least, for nouns with the stress contour –21. *Condensation*, the main example in Section 2.1, is also a noun. The derivation for *cond[ə]nsation* (3010) in (22) does not satisfy the condition for the optional application of the Rule (9), since the stress contour is 0010 after the triggering of the Main Stress Rule (2bi). The derivation for the other variant *cond[e]nsation* (3410) in (16) meets the condition for the optional application of the Rule (9), since the stress contour is 0210 after the activation of the Main Stress Rule (2bi) in the second cycle. Consequently, it appears reasonable for the Rule (9) to be as well optional for *cond[e]nsation*. The derivation to obtain the stress pattern *cond[e]nsation* (3410) in (16) is repeated in (34) as below:

(34) $[_N[_Vkɔ N=deNs]_V At+i\check{V}n]_N$ (=(16))

1			Main Stress Rule (2eii)
2	1		Main Stress Rule (2bi)
3	1		Rule (9)
2 3	1		Auxiliary Reduction Rule (11b)
3 4	1		Stress Adjustment Rule (14)

In (34), the Rule (9) is applied and the stress pattern obtained is 3410. Next I will examine the stress pattern that will be gained without the activation of the Rule (9). Following the inapplication of the Rule (9), case (a) and (b) of the Auxiliary Reduction Rule (11) cannot be triggered either. The new derivation is presented in (35):

(35) $[_N[_Vkɔ N=deNs]_V At+i\check{V}n]_N$

1		Main Stress Rule (2eii)
2	1	Main Stress Rule (2bi)
3	1	Stress Adjustment Rule (14)

The stress pattern obtained from (35) is 0310, which is incorrect. As demonstrated by derivations in (34) and (35), it seems that the optional application of the Rule (9) can present one correct stress pattern for *condensation*, but the cost is that it will also produce one incorrect stress pattern.

2.2.1.4 Summary of the Optional Application of the Rule (9)

Aimed at providing an explanation for variants of words, especially certain words with the stress contour –21, *SPE* claims that the Rule (9) is optional. The only two concrete exemplifications utilized by *SPE* are *elasticity* and *electricity*. However, even for those two examples, the stress patterns obtained are not satisfactory. For *elasticity*, one incorrect stress pattern may be yielded; and for *electricity*, although two stress patterns gained are correct, a third stress pattern is left unaccountable.

In addition to this flaw, *SPE* does not explicitly state for what classes of words the Rule (9) is optional. Since both of the two examples *SPE* lists are nouns, it seems that the so-called certain classes of words for the optional application of the Rule (9), at least, include nouns. C*ondensation* is a noun, so it appears to meet the requirement for the optional triggering of the Rule (9). However, one incorrect stress pattern is presented with this treatment.

Another problem is that case (c) and case (d) of the Auxiliary Reduction Rule (11) are not specified. The condition in (11c) and the condition in (11d) are so broad that they may be overapplied. One simple example will suffice to illustrate the point. Case (11c), which places secondary stress before the syllable finalizing with no less than two consonants, may set secondary stress on "re" in *apprehend*, since the syllable "*hend*" ends with two consonants. However, the correct stress pattern should be *àpprehénd* (201), where "re" does not bear stress.

Incorporating the above discussion together, it appears to be the case that the optional application of the Rule (9) might have painted itself into a corner: the present framework cannot tenably account for stress patterns of the above examples *condensation*,

elasticity, and *electricity*, although those are instances that *SPE*, with the optional application of the Rule (9), purports to provide an explanation for.

2.2.2 The Example *Transformation*

SPE argues that vowels in syllables that have received stress in an earlier cycle should not be reduced to schwa. The word *transformation* will be given as an illustration. *Transformation* is derived from the verb *transfórm*. In accordance with the discussion in *SPE*, "o" of "for" in *transformation* will not be reduced due to the primary stress on the syllable "form" in *transfórm*. However, *SPE* states that *transformation* "has a reduced vowel in the second syllable," which means "o" in "for" is reduced to schwa (Chomsky and Halle (1968: 161)). The stress pattern described in *SPE* is in contradiction with the result expected. As a matter of fact, *SPE* admits that "an ad hoc lexical analysis must be given for the underlying forms, specifying that they undergo the necessary reanalysis before the application of the phonological rules. Such examples, then, are true exceptions" (Chomsky and Halle (1968: 161)). To put it plainly, *SPE* may not be able to account for the stress pattern of *trànsformátion* (2010). More instances analogous to *transformation* are not difficult to find. To name a few, *refórm* bears the primary stress on the syllable "for," so *rèformátion* should bear stress on the syllable "for" according to the proposal in *SPE*, which is at odds with the empirical fact. *Àcadémic* is another counterexample. *Àcadémic* is derived from *acádemy*, so *àcadémic* should bear stress on the syllable "ca" following the treatment in *SPE*, which runs afoul of the fact. In summary, *SPE* perhaps

fails in dealing with derived words with only one stress pattern, where vowels bearing primary stress in base forms are reduced to schwa.[22]

2.2.3 The Examples of *Cond[ə]sation* and *Information*

As noted in Section 2.1, *condensation* has two stress patterns: *cond[e]nsation* and *cond[ə]nsation*. In an effort to explain the two stress patterns, *SPE* claims that *cond[e]nsation*, which means "act of condensing," is a nominalized verb and is derived from *condénse* (Chomsky and Halle (1968: 116)). As a result, *cond[e]nsation* is represented as [N[vkɔN=deNs]vAt+iV̌n]N, with an internal cycle. The stress on the syllable "den" and the failure of the reduction of "e" in the syllable "den" to schwa are

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[22] *SPE* mainly takes *A Pronouncing Dictionary of American English* (Kenyon and Knott (1944)) as its data and this is why *transformation* only has one stress pattern in *SPE*, *trànsformátion* (2010). Similar examples of derived words with only one stress pattern, where vowels bearing primary stress in base forms are reduced to schwa, consist of *cònversátion*, *cònsultátio*n, *rèformátion*, and so on. *SPE* admits that it cannot explain the reduced vowel in the syllable which bears primary stress in the base form, i.e. *SPE* cannot make an account of the reduced "e" in *cònversátion*, "u" in *consultation*, "o" in *rèformátion*, and so on. One issue must be clarified here: words do not always have the same stress patterns across American English and British English. While words as *exportation* and *condensation* have the same stress patterns in American English and British English, words like *transformation* have distinct stress patterns across American English and British English. In American English, *transformation* only has one stress pattern, *trànsformátion* (2010) (Kenyon and Knott (1944)); while in British English, *transformation* has two stress patterns, *trànsformátion* (2010) and *trànsfôrmátion* (2310) (Wells (2000)). Counterparts in British English for exemplifications as *transformation* in *SPE* include instances as *cònversátion* (2010), which has only one stress pattern and the vowel bearing primary stress in the base form is reduced. The upshot of Section 2.2.2 is to demonstrate that *SPE* fails to capture derived words with only one stress pattern, where vowels bearing primary stress in base forms are reduced to schwa. The present dissertation is based on British English data; as a result, for this dissertation, an example of a derived word with only one stress pattern, where the vowel bearing primary stress in the base form is reduced to schwa, should be an instance as *conversation*. In British English, *conversation* is a derived word with only one stress pattern, where the vowel "e" is reduced to schwa despite of the fact that it bears the primary stress in the base form *convérse*.

both due to the fact that the syllable "den" receives the primary stress in the first cycle. The other variant, c*ond[ə]nsation*, referring to "drops of water on the window pane," is just a noun, without the cycle from the verb *condénse* (Chomsky and Halle (1968: 116)). Consequently, *cond[ə]nsation* is represented as [$_N$condens+At+iV̆n]$_N$, without an internal constituent. The vowel "e" in the syllable "den" is reduced to schwa in *cond[ə]nsation* on the grounds that it has never received stress in an earlier cycle. It is claimed that this method appears to be reasonable since the two stress patterns of *condensation* are explicable in this way.

In *SPE*, *condensation* is not the only word that is treated in this way; other examples include *presentation*, etc. *SPE* also claims that *information* is not related to *infórm*. Thus, *information* does not have an internal cycle, which explains the reduction to schwa of "o" in the syllable "for."

The question now is whether the treatment in *SPE* is defensible: (i) whether the stress pattern *cond[ə]nsation* is really not related to the verb *condénse*; (ii) whether *information* is not derived from *infórm*. For example, in *Oxford Advanced Learner's Dictionary of Current English* (1995), *inform* is defined as "to give sb facts or information about sth; to tell sb"; and the meaning of *information* is "facts told, heard or discovered about sb/sth; knowledge." It seems that the two words are related semantically. Accordingly, it seems unreasonable to isolate the two words from each other and the treatment in *SPE* looks like an ad hoc method simply to gain the correct stress patterns.

2. 3 Summary

In this chapter, stress rules in *SPE* have been illustrated with relevant examples,

which include *condensation*, *elasticity*, *electricity*, *information*, *transformation*, etc. It is obvious that most of these exemplifications are derived words.

Some derived words, i.e. *èpôrtátion*, only have one stress pattern and vowels bearing primary stress in base forms are not reduced in them. For example, "o" in "por" of *èpôrtátion* is not reduced, where "o" takes on the primary stress in the base form *expórt*. *SPE* explains that words like *èpôrtátion* are derived from their base forms and thus vowels that bear primary stress in base forms are not reduced.

Some derived words, such as *transformation*, also only have one stress pattern; but vowels bearing primary stress in base forms are reduced in them. *SPE* seems to indicate that it cannot interpret stress patterns of those words and a lexical treatment may be needed.

For derived words with two stress patterns, such as *condensation* which has two variants *còndênsátion* (2310) and *còndensátion* (2010), *SPE* accounts for the two stress patterns in distinct methods. For instance, for the two variants of *condensation*, *SPE* claims that *cond[e]nsation* is derived from the base form *condénse*, thus "e" in the syllable "den" bears stress and is not reduced. The other variant, *cond[ə]nsation*, does not have an underlying cycle and, accordingly, "e" in the syllable "den" can never receive stress from an earlier cycle.

I have shown that, on the one hand, not all stress patterns of these examples can be fully accounted for within the framework of *SPE*; on the other hand, incorrect stress patterns are obtained with the treatment of *SPE*. In addition, even for these stress patterns that are provided with an explanation by *SPE*, doubts over the validity of its treatment cannot be completely cleared.

In the next chapter, I will move on to a new theory, develop a description of its stress rules, and more importantly, examine whether it can capture these stress patterns that have posed problems for *SPE*.

Chapter 3

Metrical Theory

3.0 Introduction to MT

Although *SPE* Theory was praised by McCarthy (1982) as the most comprehensive phonological theory up to date, some scholars disagree and claim that "[t]here is a fair consensus in the field that the segmental approach to stress proposed in *SPE* … is inadequate, and that stress requires some kind of suprasegmental representation" (Hays (1984: 33)). For instance, in the 1970s, it was thought that locality was an important element to push forward the development of the study in phonology (Halle and Vergnaud (1987)). One approach to deal with the locality theme is to construct "a theory for interpreting variables that would significantly restrict their notational power"; however, "[t]he linear character of the representations assumed in *SPE* … imposed fundamental limits to this line of research" (Halle and Vergnaud (1987: x)).

In light of the inadequacy of *SPE* theory, alternative theories are proposed, such as Autosegmental Theory and Metrical Theory (hereafter MT), both of which are nonlinear phonological theories. Autosegmental theory mainly discusses tone, accent, and vowel harmony. Since none of its focuses is the main concern of this dissertation, I will simply overlook Autosegmental Theory here. With regard to MT, the main difference between MT and *SPE* is that MT "deals with the specification of nodes," while *SPE* "deals with the specification of segments. This difference is what allows the metrical theory to do

without variables, cyclic rule application, and stress subordination" (Liberman (1975: 205)). MT was first introduced in Liberman (1975) and Liberman and Prince (1977), and then developed in a number of directions (Gupta and Touretzky (1994), Halle and Vergnaud (1987), Hays (1980), Selkirk (1984)).

3.1 The Version of MT in Liberman (1975) and Liberman and Prince (1977)

MT, first proposed by Liberman (1975) and Liberman and Prince (1977), introduced "a non-linear analysis of stress patterns" by use of metrical trees, and treated stress "as a relative property rather than an absolute one; however, the stress feature was retained in the analysis" (Gupta and Touretzky (1994: 2)). Specifically, "two basic ideas about the representation of traditional prosodic concepts" are employed, where "certain aspects of the notion linguistic rhythm" are represented "in terms of the alignment of linguistic material with a 'metrical grid'" and the notion of relative prominence is represented "in terms of a relation defined on constituent structure" (Liberman and Prince (1977: 249)). More specifically, relative prominence is realized "by means of complementary strong (s) and weak (w) labels on the sister nodes of a binary-branching tree," in which "prominence can be instantiated as one or more of a number of phonetic correlates" (McCarthy (1982: 3)). Liberman and Prince (1977: 249) claim that "[t]he perceived 'stressing' of an utterance … reflects the combined influence of a constituent-structure pattern and its grid alignment."

According to Hayes (1984: 34), the system in Liberman and Prince (1977) "performs two functions: it accounts for native intuitions of syllable prominence more

accurately than the *n*-ary [stress] feature of *SPE*, and it predicts when the Rhythm Rule

will apply."

3.1.1 Stress Rules in Liberman (1975) and Liberman and Prince (1977)

In this section, I will review how the version of MT in Liberman (1975) and

Liberman and Prince (1977) explicates word stress. Before any details about MT are

unfolded, the *English Stress Rule* (hereafter *ESR*; Liberman and Prince (1977: 301)) must

be introduced, because the position of stress decided by *ESR* is the starting point of the

metrical tree construction.

(1) ESR (Cyclic Version; Liberman and Prince (1977: 301))

$$V \rightarrow [+stress] / \underline{\quad} C_0 (\quad V \quad (C))_a (\quad V \quad C_0)_b (\acute{V} X)_c \, _\alpha]$$

$$\begin{bmatrix} - \text{long} \\ - \text{stress} \end{bmatrix} \qquad [< - \text{long}>_d]$$

Conditions: ~ c ⊐ d, α = N, A, V

ESR in (1) should be firstly applied to the end of a constituent, rather than to the end of a

word.[1] While *α* is limited to stressless syllables, *b* can include a stressed syllable.

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[1] The rule in (1) is the cyclic version of *ESR* and also its final version. The other two
versions of the rule, the preliminary version and the iterative version of *ESR*, can as well
be witnessed in Liberman and Prince (1977). The preliminary version of *ESR*, as its name
indicates, is just a first trial and not the concluding version. The iterative version of *ESR*
is later slightly modified and finalized into the cyclic version in (1) in this dissertation.
The major differentiation between the cyclic version and the other two versions is that the
cyclic version takes into account of the cyclic effect, while the other two versions do not.
Liberman (1975: 195, 199) claimed that "[t]he metrical theory does not need: the principle
of the cycle; the principle of stress subordination; any nonbinary features," and MT
"accounts for the 'cyclic' properties of prosodic phenomena on the basis that stress is a

Another character of the rule *ESR* is that it must be triggered disjunctively; and "to any given word only the longest applicable subrule may apply" (Liberman and Prince (1977: 272)). To put it in simple words, *ESR* in (1) should be activated as the following:

(2)   a.   stress is assigned to the vowel immediately to the left of the last two syllables if the end of the first constituent matches with the structure C_0VCVC_0, where both V should be short vowels and the first V be stressless;

     b.   if the end of the first constituent does not meet the condition in (a), then stress is assigned to the vowel immediately to the left of the last syllable if the end of the first constituent matches with the structure C_0VC_0, where V should be a short vowel;

     c.   if the end of the first constituent neither meets the condition in (a) nor (b), then stress is assigned to the final vowel.

Take the word *rèconcîliátion* (203010) in Liberman and Prince (1977) as an instance. *Rèconcîliátion* is derived from *réconcile*, so it can be represented as [[reconcil$_V$]iation$_N$]. *ESR* (1) should be firstly triggered on the constituent *reconcile*. I will firstly examine whether *reconcile* meets the condition in (2a). The end of *reconcile*, "concile," does not

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hierarchically defined relation; that is, on the basis of the inherent nature of the phenomenon itself." For example, to explain the stress pattern of *elasticity* within the framework of MT, "it is not necessary to first derive the 'inner word' and then derive the 'outer word,'" with the *inner word* referring to *elastic* and the *outer word elasticity* (Liberman (1975: 226)). However, later the cyclic effect is accommodated into the analysis of Liberman and Prince (1977: 301), based on the reason that "with a cycle to transmit to the whole word the features that its parts earn on their own, … no lexical stipulation is required, general or specific." To put it in plain terms, the incorporation of cyclic effect into MT can avoid lexical treatments for related words.

match with the structure C_0VCVC_0, since there are two consonants between the two vowels. As for the condition in (2b), "cile" matches with the structure C_0VC_0, so stress is assigned to the vowel immediately to the left of the last syllable, that is, to "o."[2] Since (2a), (2b), and (2c) are applied disjunctively, (2c) will be simply skipped.

The stress pattern after the triggering of condition (2b) of *ESR* (1) is **recóncile*. The result is at odds with empirical facts, since the correct stress pattern should be *réconcile*. Another rule, *Stress Retraction Rule* (*SRR*), will be made use of:

(3) *Stress Retraction Rule* (*SRR*; Liberman and Prince (1977: 278))

$V \rightarrow$ [+stress] / ＿＿ $C_0 (\check{V}(C))_a (VC_0)_b$ V

                                  [+stress]

SRR in (3) starts from a stressed syllable and applies in the following manner:

(4) a. Long Retraction (Liberman and Prince (1977: 276))

$V \rightarrow$ [+stress] / ＿＿ $C_0 (\check{V}(C)) (VC_0)$ V

                                  [+stress]

    b. Strong Retraction (Liberman and Prince (1977: 275))

$V \rightarrow$ [+stress] / ＿＿ $C_0 (VC_0)$ V

                           [+stress]

---

[2] The final "e" is silent and thus not counted into for the application of *ESR*.

c. Weak Retraction (Liberman and Prince (1977: 274))

$$V \rightarrow [+\text{stress}] / \underline{\quad} C_0 (\check{V}(C)) \quad V$$

$$[+\text{stress}]$$

Long Retraction Rule (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c) are subrules of *SRR* (3). Liberman and Prince (1977) neither specify the ordering relations among (4a), (4b), and (4c) nor clearly define word forms for the activation of (4a), (4b), and (4c). They simply describe that stress should be put on the vowel that is to the left of the stressed vowel in accordance with rule (4a), (4b), and (4c). A close look will reveal that a great overlapping exists between *Long Retraction Rule* (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c). For example, the following rule (5) is contained in all the three rules:

(5) $V \rightarrow [+\text{stress}] / \underline{\quad} C_0 \quad V$

$$[+\text{stress}]$$

I will first return to the word *reconcile*. As noted, stress is already assigned to "o" of the syllable "con" in *reconcile* following the condition (2b) of *ESR*. In *reconcile*, the syllable "re" is the only syllable that is to the left of the stressed vowel; in other words, the stress can only be moved to the syllable immediately to the left of the stressed vowel. Consequently, rule (5), that is, the overlapping rule among *Long Retraction Rule* (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c), can be triggered and place stress on "e" in "re." The stress pattern now is *réconcile*. It is not easy to decide which rule exactly has been activated, since rules (4a), (4b), and (4c) all contain the rule (5).

Since the focus at present is an introduction to MT, I will for now not go any further to probe into latent problems in Liberman (1975) and Liberman and Prince (1977). I will turn to the topic of possible inadequacies in *SRR* (3) in Section 3.1.2.

Recall that the position of stress decided by *ESR* (1) is the starting point of the metrical tree construction. Since stress is placed on "e" of "re" in "*reconcile*," the next step is to construct a metrical tree for *reconcile*. The underlying concept is that "words have an internal metrical structure in which syllables and groups of syllables are weighed against each other" (Liberman and Prince (1977: 264)). The details are as follows:

(6) (Liberman and Prince (1977: 266))

Every sequence of syllables $+ -$, $+ - -$, $+ - - -$, etc., forms a metrical tree. Because of the condition limiting [−stress] to weak positions, and because of the bivalent (binary-branching) character of metrical trees, the structure and labeling of the sequences is uniquely determined. We have, necessarily, left-branching trees.

The relation between (s, w) and [(+, −) stress] is as follows:

(7) (Liberman and Prince (1977: 265))

If a vowel is *s*, then it is [+stress]. By contraposition, …if a vowel is [−stress], it must be *w*.

The pattern described in (6) should start at the position of the stress decided by *ESR* (1) and go leftward. The principle (7) asserts that stressed syllables should be taken as *strong*

(*s*) and unstressed syllables as *weak* (*w*). In a metrical foot, "only a stressed syllable may be the strong element of a metrical foot" (Liberman and Prince (1977: 265)). After applying the pattern in (6) to *reconcile*, I will obtain the following stress pattern:

(8)   [reconcil$_V$]

```
              /\
             /  \
            /    \
           S      \
          /\       \
         /  \       \
        s    w   w
        |    |   |
        reconcile

        +    −   −
```
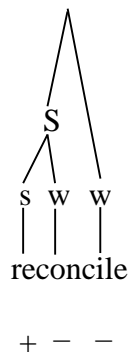
In (8), the starting point is the stressed syllable "re," which is indicated as "+". According to (7), the strong element is [+stress]. The syllable "re" is already stressed, so it is a strong element. The pattern in (6) depicts that the sequence of syllables should be in the shape of "+ −", "+ − −", or "+ − − −", that is, syllables to the right of the stress should be weak. Consequently, syllables to the right of the stressed syllable, namely, syllables "con" and "cile," are weak. The first trochaic foot is built with "re" and "con." The only part left is "cile," which cannot form another trochaic foot; thus, there is only one trochaic foot in (8). The trochaic foot is later joined to the residue "cile," generating the structure in (8).

In order to generate the metrical tree for *reconciliation*, the structure in (8) for the inner constituent *reconcile* needs to go through a process termed *Deforestation*, prior to the beginning of the next cycle.

(9) Deforestation (Liberman and Prince (1977: 301))

Before applying any rules on a cycle, erase all prosodic structure in the domain

of that cycle.

Deforestation in (9) will "leave the *ESR* with a slate that is clean except for the residue of

[+stress] marks deposited by applications on earlier cycles" (Liberman and Prince (1977:

301)). The necessity of *Deforestation* lies in that any metrical tree built by use of *ESR* on

a cycle lower than the word level should not influence the next process (Liberman and

Prince (1977)). In other words, any metrical tree built by use of *ESR* on a cycle lower

than the word level does not survive in the next cycle. Applying *Deforestation* to the

metrical structure in (8) will present the following:

(10) [[reconcil$_V$]iation$_N$]

reconcile

+

The next step is to apply *ESR* (1) to the outer constituent, *reconciliation*. Condition (2a)

cannot be triggered here, because *-ation*, the end of *reconciliation*, does not meet the

condition (2a) that both Vs in the structure C_0VCVC_0 should be short vowels. Condition

(2b) can be applied, on the grounds that *-ion* fits into the structure C_0VC_0 in (2b) and

meets the requirement that V should be a short vowel. Accordingly, condition (2c) is

skipped. Stress is allotted onto *-at-*. The stress from the previous cycle, that is, stress on

"re," is kept. The structure for *reconciliation* should be as follows:

(11)　re con ci　li　at ion

　　　　+　−　+　−　+　−

Before the metrical tree is added, clarification about *weak* and *strong* in (11), namely [−stress] and [+stress], will be made. The mark "+" under "re" and "at" is due to stress assigned by *ESR* (1) on an earlier cycle and this cycle respectively. Since "ion" is to the right of "at," it should be weak. Similarly, "con," which is to the right of "re," should be weak as well. The two syllables left, "ci" and "li," can form another trochaic foot and "ci" is to the left of "li," so "ci" is strong and "li" weak. In (12), the complete metrical tree will be illustrated:

(12)
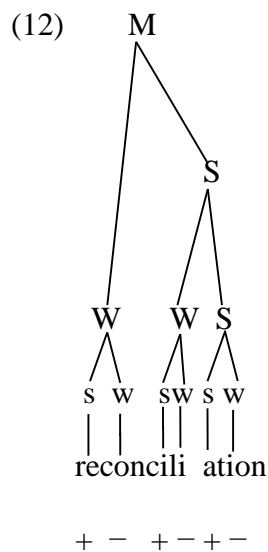
In (12), the two trochaic feet to the right are joined into a higher-level unit. The leftmost trochaic foot meets with this higher-level unit later and completes the metrical tree of *reconciliation*. The next step is to decide the stress pattern for this word with the *Lexical Category Prominence Rule* (*LCPR*):

(13)   LCPR (Liberman and Prince (1977: 305))

In the configuration [N$_1$ N$_2$], within a lexical category, N$_2$ is strong iff:

(a)   It branches, or

(b)   It immediately dominates [+F]

Condition (13b) is not related to the example *reconciliation* here, thus it will be temporarily overlooked.[3]   Condition (13a) asks for a branching N$_2$, which will be explained with the illustration in (14). For every metrical unit in a word tree, there are two possibilities:

(14)   (Liberman and Prince (1977: 268))

(a)   s   w   (N$_2$ does not branch)   (b)   w   s   (N$_2$ branches)
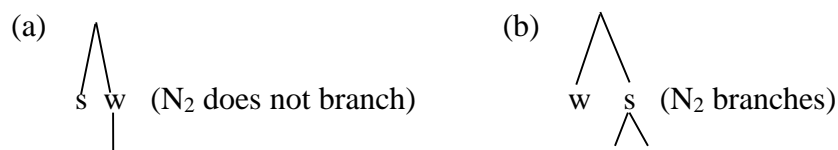
As stated in (13a), N$_2$ can be strong if and only if it branches. The illustration (14b) shows a branching N$_2$, while (14a) shows a non-branching N$_2$. With respect to the metrical tree of *reconciliation* in (12), there are three branching nodes and stress will be allotted to the strong vowel. The final stress pattern is as follows:

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[3] Members marked as [+F] include words ending in *-ade, -air, -ane, -ār, -che, -eau, -ee, -eer, -elle, -esce, -esque, -ette, -ier, -ique, -ise, -oo, -oon*, et al. Obviously, neither *reconcile* nor *reconciliation* ends with any of the above affixes. Consequently, condition (13b) is irrelevant to the word *reconciliation*.

(15) (cf. Liberman and Prince (1977: 268, 280))

```
                M
               / \
                  \
                   S
                  /\
                 /  \
      W         W    S
     /\        /\   /\
    s  w      s w  s  w
    |  |      | |  |  |
    reconcili  ation

    +  −    + − + −

   (2    3    1    )
```
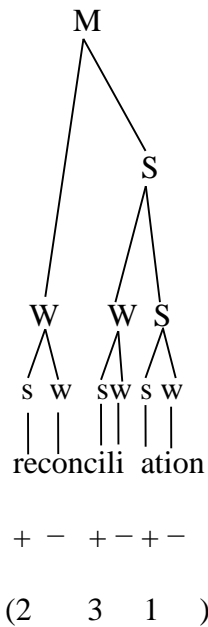
With respect to the deriving of stress patterns from metrical trees, Liberman and Prince (1977) state that the stress decided by *ESR* (1) in the final cycle should be the position of the primary stress for words. For example, in *reconciliation*, the second-time application of *ESR* (1) puts stress on "-at-" in the analyses of (11) and (12), so the primary stress is on "-at-". With regard to subsidiary stress assignment, it is not as easy to decide as primary stress assignment, because "[i]t is less clear how such trees should be considered to define relative prominence among their non-main-stressed-terminal elements. If we wished to mimic closely the numerology of previous theories, we could make use of the following definition" in (16) (Liberman and Prince (1977: 259)):

(16) (Liberman and Prince (1977: 259))

If a terminal node *t* is labeled *W*, its stress number is equal to the number of nodes that dominate it, plus one. If a terminal node *t* is labeled *S*, its stress

number is equal to the number of nodes that dominate the lowest *W* dominating

t, plus one.

As illustrated in (15), the terminal node of "re" is labeled *W*, so the stress number of "re" is the number of nodes that dominates it, plus one. There is only one node *M* that dominates the terminal node of "re," so the stress number of "re" is two.[4] With regard to "ci," the terminal node is also labeled *W*, so the stress number of "ci" is the number of nodes that dominates it, plus one. There are two nodes, *M* and *S*, which dominate the terminal node of "ci," so the stress number of "ci" is three. In conclusion, the stress pattern obtained is *rèconcîliátion* (203010).

The upshot up to now is an illustration of how MT accounts for word stress patterns, with the instance *reconciliation*. Obviously, MT is not limited to words; it also covers phrases and sentences. In this dissertation, my focus will be limited to words and their stress patterns due to the fact that this is the main topic of the dissertation.

3.1.2 Problems in Liberman (1975) and Liberman and Prince (1977)

In this section, I will mainly make clear two potential drawbacks in the version of MT in Liberman (1975) and Liberman and Prince (1977): the undefined application conditions for rules and the lack of satisfactory explanation mechanisms for words failed by *SPE*.

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[4] Although the terminal node of "con" in (15) is also *W*, "con" cannot bear stress here. The rule (7) has established that "if a vowel is [−stress], it must be *w*." "Con" in (15) is labeled as *w*, so it should not bear stress. This is also the reason why "li" and "ion" in (15) do not bear stress. Notice here that terminal nodes are indicated with italicized capital letter *S* or *W*; while strong syllables are marked with the small letter *s* and weak syllables are marked with the small letter *w*.

Recall that, in Section 3.1.1, the ambiguity in the application of *SRR* (3) is demonstrated with the example of *reconcile*. *SRR* (3) is not the only rule whose conditions for application are not clearly described in Liberman and Prince (1977). Other rules, involving the *English Destressing Rule*, *LCPR* (13), and so on, are also vague. The dilemma in this respect will be illustrated with examples in Subsection 3.1.2.1.

MT is introduced in light of the inadequacy of the segmental approach to stress in *SPE*, so MT should be able to offer more convincing explanations for words and their stress patterns that are beyond *SPE*, such as *condensation*, *elasticity*, *electricity*, *information*, *transformation*, etc. In Chapter Two, a brief review of *SPE* and examples that it cannot account for have already been given. In Subsection 3.1.2.2, I will take a closer look at MT in Liberman (1975) and Liberman and Prince (1977) and examine whether it can account for stress patterns that are failed by *SPE*.

3.1.2.1 Ambiguities in the Conditions for Rules' Application

As shown in Section 3.1.1, Liberman and Prince (1977) neither give the precise ordering nor word forms for the application of the three subrules of *SRR* (3), namely, *Long Retraction Rule* (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c). They just state that, for *SRR* (3), "[w]e shall assume that words are unmarked in the lexicon for which of the three cases … provides their stress, and further that these marks are distributed, whenever possible, according to morphological and phonological subregularities of the type we have been surveying" (Liberman and Prince (1977: 278)).

Here, "subregularities of the type we have been surveying" refer to certain types of words and words ending in certain suffixes. For example, for *Long Retraction Rule* (4a), related types of words and suffixes include noncomplex words, words with two

consecutive short vowels that immediately precede the syllable stressed by *ESR*, words with Greek prefixes, words with the suffix *-atory* and some miscellaneous words. For *Strong Retraction Rule* (4b), relevant words involve words ending with the suffix *-ate* and some miscellaneous words. For the *Weak Retraction Rule* (4c), related suffixes are, at least, composed of *-i*, *-ide*, *-ite*, *-ode*, *-ology*, *-on*, etc.

It can be inferred that suffixes and types of words are quite vital for the application of *SRR* (3) or even the only decisive factor for its application. However, Liberman and Prince (1977: 275) use the ambiguous expression that those suffixes and types of words they have listed are "a characteristic sample of the forms that fall in the domain of the rule." Namely, there may be other forms that can trigger *SRR* (3). Liberman and Prince (1977) do not state what exactly these other forms are, which leaves not an insignificant vagueness for the activation of *SRR* (3).

Another problem comes from some miscellaneous word structures which can trigger *Long Retraction Rule* (4a) and *Strong Retraction Rule* (4b). Liberman and Prince (1977) add four instances to the miscellaneous collection of *Long Retraction Rule* (4a) and eighteen examples to that of *Strong Retraction Rule* (4b). Take *Strong Retraction Rule* (4b) as an example. Instances in the miscellaneous collection of *Strong Retraction Rule* (4b), such as *anecdote*, *caterwaul*, *nightingale*, *recognition*, *surreptitious*, etc., are quite distinct from each other: (i) they have different syllable counts; (ii) derived words end with different suffixes; (iii) some are derived words, while others are simple words; (iv) some are nouns, while others are adjectives. The list of dissimilarities among them can still go on. Therefore, it seems that miscellaneous word structures for *Long Retraction Rule* (4a) and *Strong Retraction Rule* (4b) have included almost every word

type. It does not appear particularly implausible to claim that *Long Retraction Rule* (4a) and *Strong Retraction Rule* (4b) are possible to be applied without restrictions.

For example, *SRR* (3) was applied to the word *reconcile* in Section 3.1.1. The stress pattern gained prior to the triggering of *SRR* (3) is incorrect. The suffix of the word, *-ile*, however, does not fall into any suffixes I have mentioned in the second paragraph of this section. I can only take the word *reconcile* as not among "a characteristic sample of the forms that fall in the domain of the rule." If I go on with this line of thinking, it may turn out that it is possible to apply *SRR* (3) to any word.

For example, in Section 3.1.1, I applied *SRR* (3) to **recóncile* and moved the stress to "re"; but I did not apply *SRR* (3) to *reconciliátion*. If I take a second look here, it seems that *reconciliátion* is not absolutely disqualified for the application of *SRR* (3). Although the suffix *-ation* is not among any suffixes listed above for the triggering of the three subrules of *SRR* (3), *Long Retraction Rule* (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c), the above suffixes are just "a characteristic sample," which means the above suffixes may not have exhausted all potential suffixes for the triggering of *SRR* (3). To put it in other words, the suffix *-ation* and thus the word *reconciliation* do not necessarily fall out of *SRR* (3). In addition to this, there are miscellaneous word structures that can trigger *Long Retraction Rule* (4a) and *Strong Retraction Rule* (4b). Consequently, it is not completely impossible for *SRR* (3) to be activated on *reconciliation* after its stress being set on "at" by condition (2b) of *ESR*. In the following I will examine whether *Long Retraction Rule* (4a) and *Strong Retraction Rule* (4b) can be activated on *reconciliation* or not.

Long Retraction Rule (4a) seems to be satisfied, because *cili*, the two syllables immediately to the left of the stressed vowel, matches with the structure $C_0\breve{V}CVC_0$, where

V̌ must be short. As a result, the stress may be moved to the vowel immediately two syllables to the left of the stressed vowel, that is, to "o" in "con" after the triggering of *Long Retraction Rule* (4a). The stress pattern now is *recónciliation*, which is at odds with empirical facts.

Long Retraction Rule (4a), *Strong Retraction Rule* (4b), and *Weak Retraction Rule* (4c) are not disjunctively ordered; accordingly, even if the condition for the application of *Long Retraction Rule* (4a) is met, *Strong Retraction Rule* (4b) may still be triggered.

Strong Retraction Rule (4b) seems to be able to be applied, due to the fact that the syllable *li*, the syllable immediately to the left of the stressed vowel, matches with the structure C_0VC_0. Accordingly, the stress might be moved to the vowel immediately one syllable to the left of the stressed vowel, that is, "i" of "ci" after the activation of *Strong Retraction Rule* (4b). The stress pattern at the present stage is *reconcíliation*, which is incorrect.

To summarize problems in *SRR*: Liberman and Prince (1977) seem to give a too broad description of conditions for the application of *SRR* (3), which may lead to its random activation and present stress patterns for words which are in contradiction with empirical facts.

What makes the situation even worse is that *SRR* (3) is not the only rule without proper limitations for its application in Liberman and Prince (1977). Other examples include *English Destressing Rule* (hereafter *EDR*; Liberman and Prince (1977: 290)), *LCPR* (13), etc. Firstly, *EDR* will be shown in (17):

(17)   English Destressing Rule ((Liberman and Prince (1977: 290))

$$V \quad \rightarrow \begin{bmatrix} -\text{stress} \\ -\text{long} \end{bmatrix} / \# <X\ V>_b\ C_0 \underline{\quad} < C_0 = >_C (C)\ V$$
$$[<+\text{long}>_a]$$

Condition: $a \supset (b \vee c)$

Instead of explaining in detail about the condition for the application of *EDR* (17), Liberman and Prince (1977: 290) state as follows:

(18) In order to express the appropriate conditioning environment of the Destressing Rule…, we must, it seems, be able to refer to aspects of tree form in phonological rules, rules that make adjustments at the segmental level, based largely on features of segmental or syllabic structure. … There is no reason, then, that a specific rule such as [the Destressing Rule] should have to refer to a metrical property that follows from general principles.

Liberman and Prince (1977: 290) go on stating that in order to "bridge the gap between well-formedness conditions … and the theory of rule application, …we suggest the following rather minimal condition":

(19)   Liberman and Prince (1977: 290)

No rule may apply so as to produce an ill-formed representation.

The condition in (18) seems to indicate that precise metrical property descriptions do not need to be included in *EDR*. Condition (19) perhaps implies that the applicability of *EDR*

(17) is determined by the representation it produces: if the representation will be ill-formed, then *EDR* (17) cannot be applied; otherwise, it can be applied. This kind of reasoning is quite difficult to be considered as convincing. The conditions for the application of *EDR* (17) in (18) and (19) seem to be untenable and take the rule not nearer to but further from being a satisfactory one.

Now it is time to move on to *LCPR*, which is cited in (13) in this chapter. *LCPR* (13) is another exemplification of rules without proper restrictions. Condition (13b) of *LCPR* (13) states that if N_2 dominates [+F], N_2 is strong. Words marked as [+F] comprises words ending in *-ade*, *-air*, *-ane*, *-ār*, *-che*, *-eau*, *-ee*, *-eer*, *-elle*, *-esce*, *-esque*, *-ette*, *-ier*, *-ique*, *-ise*, *-oo*, *-oon*, and so on. If words marked as [+F] are exhausted here, then it is reasonable to claim that (13b) is well defined. However, Liberman and Prince (1977: 304-305) note that the list "gives many of the relevant endings." The expression is *many of the relevant endings*, instead of *all of the relevant endings*, thus it is not completely irrational to assume that words marked as [+F] are not exhausted in Liberman and Prince (1977). Accordingly, words that can be marked as [+F] are not decisively limited, which leaves no small amount of uncertainty for the application of *LCRP*.

In summary, this section has focused on the ambiguities in conditions for the application of several rules in Liberman and Prince (1977). It is time to move on to the next flaw in Liberman and Prince (1977): being unenlightening for examples failed by *SPE*.

3.1.2.2 Two Failed Instances from *SPE*

As described in Section 2.2.2, *SPE* admits that the stress pattern *trànsformátion* (2010) must be accounted for with a lexical analysis. Since MT is a theory proposed due

to the inadequacy of *SPE*, it seems plausible to infer that MT should illuminate the understanding towards these stress patterns that are beyond *SPE*. Now I will examine whether *trànsformátion* (2010) is provided with a more explanatory mechanism within the framework of MT.

    Transformation is derived from *transfórm*, so it can be represented as [[transform$_V$]ation$_N$]. Firstly, I will apply *ESR* (1) to the inner constituent [transform$_V$]. If condition (2a) of *ESR* (1) is to be applied, then the related word should, at least, have three syllables. The word *transform* is only composed of two syllables, thus the condition (2a) is disqualified from being activated. With respect to condition (2b), the structure of the end of the constituent should be C_0VC_0, where V is a short vowel. The end of *transform*, *-form*, does not match with the description in (2b), since the vowel in "form" is long. Thus, condition (2c) is triggered and stress is put on the final syllable "form." The metrical tree is as follows:

(20) [transform$_V$]

           w   s

        transform

          −   +
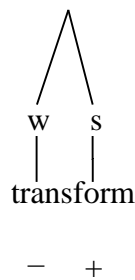
After *Deforestation*, only the stress is kept in (21):

(21) [[transform$_V$]ation$_N$]

transform

+

The next step is to apply *ESR* (1) to *transformation*. Condition (2b) of *ESR* (1) is satisfied, since the end *-ion* matches with the structure C_0VC_0, where V should be a short vowel; and the stress is placed on "a" in the syllable "ma." The metrical tree is as follows:

(22) [[transform$_V$]ation$_N$]

```
              M
             / \
            /   \
           /     \
          /       \
         W         S
        / \       / \
       w   s     s   w
       |   |     |   |
     trans for  ma tion

       −    +    +   −
```
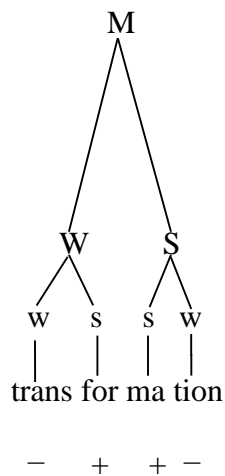
In (22), one iambic foot, one trochaic foot, and two branching nodes can be witnessed. Stress will be allotted to the strong vowels of branching nodes, which means "for" and "ma" will be [+stress]. The primary stress is on "ma," so "for" will bear secondary stress. The stress pattern obtained is *transfòrmátion* (0210), which is incorrect.

As a matter of fact, with regard to the word *trànsformátion*, Liberman (1975: 226) gives the following description:

(23) These cases require exceptionality of some sort, somewhere, in any system of stress rules I know of — the question of just where in our theory it would be most appropriate to introduce this exceptionality is not relevant to the present discussion, and will be left open.

In other words, Liberman (1975) may not be able to provide a convincing explanation for *trànsformátion* (2010), where the vowel of the syllable with the primary stress in the base form *transfórm* is reduced.[5]

In Liberman and Prince (1977: 299), another explanation is given, which is "what is unusual about words like *transformation* is the coalescence of the vowel with the sonorant /r/; after that, the reduction of the resulting *r*-colored vowel (or syllabic *r*) is completely normal." The new clarification in Liberman and Prince (1977), in plain terms, is that the reduction of the vowel of the syllable with the primary stress in the base form *transfórm* is due to "the coalescence of the vowel with the sonorant /r/." If all *r*-colored vowels are reduced, then perhaps the phenomenon can be attributed to "the coalescence of the vowel with the sonorant /r/." However, the reality is quite complex. For example, in *èxpôrtátion*, "o" in "*por*" is not reduced; in *ìnformátion*, "o" in "*for*" is reduced; and

---

[5] Analogous to *SPE*, Liberman and Prince (1977) take American English as the base for discussions and takes *transformation* as only with one stress pattern, *trànsformátion* (2010). For British English, a counterpart should be an instance as *conversation*, which has only one stress pattern *cònversátion* (2010) and "e" is reduced although it bears the primary stress in the base form *convérse*.

transportation has two stress patterns: *trànspôrtátion* and *trànsportátion*, with "o" in "por" unreduced in the first variant and reduced in the second variant. Accordingly, the phenomenon cannot be simply explained as "the coalescence of the vowel with the sonorant /r/," based on the fact that this explanation cannot shed much light on unreduced *r*-colored vowels. It seems fair to conclude that Liberman and Prince (1977) still fail to capture the stress pattern of *transformation*, the one failed by *SPE*.

Next I will examine another instance by use of the rules in Liberman and Prince (1977), i.e. *electricity*, also an example not satisfactorily accounted for by *SPE*. *Electricity* is derived from *electric*, so it can be represented as [[electric$_A$]icity$_N$]. Firstly, I will apply *ESR* (1) to the inner constituent [electric$_A$]. The end *-tric* fits into condition (2b) C_0VC_0, where V should be a short vowel. The stress is put on "lec" and the metrical tree is as follows:

(24) [electric$_A$]
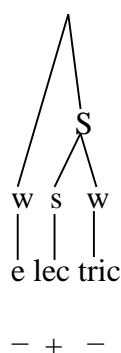
After *Deforestation*, only the stress is kept in (25):

(25) [[electric_A]icity_N]

    electric

      +

In the next step, *ESR* (1) will be triggered on *electricity*. Condition (2a) is applicable and stress is placed on "tri." The metrical tree is as follows:

(26) [[electric_A]icity_N]
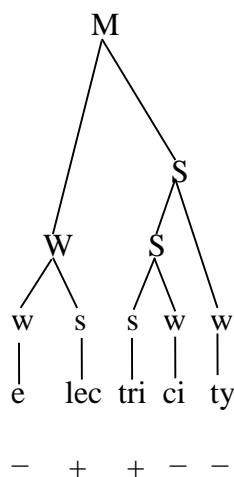
The stress pattern obtained from (26) is *elèctrícity* (02100). Next I will apply *SRR* (3) to *electricity* to account for other variants. The subrule of *SRR* (3), the *Strong Retraction Rule* (4b), will be triggered on *elèctrícity* (02100) and move the stress on "lec" to the first syllable "e." The stress pattern obtained now is *èlectrícity* (20100). *Strong Retraction Rule* (4b) is the only subrule of *SRR* (3) that can be triggered, since there is only one syllable to the left of "lec" in *elèctrícity* (02100). The secondary stress, if it can be moved,

is only possible to be relocated to the syllable "e." One problem will arise when faced

with the fact that *electricity* has three variants, *elèctrícity* (02100), *èlectrícity* (2010), and

èlêctrícity (2310): the variant *èlêctrícity* (2310) is yet to be explained.

3.1.3 Summary

In this section, I have presented a brief introduction to the version of MT in

Liberman (1975) and Liberman and Prince (1977) and as well discussed loopholes in it.

The main unsatisfactory aspect includes the uncertainty of conditions for the application

of rules. Another important drawback is that it still cannot surmount the problems of *SPE*,

in particular, *transformation* and *electricity*. In the next section, focus will turn to the

later development of MT.

3.2 Later Development of MT

After its first introduction, MT has developed in a number of directions (Halle and

Vergnaud (1987), Gupta and Touretzky (1994)). Hayes (1980), with reference to a small

number of parameters, analyzes metrical tree geometries by use of examples from various

languages, from English, a well-discussed language, to Aklan, a relatively unfamiliar

language. Hayes' (1980) account is later further specified by Halle and Clements (1983)

and Hammond (1984). Dell (1984), by extending the role of the metrical grid proposed

in Liberman (1975) and Liberman and Prince (1977), provides "[a] critical appraisal of

the tree formalism" of Hayes (1980) (Halle and Vergnaud (1987: x)). Prince (1983) and

Selkirk (1984) adopt and forward Dell's (1984) approach to an extremity that they desert

metrical trees and use metrical grids only to autosegmentally represent stress. While

Hayes (1980) adopts metrical-tree-only treatment and Prince (1983) and Selkirk (1984) use metrical grids only, some scholars choose the mid-way, which is a kind of combination of the two treatments, such as Halle and Vergnaud (1987). Halle and Vergnaud (1987) agree with Prince (1983) and Selkirk (1984) on their opposition towards metrical trees of Hayes (1980) and their support for metrical grids, but they hold the idea that constituents are necessary for the account of stress phenomena. As a result, Halle and Vergnaud (1987: xi) inherit the idea that "strings are hierarchically organized into metrical constituents," but, at the same time, assign "a central role to the metrical grid." Since I cannot cover every variant of MT, I will only take Halle and Vergnaud's (1987) version as an instance and take a close look at it.

3.2.1 Rules of English Stress Assignment in Halle and Vergnaud (1987)

Rules for English stress assignment from Halle and Vergnaud (1987) will be listed in the following, where "c" stands for "cyclic" and "n" for "noncyclic":[6]

(27) (cf. Halle and Vergnaud (1987: 237, 238, 242, 246, 262, 263))

    c   Extrametricality

    c   Accent Rule

    n   Stress Copy

    c/n   Binary Constituent Construction/Alternator (a – c)

---

[6] I will not go into details about the rule *Shortening* in (27), based on two reasons: (1) the rule *Shortening* is irrelevant to the analysis and examples in Section 3.2; (2) Halle and Vergnaud (1987) seem to give an inconclusive description about conditions for the triggering of the rule *Shortening* and admit that there is a large class of exceptions to this rule. Another note that will be made is the order between the *Rhythm Rule* and *Stress Enhancement* is variable.

a. Line 0 parameter settings are [+HT, +BND, left, left to right].

b. Construct constituent boundaries on line 0.

c. Locate the heads of line 0 constituent on line 1.

c   Unbounded Constituent Construction on line 1 and Stress conflation (d –

g)

d. Line 1 parameter settings are [+HT, –BND, right].

e. Construct constituent boundaries on line 1.

f. Locate the head of the line 1 constituent on line 2.

g. Conflate lines 1 and 2.

c   Shortening

n   Unbounded Constituent Construction on line 2

h. Line 2 parameter settings are [+ HT, –BND, right].

i. On line 2 construct constituent boundaries.

j. Locate the line 2 constituent head on line 3.

n   Rhythm Rule

n   Stress Enhancement

n   Sonorant Destressing

n   *-ative* Rule

n   *y*-Syllabification

n   Shortening over a Stress Well

n   Stress Deletion

n   Reduction

I will take the word *serendipity* as an exemplification and examine how to utilize rules in (27). *Serendipity* has two stress patterns, *sèrendípity* (20100) and *sèrêndípity* (23100). Firstly, I will take *sèrendípity* (20100) as an instance.

(28)   Halle and Vergnaud (1987)[7]

```
                                    . *   . .   .           line 1
    * *  * * *            * *  * *   .          * *  * *   .   line 0
serendipity ──extrametricality──▶ serendipit<y> ──Accent Rule──▶ serendipit<y> ──(27a – 27c)──▶
```

```
                    . . * . .          . . * . .        line 2
    * * * . .        (. . *). .         (* . * *).       line 1
(*)(*)(* *) .        * * (* *) .        (* *)(*)(* *)     line 0
serendipit<y> ──(27d – 27g)──▶ serendipit y ──Alternator──▶ serendipit y ──Stress Well──▶
```

```
. . * . .          . . * . .    line 2
(* . * *).          *. * . .    line 1
(* *)(*)(* *)        * * * * *   line 0
serendipit y ──Stress Deletion──▶ serendipit y
   w   w w
```

---
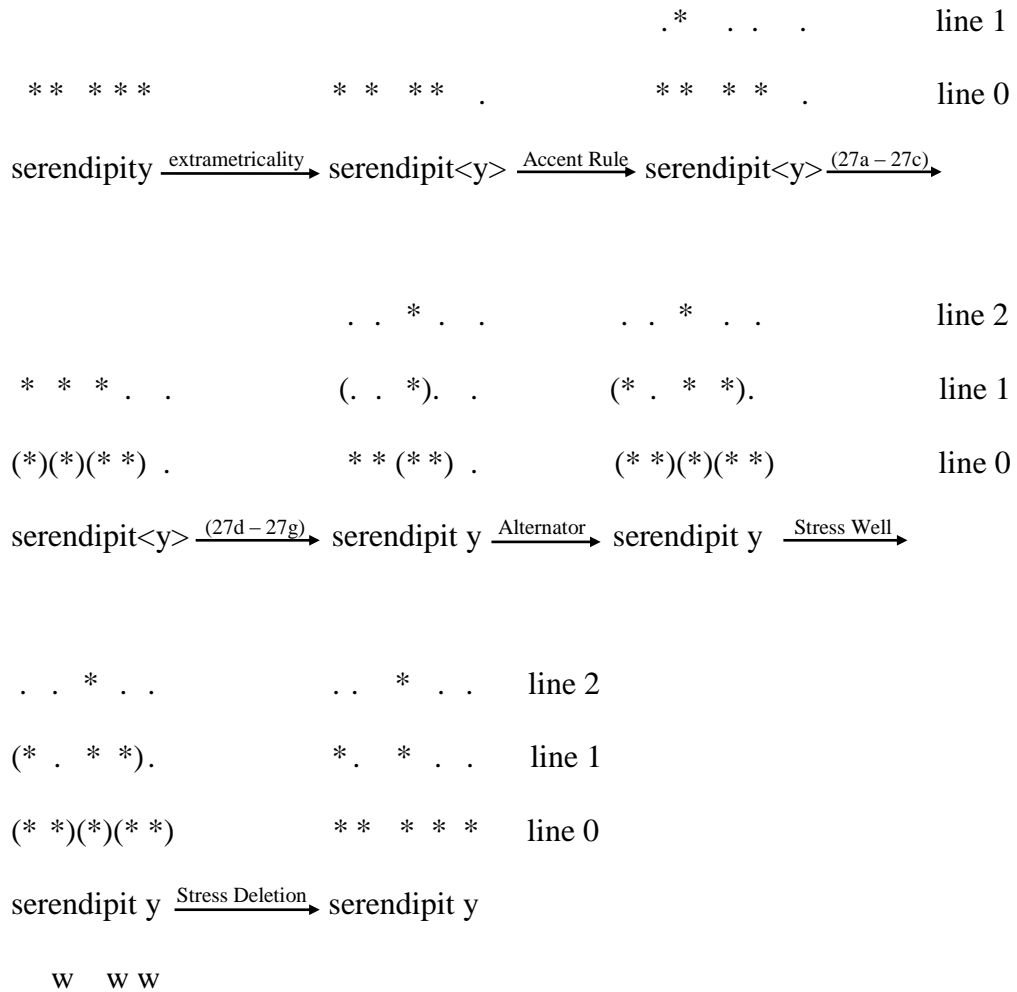
[7] It seems the rule *Stress Copy* in (27) is skipped In (28). *Stress Copy* is defined as "[p]lace a line 1 asterisk over an element that has stress on any metrical plane" (Halle and Vergnaud (1987: 247)). In plain terms, *Stress Copy* "preserves a 'memory' of the fact that a particular syllable received main stress on a previous pass through the cyclic stress rules" (Halle and Vergnaud (1987: 247)). *Serendipity* is a simple word, without any previous passes; in other words, the rule *Stress Copy* is inapplicable to *serendipity*.

Line 0 is "a special line in the stress plane on which each stress-bearing phoneme will be represented by an asterisk" (Halle and Vergnaud (1987: 6)). The first step is *Extrametricality*, a process to render "the word-final rime invisible to the constituent construction rules," where the constituent of extrametricality is indicated by a dot, instead of an asterisk, on line 0 (Halle and Vergnaud (1987: 227)). The second step is to apply the *Accent Rule*, whose definition is as follows:

(29) Accent Rule (Halle and Vergnaud (1987: 231))

Assign a line 1 asterisk to a syllable with a branching rime with the proviso that the word-final consonant is not counted in the determination of rime branchingness in the case of the final syllable of underived verbs and adjectives.

In the word *serendipity*, the only syllable with a branching rime is "ren," so an asterisk on line 1 is assigned to "ren."

After the activation of the *Accent Rule*, rules (27a), (27b), and (27c) should be triggered. (27a) states parameters for line 0 setting in English. HT (head-terminal) and BND (bounded) are two binary parameters, where [+HT] stands for that "the head of the constituent is adjacent to one of the constituent boundaries" and [+BND] that "the head of the constituent is separated from its constituent boundaries by no more than one intervening element" (Halle and Vergnaud (1987: 9-10)). Thus, [+HT, +BND, left] is equal to binary left-headed. The description [left to right] in (27a) indicates that metrical constituent boundaries will be constructed from left to right on a certain line. In summary, line 0 parameter settings in English are binary, left-headed, and left-to-right constituent boundary construction. Following line 0 parameter settings in (27a), constituent

boundaries are constructed on line 0 according to (27b). In accordance with the statement in (27c), the stress elements on line 1 are identified by the very same mark that is used to identify the stress-bearing elements on line 0.

After the application of rules (27a-27c), rules (27d) to (27g) should be triggered. (27d) describes line 1 parameter settings as [+HT, −BND, right]. [−BND] means unbounded; in other words, it means that the head of the constituent can be separated from its constituent by more than one intervening element. Consequently, (27d) states that line 1 parameter settings in English are unbounded and right-headed. After constituent boundaries are constructed on line 1 by following line 1 parameter settings in (27d), heads of the line 1 constituent are located on line 2. The rule (27g) will conflate lines 1 and 2, which implies that all asterisks, but the one standing for the primary stress, on line 1 and line 2 will be deleted. After the triggering of rules from (27d) to (27g), only the asterisk on the syllable "di" is preserved on line 1 and line 2.

Cyclic stratum ends after the application of rules from (27d) to (27g); rules of noncyclic stratum will be triggered in the next step. The first noncyclic rule to be triggered is termed *Alternator*. When rules from (27a) to (27c) are applied in the noncyclic stratum, they are entitled as *Alternator*, which is for the generation of subsidiary stress of words. In the noncyclic stratum, neither *Extrametricality* nor the *Accent rule* apply, so there will be no extrametrical syllables when *Alternator* is activated.

After the triggering of *Alternator*, the concept of *stress well* is utilized, which is defined as "every stressed syllable automatically induces a well under a syllable adjacent to it, provided that the stress of the latter is of lesser magnitude than the stress of the

former" (Halle and Vergnaud (1987: 238)).[8] The highest stress magnitude for the syllable

"se" is on line 1. Because the highest stress magnitude for "ren," the syllable immediately

after "se," is on line 0, a stress well is given to "ren." Analogously, stress wells are also

assigned to syllables "pi" and "ty."[9] The final step is *Stress Deletion*:

(30) Stress Deletion (Halle and Vergnaud (1987: 239))

Over a stress well, delete asterisks on line 1 and above, provided that the well

is assigned to a syllable with a nonbranching rime or to a Latinate prefix.

Following *Stress Deletion* (30), asterisks on line 1 and above of "pi" and "ty" are

deleted.[10] The final stress pattern obtained from (28) is *sèrendípity* (20100), which is

correct.

In the above, I have presented a brief introduction to rules in Halle and Vergnaud

(1987). It seems that rules in (27) can well account for, at least, one stress pattern of

serendipity. However, in the next section, I will proceed to the illustration of one loophole

in the derivation (28). In order to provide a reasonable explanation for the stress pattern

---

[8] After the application of *Alternator*, rules that should be activated are *Shortening*, rules (27h-27j), *Rhythm Rule*, *Stress Enhancement*, *Sonorant Destressing*, *-ative Rule*, *y-Syllabification*, *Shortening over a Stress Well*, *Stress Deletion*, and finally *Reduction*. In the derivation of *serendipity* in (28), *Shortening*, rules (27h-27j), *Rhythm Rule*, *Stress Enhancement*, *Sonorant Destressing*, *-ative Rule*, and *y-Syllabification* are omitted. I will come back to this issue in Section 3.2.2.1 and explain that *Shortening*, *Rhythm Rule*, *Sonorant Destressing*, *-ative Rule*, and *y-Syllabification* are inapplicable to *serendipity* and thus are not triggered, but rules (27h-27j) and *Stress Enhancement* should have been applied.

[9] After the positions of stress well are decided, the rule of *Shortening over a Stress Well* should be applied. This rule shortens vowels over stress wells. Since there are no long vowels or diphthongs in the word *serendipity*, it is impossible for *Shortening over a Stress Well* to apply in (28).

[10] I will discuss the weakness in the rule of *Stress Deletion* in Section 3.2.2.2.

of *serendipity*, some rules in (27), which should have been triggered in (28), were not actually applied. Along with this line of discussion, I will address other drawbacks in Halle and Vergnaud (1987) as well.

3.2.2 Problems in Halle and Vergnaud (1987)

In this section, along with lexical treatment of *Stress Enhancement*, I will also unfold other unsatisfactory points in Halle and Vergnaud (1987), such as the ad hoc treatment of the rule of *Stress Deletion*, the lexical treatment of *Stress Conflation*, and examples that are beyond *SPE* still unaccountable.

3.2.2.1 Lexical Treatment of the Rule of *Stress Enhancement*

As already noted in footnote 8, not every rule in (27) has been utilized in (28). To name a few, *Shortening*, rules (27h-27j), *Rhythm Rule*, *Stress Enhancement*, *Sonorant Destressing*, *-ative Rule*, *y-Syllabification*, *Reduction*, etc., are not made use of, among which *Shortening*, *Rhythm Rule*, *Sonorant Destressing*, *-ative Rule*, and *y-Syllabification* are inapplicable to *serendipity*. Take *Rhythm Rule* as an example to illustrate the point. *Rhythm Rule* can be applied to nouns with a final rime containing a long vowel, such as *políce*, to words ending in suffixes with long vowels, i.e. *désignàte*, and to deverbal nouns, e.g. *prótèst*. *Serendipity* does not belong to any of them; and this is why *Rhythm Rule* is not applicable in (28). *Reduction* does not need to be clearly demonstrated since this rule just reduces unstressed vowels to schwa. For example, after the stress pattern of *sèrendípity* (20100) is obtained from (28), it can be easily told that "e" of "ren" will be reduced due to the lack of stress. Thus, the real problem is the inapplication of rules (27h-

27j) and the rule of *Stress Enhancement* in (28). Firstly, the definition of *Stress Enhancement* will be presented in (31):

(31) Stress Enhancement (Halle and Vergnaud (1987: 242))

        *   line 2

    * → * / [(SYL)____   line 1

The rule of *Stress Enhancement* in (31) "enhances stress on the first or second syllable of a word" (Halle and Vergnaud (1987: 242)). To illustrate the application of this rule, Halle and Vergnaud (1987: 243) list several examples and state that the rule of *Stress Enhancement* "applies without exception when the two syllables beginning the word have nonbranching rimes … or when the first syllable does not branch and the second does." With respect to *serendipity*, "the two syllables beginning the word" are "se" and "ren," where the first syllable "se" does not branch and the second syllable "ren" does. Therefore, for *serendipity*, *Stress Enhancement* should apply without exception. Next, I will proceed to examine the stress pattern gained with the activation of *Stress Enhancement*. As already stated, rules (27h-27j) are not applied to *serendipity* in (28), so I will start from the metrical constituent construction immediately after the application of *Alternator* in (28):

(32) a.

```
                        . . * . .              . . * . .      line 3

    . .  *  . .        (. . *) . .           (* . *) . .      line 2

 (* .  * *).          (* * *) . .           (* * *) . .       line 1

 (* *) (*)(* *)        (*)(*)(**) .          (*)(*)(* *) .     line 0
```

serendipit y $\xrightarrow{(27h-27j)}$ serendipit y$\xrightarrow{\text{Stress Enhancement}}$serendipit y

```
              . . * . .              . . * . .     line 3

              * . * . .              * . * . .     line 2

              * * * . .              * * * . .     line 1

              * * * * .              * * * * .     line0
```

$\xrightarrow{\text{stress well}}$ serendipit y $\xrightarrow{\text{Stress Deletion}}$ serendipit y

```
              w    w w
```

b.

```
                        . . * . .              . . * . .      line 3

    . .  *  . .        (. . *). .           (. * *) . .       line 2

 (* .  * *).          (* * *). .           (* * *) . .        line 1

 (* *) (*)(**)        (*)(*)(* *) .          (*)(*)(* *) .     line 0
```

serendipit y $\xrightarrow{(27h-27j)}$ serendipit y$\xrightarrow{\text{Stress Enhancement}}$serendipit y

```
   .  .  *  .  .              .  .  *  .  .       line 3

   .  *  *  .  .              .  *  *  .  .       line 2

   *  *  *  .  .              .  *  *  .  .       line 1

   *  *  *  *  .              *  *  *  *  .        line0
```

<u>stress well</u>→ serendipit y <u>Stress Deletion</u>→ serendipit y

w w   w w
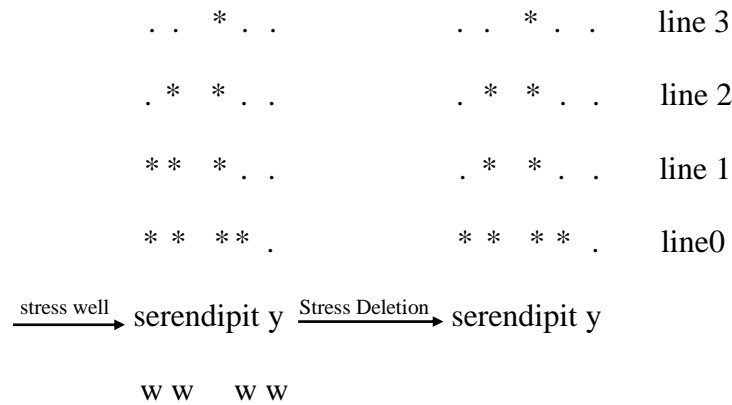
Halle and Vergnaud (1987) do not specify the conditions for the rule of *Stress Enhancement* to enhance stress on the first syllable nor the conditions for it to enhance stress on the second syllable. In (32a), the stress on the first syllable "se" is enhanced; and in (32b), the stress on the second syllable "ren" is raised.

In (32a), after the application of rules (27h-27j), the asterisk on the first syllable "se" is enhanced by *Stress Enhancement*. And then stress wells are allotted to related positions, followed by the activation of *Stress Deletion*. The stress pattern obtained is *sèrêndípity* (23100), which is correct.[11]

The derivation in (32b) is different from (32a) in that the asterisk on line 1 on the second syllable "ren" is enhanced by *Stress Enhancement*. After the triggering of *Stress Deletion*, the stress pattern obtained is *serèndípity* (02100), which is incorrect.

In combination with the stress pattern obtained from (28), the following results can be gained with related rules:

---

[11] The relationship between stress assigned to related syllables and asterisks are as follows:

(i) primary stress   (an asterisk on line 3)
     secondary stress   (an asterisk on line 2)
     tertiary stress   (an asterisk on line 1)
     no stress   (an asterisk on line 0 or no asterisk on any line)

(33) a. *sèrendípity* (20100) correct

without the application of rules (27h-27j) and *Stress Enhancement*;

obtained from the derivation in (28)

b. *sèrêndípity* (23100) correct

with the application of rules (27h-27j) and *Stress Enhancement* to the first

syllable;

obtained from the derivation in (32a)

c. *serèndípity* (02100)   incorrect

with the application of rules (27h-27j) and *Stress Enhancement* to the

second syllable;

obtained from the derivation in (32b)

Serendipity has two stress patterns, *sèrendípity* (20100) and *sèrêndípity* (23100). Although both of them have been obtained, an incorrect stress pattern *serèndípity* (02100) is also gained. Another flaw is that the stress pattern *sèrendípity* (20100) obtained in (28) is not so convincing, in consideration of the fact that rules (27h-27j) and *Stress Enhancement* are not activated in (28). Halle and Vergnaud (1987) do not detail reasons why rules (27h-27j) and *Stress Enhancement* are not triggered in (28). It does not seem absolutely impossible that it is just an ad hoc treatment to derive the correct output. The other correct stress pattern *sèrêndípity* (23100) can be gained with the activation of rules (27h-27j) and *Stress Enhancement* in (32a). However, as Halle and Vergnaud (1987) do not specify the application of *Stress Enhancement*, one incorrect stress pattern *serèndípity* (02100) is also obtained with the triggering of rules (27h-27j) and *Stress Enhancement* in (32b).

It appears to be fair to claim here that the only convincing and correct stress pattern that can be gained is *sèrêndípity* (23100) in (32a), with the stress on the first syllable enhanced by *Stress Enhancement*. The derivation in (32b), by raising stress on the second syllable with *Stress Enhancement*, presents an incorrect output of *serèndípity* (02100). The treatment in (28) to obtain *sèrendípity* (20100) seems as a lexical one, since rules (27h-27j) and *Stress Enhancement* are not triggered. The specifications of conditions for the application of *Stress Enhancement*, especially the exact condition to raise the stress on the first syllable and the condition to enhance the stress on the second syllable, need to be provided.

3.2.2.2 Lexical Treatment of the Rule of *Stress Deletion*

In this section, I will turn to the lexical treatment of the rule of *Stress Deletion* in Halle and Vergnaud (1987), using the examples *denotation* and *exploitation*. In Wells (2000), the stress pattern for *denotation* is *dènôtátion* (2310). Firstly, rules in (27) will be utilized to account for its stress pattern:

(34)

```
                                                        .  *  *    .  line 1
        *  *  *  *              *  *  *   .              *  *  *    .  line 0
    denotation  --extrametricality-->  denota<tion>  ----Accent Rule---->    denota<tion>
```

```
                              .  .  *  .              .  .  *  .    line 2
        *   *   *   .         (.  .  *) .             (*  *  *) .   line 1
        (*)(*)(*)  .           *  *  *  .             (* *)(* *)    line 0
    --(27a – 27c)-->  denota<tion>  --(27d – 27g)-->  denota tion  --Stress Copy-->  denota tion
```

```
  .  .  *   .        line 2

(* * *) .          line 1

(* *)(* *)         line 0
```

$\xrightarrow{\text{Alternator}}$ denota tion
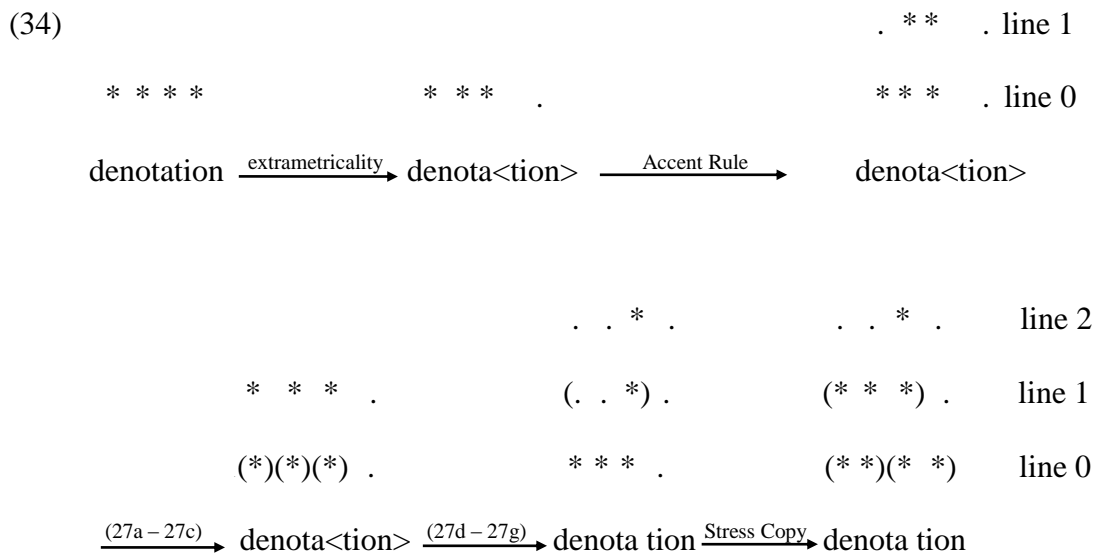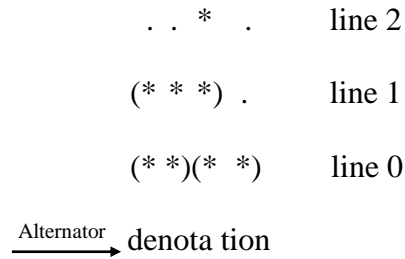
According to Halle and Vergnaud, the derivation in (34) will not reduce "o" in "no" to schwa; in other words, "no" will bear stress. Following their logic, the stress pattern obtained from (34) should be *dènòtátion* (2210), which is incorrect. A close look will reveal further flaws in the treatment in (34).

The first problem is that the derivation for *denotation* in (34) ends after the application of *Alternator*. In the rule list (27), *Alternator* is followed by *Shortening*, rules (27h-27j), *Rhythm Rule*, *Stress Enhancement*, *Sonorant Destressing*, *-ative Rule*, *y-Syllabification*, *Shortening over a Stress Well*, *Stress Deletion*, and finally *Reduction*. For the word *denotation*, *Shortening*, *Rhythm Rule*, *Sonorant Destressing*, *-ative Rule*, and *y-Syllabification* are inapplicable. However, rules (27h-27j), *Stress Enhancement*, *Shortening over a Stress Well*, *Stress Deletion*, and *Reduction* should have been triggered. Halle and Vergnaud (1987) do not address the reasons why rules (27h-27j) and *Stress Enhancement* are not triggered. They explain the inapplication of *Shortening over a Stress Well*, *Stress Deletion*, and *Reduction* as "[w]ords such as *denotation* and *exploitation* will be lexically marked as exceptions to *Shortening*; they will therefore not undergo *Stress Deletion* either" (Halle and Vergnaud (1987: 241)). However, even with the lexical treatment of *Shortening over a Stress Well*, *Stress Deletion*, and *Reduction* in (34), the final stress pattern *dènòtátion* (2210) is incorrect.

I will examine the stress pattern that can be got if rules (27h-27j), *Stress Enhancement*, *Shortening over a Stress Well*, *Stress Deletion*, and *Reduction* are triggered to *denotation*. The derivation in (34) stops at the rule *Alternator*; the next step should be to apply rules (27h-27i):

(35)
```
                    . . * .              . . * .      line 3

   . . * .         (. . *) .            (* . *) .     line 2

(** *) .          (* * *) .            (* * *) .     line 1

(* *)(* *)        (* *)(* *)           (**)(* *)     line0

denota tion  (27h-27j)→ denota tion  Stress Enhancement→ denota tion
```

```
      . . * .               . . * .       line 3

   (* . *) .              (* . *) .        line 2

   (* * *) .              (* . *) .        line 1

   (* *)(* *)             (* *)(* *)       line 0

 stress well→ denota tion  Stress Deletion→denota tion
      w    w
```

In (35), after the triggering of rules (27h-27j) and *Stress Enhancement*, the positions of stress wells are set on "no" and "tion." The rule of *Shortening over a Stress Well* will then shorten vowels over stress wells, i.e. "o" in "no" and "io" in "tion." Finally, after the application of *Stress Deletion* and *Reduction*, "o" in "no" and "io" in "tion" will be

reduced to schwa. The stress pattern obtained from (35) is *dènotátion* (2010), which is at odds with empirical facts.[12]

The upshot of this section is the illustration of the lexical treatment of the rule of *Stress Deletion*. *Stress Deletion* is not applied to *denotation* although it should have been activated. The only reasonable explanation at the present stage appears to be that the inapplication of *Stress Deletion* is a lexical treatment aimed at the correct output. Lexical treatment is not limited to *Stress Enhancement* in Section 3.2.2.1 and *Stress Deletion* in this section; in the next section the lexical treatment of the rule *Stress Conflation* (27g) will also be analyzed.

3.2.2.3 Lexical Treatment of the Rule of *Stress Conflation*

Halle and Vergnaud (1987: 233) state that words such as *Hàlicàrnássus*, *ìncàntátion*, *ìncàrnátion*, and *òstèntátion*, are "lexically marked exceptions to *Stress Conflation*."[13] In simple words, *Stress Conflation* (27g) will not be triggered on the above four words. In addition to those four words, "a considerably larger class of cases are exceptions to *Stress Conflation*," where *a considerably larger class of cases* refers to underived words with an unreduced vowel in the syllable immediately preceding the primary stress, such as *incantation* (Halle and Vergnaud (1987: 233)). *Alternator* should

---

[12] In (35), the rule *Stress Enhancement* can also be applied to the second syllable "no" and enhance the asterisk on it from line 1 to line 2. This treatment will present the stress pattern *denòtátion* (0210), which is incorrect. I did not include the derivation of *denòtátion* (0210) into the thesis because the focus of this subsection is the lexical treatment of the rule of Stress Deletion, not the rule of Stress Enhancement.

[13] Halle and Vergnaud (1987: 233) denote stress patterns as *Hàlicàrnássus*, *ìncàntátion*, *ìncàrnátion*, and *òstèntátion*; the exact stress patterns should be *Hàlicârnássus*, *incântátion*, *incârnátion*, and *òstêntátion*. It seems to be the case that Halle and Vergnaud (1987) do not distinguish between secondary stress and tertiary stress in these cases.

be applied after rules (27d-27g); with *Stress Conflation* (27g) being inapplicable, *Alternator* will be vacuous and so will be rules following the *Alternator*, which include *Shortening*, rules (27h-27j), *Rhythm Rule*, *Stress Enhancement*, *Sonorant Destressing*, *-ative Rule*, *y-Syllabification*, *Shortening over a Stress Well*, *Stress Deletion*, and finally *Reduction*. The lexical treatment of *Stress Conflation* will be exemplified with *Hàlicàrnássus* in (36).

(36)   (Halle and Vergnaud (1987: 233))

```
 .   .   . *     .        line 2
 * .   * *       .        line 1
(* *) (*)(*)     .        line 0
Hali carnas<sus>
```

The stress pattern obtained from (36) is *Hàlicàrnássus*. This word does not have an entry in Wells (2000). But according to Jones (2011), the stress pattern is *Hàlicârnássus* (2310). Therefore, even with the lexical treatment, the output is still incorrect.

In addition to the ad hoc treatment of *Stress Conflation* (27g), there is yet another lexical treatment in (36), which concerns syllabification. In (36), *Halicarnassus* is syllabified as *Ha.li.car.nas.sus*. In this case, it seems that Halle and Vergnaud (1987) postulate the string "*ss*" as double consonants /ss/. However, for another example *Hackensack*, Halle and Vergnaud (1987: 9) syllabify it as *Ha.cken.sack.*, where the string "ck" is taken as a single consonant /k/. Another instance which is more analogous to *Halicarnassus* is *Tennessee*. Halle and Vergnaud (1987: 44) syllabify it as *Te.nne.ssee.*, where the string "*ss*" is considered as a single consonant /s/. Distinct syllabifications for

similar structures in different words appear to be another ad hoc treatment meant for the correct results.

I will examine the stress pattern that will be gained if *Halicarnassus* is syllabified as *Ha.li.car.na.ssus*, just like the way *Hackensack* and *Tennessee* are syllabified. I will only illustrate the derivation after the application of rules (27d-27f) for the convenience of exposition:

(37)　　.　.　*　.　　.　　　　line 2

　　　　 *　.　*　.　　.　　　　line 1

　　　　(* *) (*　*)　　.　　　line 0

　　　　Hali　carna<ssus>

The stress pattern obtained from (37) is *Hàlicárnassus*, which does not comply with empirical facts. Consequently, it seems fair to establish that only with both the lexical treatment of rules in (27) and the ad hoc syllabification can the so-called correct stress pattern of *Hàlicàrnássus* be obtained. But even this stress pattern, in fact, is not absolutely correct. It is quite difficult to claim that the treatment for *Hàlicàrnássuss*, *ìncàntátion*, *ìncàrnátion*, *òstèntátion*, and "a considerably larger class of cases" in Halle and Vergnaud (1987) is satisfactory in the light of the above discussion.

3.2.2.4 Problems in *SPE* still Unaccountable

As stated at the beginning of Chapter 3, MT is claimed to be proposed in the wake of inadequacies in *SPE*; thus, MT should be able to capture stress patterns failed by *SPE* and insurmountable problems in *SPE*.

For derived words with reduced vowels bearing primary stress in base forms, *SPE* either treats them as lack of internal constituent structure or admits that it cannot account for the reduction. For instance, *SPE* states that *information* is not the nominalized form of *inform*, but rather a single noun, and admits that it cannot account for the vowel reduction of "o" in "for" of *transformation.* For *condensation*, *SPE* adopts different treatments for its two stress patterns respectively, $[_N[_Vk\mathfrak{d}N{=}deNs]_VAt{+}i\breve{V}n]_N$ and $[_NcondeNs{+}At{+}i\breve{V}n]_N$. The treatment of words as *condensation* and *information* in *SPE* is not so convincing. The most urgent is words like *transformation*, since it even does not have a treatment in *SPE.* It seems that Halle and Vergnaud (1987) should, at least, provide an explanation for *transformation*. However, Halle and Vergnaud (1987: 251) state that "[w]e shall follow *SPE*.... It is therefore to be expected that different speakers will make somewhat different choices for different words." To put it more explicitly, stress patterns that are insurmountable for *SPE* are yet to be overcome in Halle and Vergnaud (1987), which does not seem to imply that MT is a superior theory to *SPE*.

3. 3 Summary

In this chapter, I have reviewed different versions of MT, mainly the version of MT in Liberman (1975) and Liberman and Prince (1977) and the variant in Halle and Vergnaud (1987). The way MT accounts for stress patterns is claimed to be quite distinct from that of *SPE*. However, too much lexical treatment has been witnessed in this chapter and problems in *SPE* are still left insurmountable, which appears to indicate that MT has introduced complexity and disorder into itself without fully addressing problems it purports to solve.

Part II

Positional Function Theory

Chapter 4

The Sixteen Positional Functions for Subsidiary Stress Assignment in Positional Function Theory

4.0 Introduction

In this chapter, firstly, the basic concept of the Positional Function Theory (hereafter PFT) will be laid out. Secondly, the definitions of the sixteen Positional Functions for subsidiary stress assignment in PFT will be presented with related instances.

With respect to exemplifications, I will mainly resort to stress patterns that are beyond *SPE* and MT. For example, I have discussed distinct stress patterns of derived words, especially those that are utilized in *SPE*: (i) derived words with only one stress pattern, where vowels in syllables bearing primary stress in base forms are reduced, such as "e" in *cònversátion*; (ii) derived words with only one stress pattern, where vowels in syllables bearing primary stress in base forms are unreduced, i.e. "o" in "por" of *èxpôrtátion*; (iii) derived words with two stress patterns, such as *cònsultátion* and *cònsûltátion*, with vowels bearing primary stress in base forms reduced in one stress pattern and unreduced in the other stress pattern.[1] For words in (i), *SPE* and MT can only

---

[1] Other well-discussed instances in this dissertation will be used in later chapters. To name a few, *electricity* with its three stress patterns, *elèctrícitŷ* (02103), *èlectrícitŷ* (20103), and *èlêctrícitŷ* (23103), will be presented in Chapter 6 as the main example to present how PFT accounts for variants. *Condensation*, with stress patterns of *còndênsátion* (2310) and *còndensátion* (2010), and *information* will be utilized in Chapter 7 to articulate ordering relations among Positional Functions. Needless to say, along the discussions in later chapters, new examples and instances will be referred to as well.

provide them with lexical treatment; for those in (iii), *SPE* and MT take stress patterns with reduced vowels as unrelated with their respective base forms, which is not absolutely tenable. In this chapter, I will develop a description of how PFT explains all the above stress patterns in (i), (ii), and (iii).

4.1   The Basic Concept in PFT

PFT, proposed by Yamada (2010a, 2010b, 2012, 2013), is meant to examine the mechanism of subsidiary stress assignment of English words. This new theory is distinct from *SPE* theory and MT in that it postulates that stress rules, especially subsidiary stress rules, are composed of sixteen Positional Functions and "stress assignment is computed through an algorithm in which a certain number of 'Positional Functions' interact" (Yamada (2010b: 182)).[2] For ease of exposition, a simple example *ènginéer* ((201); Wells (2000)) and the related Positional Function *Heaviness* (*H*) will be utilized to present an introduction to PFT.

First of all, the primary stress assignment rule is applied to *engineer* to decide the position of its primary stress, whose detailed explanation will be omitted in this

---

[2] PFT consists of two sets of stress rules, the primary stress assignment rule, which is composed of three Positional Functions, and the subsidiary stress assignment rule, which is made up of sixteen Positional Functions. For the computation of stress assignment, firstly, the primary stress assignment rule is applied to a word to determine the position of primary stress and then the subsidiary stress assignment rule is applied to the word to account for its subsidiary stress. The topic of this dissertation is subsidiary stress assignment; consequently, the focus will be mainly on the sixteen Positional Functions for subsidiary stress assignment. The three Positional Functions for the primary stress assignment, respectively, are *Bounded Binarity* (*BB*), *Heaviness* (*H*), and *Rhythmic Adjustment* (*RA*). For more details about these three Positional Functions, refer to Yamada (2012, 2013).

dissertation as it is not the main theme here. The second step is to apply relevant Positional Functions for subsidiary stress assignment to *engineer*, to account for its subsidiary stress:

(1) ènginéer (201)

y-axis

```
+                              ↑                    line 1
en ——————— gi ——————— neer ——→ x-axis   line 0
2           1           0
h(2)=+ _____ + Heaviness      line –1
S(2)=+
```
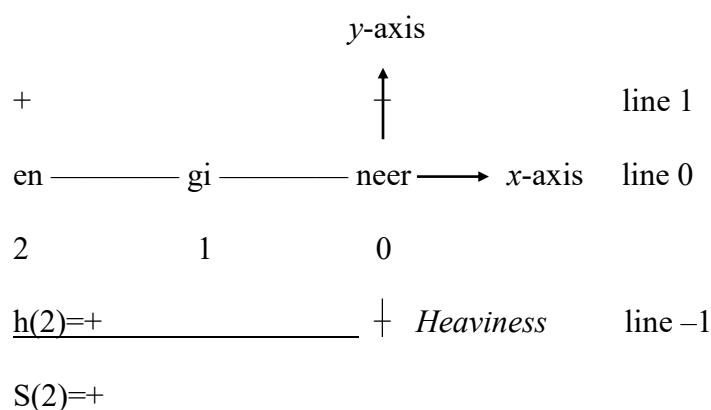
With regard to the computation of subsidiary stress assignment, the number "0" stands for the position of primary stress and numerals under the central segmental melody line (here, "1" and "2") indicate each syllable position counted leftward from the primary stressed position. "The strength of stress is expressed by integers on the vertical axis, where a larger number indicates stronger stress" (Yamada (2010b: 183)). The area over line 0 is the Positional Function stress-representation plane and the area under line 0 is the Computational plane for Positional Functions.

In (1), the syllable "en" is a heavy syllable, so it triggers the application of the Positional Function *Heaviness*, whose definition is given in (2):

(2) *Heaviness* (*H*) (Yamada (2010b: 305))

Assign stress "+" to the heavy syllable by the formula $h(x)$ = y, with the stress value "+", i.e. $h(x)$ = +.

Heaviness is the only Positional Function that can be activated on this word. The stress value of $S(2)$ is "+", which is given by "$h(2)$ = +", as illustrated in (1). The value "+" is then mapped onto the Positional Function stress-representation plane on the syllable "*en*". The expression of the computation of stress value "$S(2)$ = +", where the capital letter "*S*" stands for "syllable" and "+" for "stress value," shows that the syllable "en" is the only syllable with stress value. Since the stress on the syllable "en" is the strongest except for the primary stress on the syllable "neer," "en" bears secondary stress in *engineer*. In this way, the correct stress pattern *ènginéer* (201) is obtained from the analysis and computation of the word in (1).

4.2 The Sixteen Positional Functions

The sixteen Positional Functions of subsidiary stress assignment rule are *Alveolar Consonant Sequence* (*ACS*), *Bare Nucleus Avoidance* (*BNA*), *Binarity* (*B*), *Category Selection* (*CS*), *Double Stop* (*DS*), *Edge Exemption I* (*EE-I*), *Edge Exemption II* (*EE-II*), *Farness* (*F*), *Free Binarity* (*FB*), *Heaviness* (*H*), *Rhythm* (*R*), *Rhythmic Adjustment* (*RA*), *Sole Stress Resistance* (*SSR*), *Stress Reduction* (*SR*), *Trace* (*T*), and *Velar-Alveolar Sequence* (*VAS*). In this section, definitions of all the sixteen Positional Functions will be presented, except the definition of *Heaviness*, which has already been spelt out in (2).

Firstly, the word *cònversátion* (2010) will be used as an example (Wells (2000)). *Cònversátion* is derived from *convérse*, where the syllable "verse" bears the primary stress. However, "e" is reduced in the derived noun form *cònversátion* (2010). As addressed in Chapter 2 and 3, neither *SPE* nor MT can provide a convincing explanation for the reduction in words such as *cònversátion*. I will illustrate how PFT, without any lexical treatment, accounts for stress patterns like this. The analysis and computation for *cònversátion* (2010) is as followings:

(3) cònversátion (2010) (< convérse) (Yamada (2010b: 275))[3]

```
*                │
*                │
+       +        │
+       +        │
con ──── ver ──── sa ──── tion ──→
 2        1        0
h(2)=+   h(1)=+    ┼  Heaviness
         t(1)=+    ┼  Trace
r(2)=+*            ┼  Rhythm
f(2)=*             ┼  Farness
S(2)=++** > S(1)=++
```
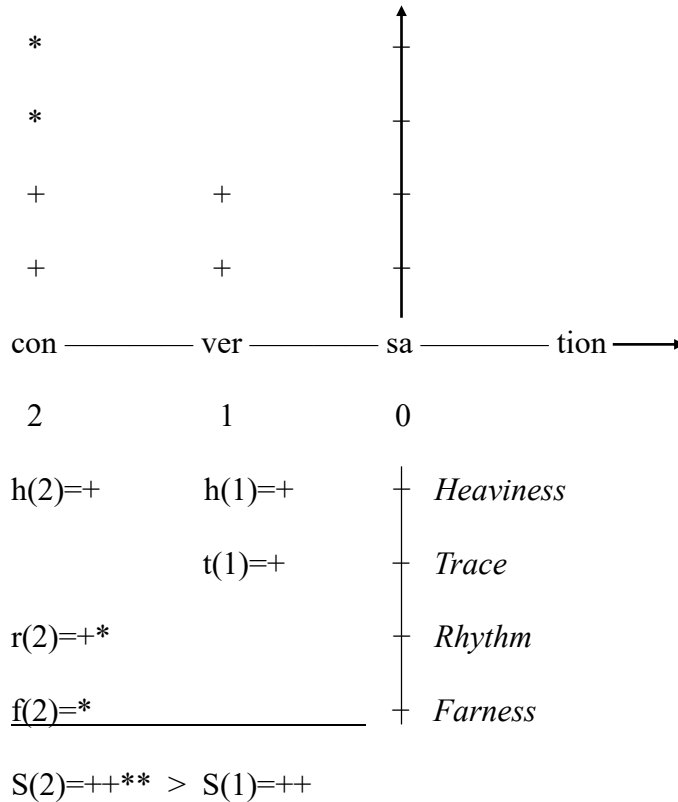
In the analysis (3), four Positional Functions are activated in five positions. Syllables "con"

and "ver" are both heavy, so *Heaviness* is triggered on both of them. The syllable "ver"

bears the primary stress in the base form *convérse*; thus, the condition for the application

of *Trace* is met. The definition of *Trace* is as the following:

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[3] The computation (3) in this dissertation is a little bit different from the one in Yamada (2010b: 275). The major distinction lies in the ordering of the activation of Positional Functions. While the ordering of the triggering of Positional Functions is *Heaviness*, *Farness*, *Trace*, and *Rhythm* in Yamada (2010b: 275), the ordering is *Heaviness*, *Trace*, *Rhythm*, and *Farness* in this dissertation. The ordering relation among Positional Functions is not the major focus of Yamada (2010b), so it is neither detailed nor strictly established in Yamada (2010b). I will turn to the issue of ordering relations among Positional Functions in Chapter 7. The ordering of the application of Positional Functions in computation (3) and in other computations in this dissertation is in accordance with the ordering of Positional Functions yet to be presented in Chapter 7.

(4) *Trace* (*T*) (Yamada (2010b: 305))

Stress the position of a trace with a value "+" using the expression $t(x) = +$, where

a trace is defined as a position of stress given on an earlier cycle.

With the expression "$t(1) = +$", *Trace* is applied to "ver." *Heaviness* and *Trace* are the

only two Positional Functions that can be applied to the syllable "ver."[4] For the syllable

"con," the Positional Function *Rhythm* can as well be activated, whose definition is

illustrated in (5):

(5) *Rhythm* (*R*) (Yamada (2010b: 305-306))

The Positional Function *Rhythm*, with the formula $r(x) = y$, is activated on the

leftmost syllable if the syllable immediately preceding the primary stressed

syllable bears stress. The stress value of $r(x) = y$ is "+*", i.e. $r(x) = +*$.

The definition of *Rhythm* in (5) indicates that the only condition for the application of

Rhythm is that "the syllable immediately preceding the primary stressed syllable bears

stress." In the word *conversation*, "ver" is the syllable immediately preceding the primary

stressed syllable. With the activation of Positional Functions *Heaviness* and *Trace*, "ver"

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[4] *Heaviness* and *Trace* are the only two Positional Functions that can be triggered on the syllable "ver." With regard to the question why the other fourteen Positional Functions cannot be applied to "ver," I will take *Rhythm*, among the fourteen Positional Functions, as an exemplification. *Rhythm* is "activated on the leftmost syllable if the syllable immediately preceding the primary stressed syllable bears stress" (Yamada (2010b: 306)). Leaving unrelated details aside, it implies that *Rhythm* should be triggered on the leftmost syllable. The syllable "ver" is clearly not the leftmost syllable in the word *conversation* and this is why *Rhythm* cannot be activated on it. In subsequent discussions, generally, only Positional Functions that can be applied to the syllable in question will be referred to.

bears stress value of "++"; in other words, the condition for the application of *Rhythm* is satisfied. As specified in (5), *Rhythm* should be triggered on the leftmost syllable. In *conversation*, the leftmost syllable is "con," so *Rhythm* is applied to "con." The condition for the activation of another Positional Function, *Farness*, is likewise met. The definition of *Farness* and its condition for application are given in (6):

(6) a. *Farness* (*F*) (Yamada (2010b: 305))

Subsidiary stress is placed as far left as possible from the position of primary stress, with the value "*" of the Function *Farness*, by means of the formula $f(x) = y$, i.e. $f(x) = *$.

b. Condition for the Application of *Farness* (Yamada (2010b: 241))

Farness is activated only when the same type of syllable appears successively on the same level.

In (3), the two continuous syllables "con" and "ver" are both heavy syllables; thus, the condition for the application of *Farness* in (6b) that "the same type of syllable appears successively on the same level" is met. According to (6a), *Farness* should be triggered "as far left as possible from the position of primary stress." In *conversation*, "as far left as possible from the position of primary stress" refers to the syllable "con"; consequently, *Farness*, with the expression "$f(2) = *$", is activated to "con."

These are all Positional Functions that can be activated on the word *conversation*; the next step is to calculate stress value for each syllable. The stress value of "con" is "++**"; and the stress value of "ver" is "++". In PFT, stress value of "*" is the same as that of "+". With regard to subsidiary stress assignment, when the difference of stress

value between two syllables is no less than two, the stronger syllable will bear secondary stress and the weaker one no stress (Yamada (2010b)). In (3), since "con" is stronger than "ver" by 2 stress values, "con" bears secondary stress and "ver" no stress. The stress pattern obtained from (3) is *cònversátion* (2010), which is correct.

Next I will move on to the word *confirmation*, with the stress pattern *cònfirmátion* (2010) in Wells (2000), another instance with only one stress pattern and where the vowel in the syllable bearing primary stress in the base form is reduced. The analysis and computation of *confirmation* is as follows:

(7) cònfirmátion (2010) (< confírm)

```
*

*

+           +

+           +

con ——————— fir ————— ma ————— tion ——→

2           1           0

h(2)=+      h(1)=+          ┼  Heaviness

            t(1)=+          ┼  Trace

r(2)=+*                     ┼  Rhythm

f(2)=*      _____┼  Farness

S(2)=++** > S(1)=++
```
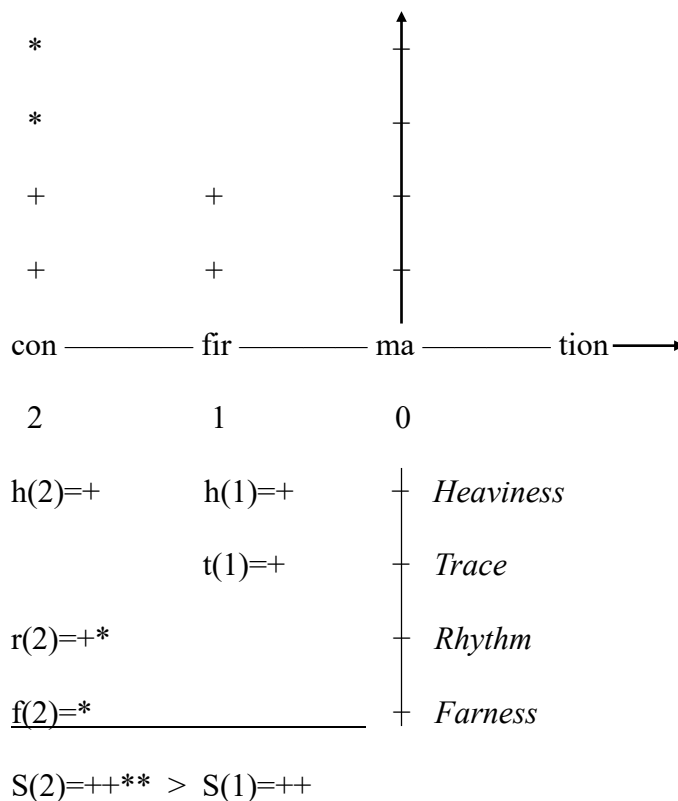
In (7), *Heaviness* is triggered on "con" and "fir" since they are both heavy syllables. *Trace* is activated on "fir" on the grounds that it bears the primary stress in the base form *confírm*.

With the application of *Heaviness* and *Trace*, the syllable "fir," the syllable that immediately preceding the primary stressed syllable, bears the stress value of "++"; namely, the condition for the application of *Rhythm* is satisfied and *Rhythm* is triggered on "con." Syllables "con" and "fir" are the same type of syllable that appears successively on the same level; therefore, *Farness* is activated to the leftmost syllable "con." The final expression of the result of computation "*S(2)* = ++** > *S(1)* = ++" shows that the stress value of "con" is stronger than that of "fir" by two, so "con" bears secondary stress and "fir" no stress. The stress pattern gained, *cònfirmátion* (2010), is in line with empirical facts.[5]

In the above, we have given two examples of derived words with only one stress pattern, where vowels bearing primary stress in the base forms are reduced. In the following, focus will be turned to words with two stress patterns, where in one stress pattern vowels bearing primary stress in the base forms are reduced and in the other

---

[5] Halle and Vergnaud (1987: 251) list ten examples, such as *affirmation*, *confirmation*, *conservation*, *consultation*, *conversation*, *information*, *lamentation*, *preservation*, *transportation*, and *usurpation*, according to Kenyon and Knott (1944), as examples of derived words with only one stress pattern, in which vowels bearing primary stress in the base forms are reduced. However, four out of the ten exemplifications just noted, namely, *consultation*, *lamentation*, *transportation*, and *usurpation*, bear different stress patterns in British English according to Wells (2000). Among the four, three words have two stress patterns in British English, such as *consultation*, *lamentation*, and *transportation* (Wells (2000)). The last one out of four, the word *usurpation*, has only one stress pattern in British English, but the stress pattern is distinct from what is described in Halle and Vergnaud (1987: 251). In Wells (2000), it is *ùsûrpátion* (2310), where the syllable "sur" with primary stress in the base form *usúrp* is not reduced. As a result, only six out of the ten instances in Halle and Vergnaud (1987) share the same stress pattern in British English, which include *affirmation*, *confirmation*, *conservation*, *conversation*, *information*, and *preservation*. Since neither *SPE* nor MT can explain stress patterns of these instances, they will be used as examples in Chapter 4 and in later chapters to introduce PFT and as well to prove its validity. Among these six examples, *confirmation* and *conversation* have already been referred to in the analyses of (7) and (3) in this chapter respectively. *Information* will be discussed in Chapter 7 to unfold the ordering relations among Positional Functions.

variant vowels bearing primary stress in the base forms are unreduced. Examples are not difficult to find, such as *condemnation*, *pigmentation*, *segmentation*, *transformation*, *transportation*, etc. Along with the discussion of these instances, Positional Functions of *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop*, and *Stress Reduction* will be utilized.

Two stress patterns of *condemnation* can be witnessed in Wells (2000), *còndêmnátion* (2310) and *còndemnátion* (2010). Firstly, I will examine how PTF accounts for the variant *còndêmnátion* (2310).

(8)   còndêmnátion (2310) (< condémn) (Yamada (2010b: 251))

```
*
*              *
+              +
+              +
con ——————— dem ——————— na ——————— tion——→
 2              1              0
h(2)=+      h(1)=+          ┤  Heaviness
            t(1)=+          ┤  Trace
            ds(1)=*         ┤  Double Stop
r(2)=+*                     ┤  Rhythm
f(2)=*_____       ┤  Farness

S(2)=++** > S(1)=++*
```
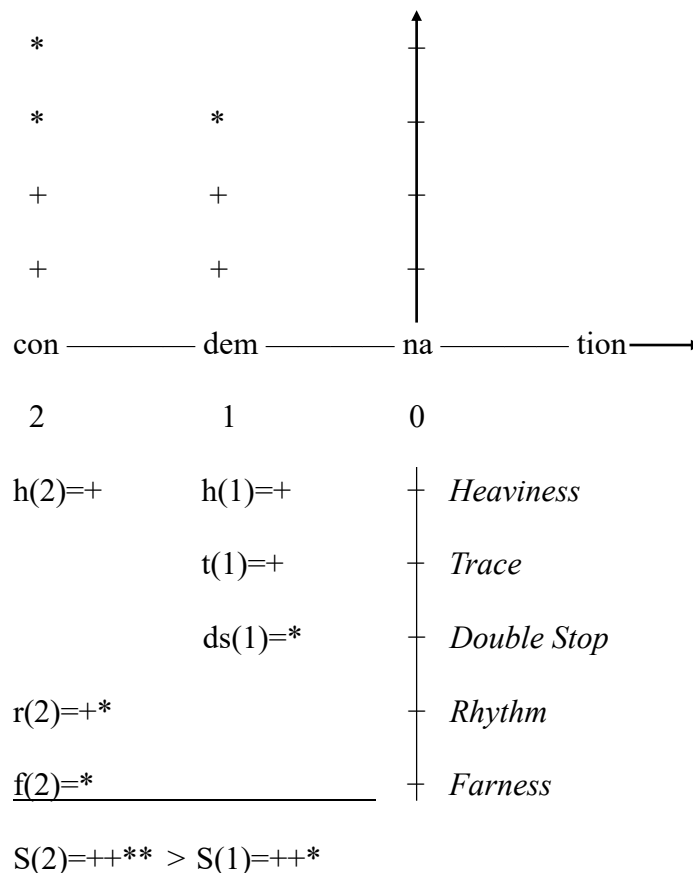
In (8), *Heaviness* is triggered on the two heavy syllables "con" and "dem." *Trace* is

activated on "dem" due to the primary stress on the syllable in the base form *condémn*. The Positional Function *Double Stop* is also applied to "*dem*," whose definition is listed in (9):

(9) *Double Stop* (*DS*) (Yamada (2010b: 307))

For a successive segmental sequence across the first and second syllables immediately preceding the primary stressed syllable, if the first syllable ends in the alveolar nasal stop consonant /n/ immediately followed by the second syllable with a stop consonant as its onset, a stress mark "*" is placed under the second syllable by the formula $ds(x) = *$.

The definition in (9) states that three conditions must be satisfied for the application of *Double Stop*:

(10) Conditions for the application of *Double Stop*:
   a. there are two syllables immediately preceding the primary stressed syllable;
   b. the first syllable of the word ends in the alveolar nasal stop consonant /n/;
   c. the second syllable of the word has a stop consonant as its onset.

In (8), syllables "con" and "dem" are the two syllables immediately preceding the primary stressed syllable; that it to say, condition (10a) has been met. Condition (10b) that the first syllable of the word ends in the alveolar nasal stop consonant /n/ is satisfied as well, since the first syllable of the word, "con," does end in /n/. Condition (10c) that the second syllable of the word has a stop consonant as its onset is also met since the onset of the

second syllable of the word, "dem," is a stop consonant. All the three conditions for the application of *Double Stop* in (10) are satisfied, so *Double Stop* is triggered on the second syllable of the word, "dem." With the activation of *Heaviness*, *Trace*, and *Double Stop*, the syllable "dem," that is, the syllable immediately preceding the primary stressed syllable, bears stress value "++*"; thus, *Rhythm* is applied to the leftmost syllable "con." *Farness* is triggered on "con" as well, since "con" and "dem" are the same type of syllable that appears successively on the same level. The final expression of the result of computation "*S(2) = ++** > S(1) = ++*"* shows that the stress value of "con" is stronger than that of "dem" by one. In PFT, as for subsidiary stress assignment, when the difference of stress value between two syllables is one, the stronger syllable will bear secondary stress and the weaker one tertiary stress (Yamada (2010b)). In (8), the stress value of "con" is stronger than that of "dem" by one, so "con" will bear secondary stress and "dem" tertiary stress. The stress obtained from (8) is *còndêmnátion* (2310), which is correct.

The analysis in (8) shows that one of the two stress patterns of *condemnation* can be explained within the framework of PFT. In the next paragraph, I will examine how PFT accounts for the other stress pattern of *condemnation*, that is, *còndemnátion* (2010):

(11) còndemnátion (2010) (< condémn)

```
*
*
+              *
+              +
con ——————— dem ——————— na ——————— tion ——→

 2             1            0

h(2)=+       h(1)=+        ┤  Heaviness

             t(1)=+        ┤  Trace

             ds(1)=*       ┤  Double Stop

r(2)=+*                    ┤  Rhythm

f(2)=* _____ ┤  Farness

S(2)=++** > S(1)=++*

         ___sr(1)=−_____ ┤  Stress Reduction

S(2)=++** > S(1)=+*
```
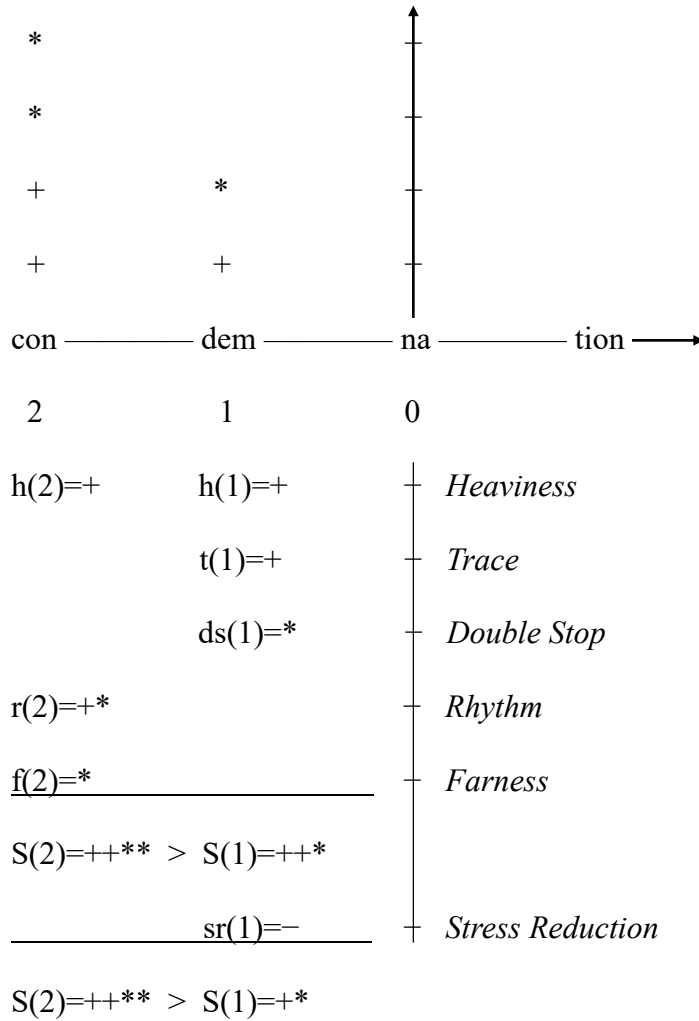
In (11), Positional Functions of *Heaviness*, *Trace*, and *Double Stop* are triggered on "dem"; Positional Functions of *Heaviness*, *Rhythm*, and *Farness* are activated to "con." The result of the first computation is "$S(2) = ++** > S(1) = ++*$", with the stress value of "$S(2)$" stronger than "$S(1)$" by one.   In order to account for the second variant *còndemnátion* (2010), an optional Positional Function *Stress Reduction* can be utilized, whose definition is shown in (12):

(12) *Stress Reduction* (*SR*) (Yamada (2010b: 307-308))

Reduce weaker stress by one, by means of the formula $sr(x) = -$ (or $\neg *$).

The definition in (12) notes that *Stress Reduction* reduces *weaker stress*. To put it another way, if syllables bear different stress values after the first computation, i.e. some with stronger stress value and some with weaker stress value, *Stress Reduction* can be *optionally* applied to the syllable with weaker stress value. For example, in the analysis of (11), the result of the first computation of stress value is "$S(2)=++** > S(1)=++*$", where the syllable "$S(2)$" is stronger than "$S(1)$" by one stress value, so *Stress Reduction* can be applied to the syllable with weaker stress value, i.e. "$S(1)$," to explain the other variant *còndemnátion* (2010). After the triggering of *Stress Reduction*, the final expression of the result of computation is "$S(2) = ++** > S(1) = +*$", where "$S(2)$" is stronger than "$S(1)$" by two stress values. Therefore, the syllable "$S(2)$" will bear secondary stress and "$S(1)$" no stress. The stress pattern gained from (11) is *còndemnátion* (2010), which is just the variant aimed at.

The analyses and computations in (8) and (11) provide an explanation for the two stress patterns of *condemnation* given in Wells (2000), *còndêmnátion* (2310) and *còndemnátion* (2010). The next example is *transformation*, which has two stress patterns in Wells (2000), *trànsformátion* (2010) and *trànsfôrmátion* (2310). Up until now, the base forms of all instances that have been used in this chapter have only one stress pattern. For example, *condemn*, the base form of *condemnation*, has only one stress pattern, *condémn*. However, *transform*, the base form of *transformation*, is a little bit different: (a) it can be a verb and a noun; (b) it has two types of stress patterns, *transfórm* (V),

tránsform (V), and *tránsform* (N) in British English.[6] Firstly, I will take *transfórm* (V) as

the base form and examine the stress pattern that will be gained in (13):

(13)   trànsformátion (< transfórm (V))

```
*                    ↑
*                    ┤
+          +         ┤
+          +         ┤
trans ──── for ──── ma ──── tion ──→

 2          1         0

h(2)=+     h(1)=+     ┤ Heaviness
           t(1)=+     ┤ Trace
r(2)=+*              ┤ Rhythm
f(2)=*              ┤ Farness

S(2)=++**  >  S(1)=++
```
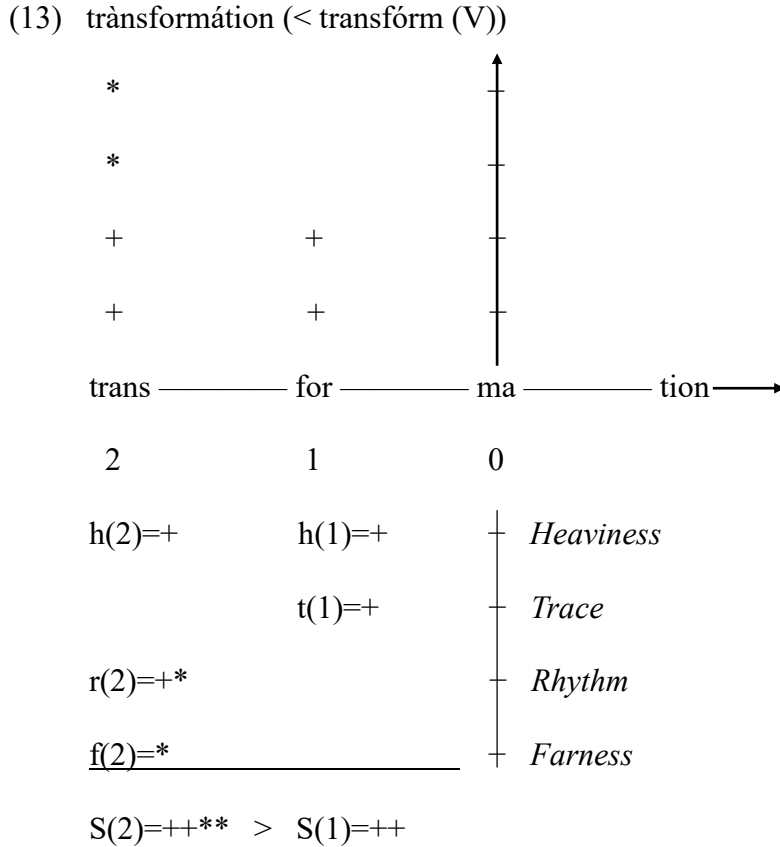
In (13), since "trans" and "for" are heavy syllables, *Heaviness* is applied to both of them.

Transfórm (verb) is taken as the base form, so the Positional Function *Trace* should be

triggered on the syllable "for" in the computation of *transformation*. *Rhythm* is applied

to "trans," since "for" bears stress value "++" after the application of *Heaviness* and *Trace*.

---

[6] *Transform* (V) has two stress patterns, *transfórm* (V) and *tránsform* (V), in British English. Wells (2000) also lists the stress pattern for *transform* (V) in American English, which is *transfórm* (V). In other words, according to Wells (2000), *transform* (V) only has one variant in American English. Notice here again that this dissertation only takes British English as its data source. With respect to *transform* (N), its stress pattern is the same in British English and American English, with both being *tránsform* (N).

Farness is triggered on the grounds that "trans" and "for" are two consecutive heavy syllables. The final expression of the result of computation is "$S(2) = ++^{**} > S(1) = ++$", where "$S(2)$" is stronger than "$S(1)$" by two stress values; consequently, "$S(2)$" will bear secondary stress and "$S(1)$" no stress. The stress pattern presented by (13) is *trànsformátion* (2010), which is correct.

The next task is to account for the other variant, *trànsfôrmátion* (2310). Firstly, the definition of *Category Selection* (*CS*), which will be activated for the computation of *trànsfôrmátion* (2310), is presented in (14).

(14)   a. *Category Selection Process* (*CSP*)[7]

        If identical category-levels are assigned to a lexical item, a category and a type must be appropriately selected in the lexicon before the lexical item is sent to morphology.

     b. *Category Selection* (*CS*) (Yamada (2010b: 261))

        For the primary stressed syllable in a category marked by *CSP* in the lexicon, a relative Positional Function termed *Category Selection* (*CS*) is activated, by means of the formula $cs(x) = {}^{*}$, along with *Trace* due to the primary stress of the underlying form.

As already noted, *transform* can both be a verb (*transfórm* (V) and *tránsform* (V)) and a noun (*tránsform* (N)). The two stress patterns of the verb form (*transfórm* (V) and

---

[7] The definition of *Category Selection* in (14b) is quoted from Yamada (2010b: 261). However, the definition of *Category Selection Process* in (14a) is not the same as the one in Yamada (2010b: 265). I will give reasons for the revision of *Category Selection Process* (14a) later in this section.

tránsform (V)) will both be thought as primary category forms; while the noun form (*tránsform* (N)) will be taken as a secondary category form. Namely, "identical category-levels [i.e. primary category] will be assigned to" lexical items *transfórm* (V) and *tránsform* (V). As a result, a category (i.e. (V)) and a type (i.e. *transfórm* or *tránsform*) must be appropriately selected between the two stress patterns of the primary category, *transfórm* (V) and *tránsform* (V), to account for the other variant *trànsfôrmátion* (2310). In this case, *transfórm* (V) will be selected. The analysis and computation is as follows:

(15)   trànsfôrmátion (2310) (< transfórm (V)^s, tránsform (V))[8]

```
 *
 *            *
 +            +
 +            +
trans ——— for ——— ma ——— tion ⟶
 2            1           0
h(2)=+      h(1)=+          ┼  Heaviness
            cs(2)=*         ┼  Category Selection
            t(2)=+          ┼  Trace
r(2)=+*                     ┼  Rhythm
f(2)=*                      ┼  Farness
S(2)=++**  >  S(1)=++*
```

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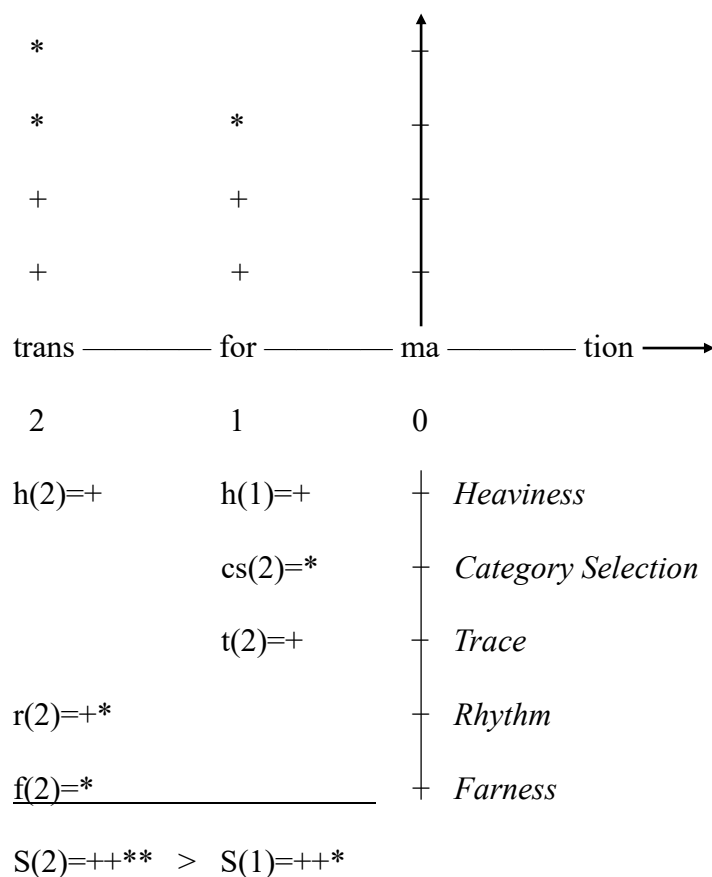
[8] The superscript *s* on *transfórm (V)* implies that the variant stress pattern of *transfórm (V)* is chosen for the analysis and computation in (15).

In (15), *Heaviness* is activated on "trans" and "for" as in (13). As stated above, the base form selected for (15) is *transfórm* (V); therefore, *Category Selection* and *Trace* are triggered on "for," the syllable with the primary stress in the underlying form *transfórm* (V). *Rhythm* and *Farness* are applied to "trans" as in (13), too. The final expression of the result of computation is "$S(2) = ++** > S(1) = ++*$", where "$S(2)$" is stronger than "$S(1)$" by one stress value; consequently, "$S(2)$" will bear secondary stress and "$S(1)$" tertiary stress. The stress pattern gained from (15) is *trànsfôrmátion* (2310), which is correct.

The analyses and computations in (13) and (15) explain both stress patterns of *transformation*. Next I will use the exemplification *pigmentation* and examine whether PFT can account for its stress patterns. This word also has two stress patterns, *pìgmêntátion* (2310) and *pìgmentátion* (2010) in British English. Its base form, *pigment*, is also both a verb (*pigmént* (V), *pígment* (V)) and a noun (*pígment* (N)) in British English. One new Positional Function, *Alveolar Consonant Sequence*, will be introduced with the computation for *pigmentation*.

(16)   pìgmêntátion (2310) (< pigmént (V))

```
   *                                  ↑
                                      ┤
   *              *                   ┤

   +              +                   ┤

   +              +                   ┤

  pig ─────── men ─────── ta ─────── tion ──→

   2              1         0

  h(2)=+       h(1)=+       ┤   Heaviness

               t(1)=+       ┤   Trace

               acs(1)=*     ┤   Alveolar Consonant Sequence

  r(2)=+*                   ┤   Rhythm

  f(2)=*    _____ ┤   Farness

  S(2)=++** > S(1)=++*
```
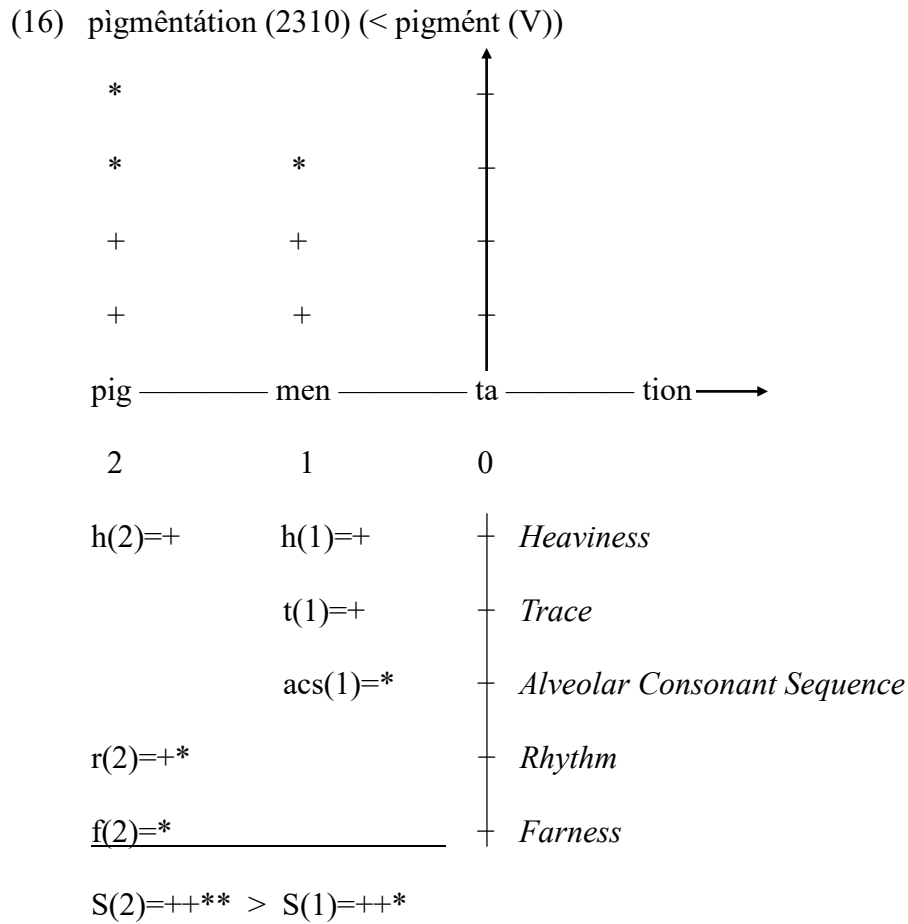
In (16), two heavy syllables "pig" and "men" trigger the application of *Heaviness*. *Trace* is applied to "men" due to the primary stress on *pigmént* (V). The Positional Function *Alveolar Consonant Sequence* can as well be activated on "men," whose definition is as below:

(17)   *Alveolar Consonant Sequence* (*ACS*) (Yamada (2010b: 306))

In an alveolar consonant concatenation across distinct syllables, the stress value

of a heavy syllable ending in a nasal consonant immediately followed by the

primary stressed syllable is augmented by one if the onset consonant of the

primary stressed syllable is voiceless, or if the coda consonant immediately preceding the syllable in question is voiceless. *ACS* [*Alveolar Consonant Sequence*] is expressed by the formula *acs*(*x*) = *.

According to the definition of *Alveolar Consonant Sequence*, three conditions must be met for its application:

(18) Conditions for the Application of *Alveolar Consonant Sequence*:

a. the syllable in question is a heavy syllable ending in a nasal consonant;

b. the syllable in question is immediately followed by the primary stressed syllable;

c. the onset consonant of the primary stressed syllable is voiceless, or the coda consonant immediately preceding the syllable in question is voiceless.

The three conditions for the application of *Alveolar Consonant Sequence* in (18) are all met in (16): (a) the syllable in question "men" is a heavy syllable ending in a nasal consonant /n/; (b) the syllable in question "men" is immediately followed by the primary stressed syllable "ta"; (c) the onset consonant of the primary stressed syllable "ta" is voiceless. Consequently, *Alveolar Consonant Sequence* is activated on "men" in (16). After the triggering of *Heaviness*, *Trace*, and *Alveolar Consonant Sequence*, the syllable "men," the one immediately preceding the primary stressed syllable, bears stress value "++*". As a result, the condition for the application of *Rhythm* has been met and *Rhythm* is activated to the leftmost syllable of the word, "pig." The syllables "pig" and "men" are two consecutive heavy syllables, and therefore they are the same type of syllable that

appears successively on the same level. In other words, the condition for the triggering of *Farness* is satisfied and *Farness* is also applied to "pig," the leftmost syllable. These are all Positional Functions that can be activated here. The expression of the result of computation "*S(2)* = ++** > *S(1)* = ++*", where "*S(2)*" is stronger than "*S(1)*" by one stress value. Consequently, "pig" will bear secondary stress and "men" tertiary stress. The stress pattern *pìgmêntátion* (2310) thus can be gained.

The analysis and computation in (16) presents one stress pattern of *pigmentation*; the other one, *pìgmentátion* (2010), is yet to be explained. Its computation will be as below:

(19) pìgmentátion (2010) (< pigmént (V), pígment (V), pígment (N)ˢ)

```
*                          |
                           |
*                          |
                           |
*                          |
                           |
+                          |
                           |
+            *             |
                           |
+            +             |

pig ——————— men ——————— ta ——————— tion ——→

 2            1            0

h(2)=+      h(1)=+       + Heaviness

cs(2)=*                 + Category Selection

t(2)=+                  + Trace

            acs(1)=*    + Alveolar Consonant Sequence

r(2)=+*                 + Rhythm

f(2)=*  _____ + Farness

S(2)=+++***>S(1)=+*
```

Heaviness is triggered on both "pig" and "men." In (19), the variant *pígment* (N) is selected as the base form. Therefore, *Category Selection* and *Trace* are activated on "pig." *Alveolar Consonant Sequence* is applied to "men" as all the three conditions for its application in (18) are met. The Positional Functions *Rhythm* and *Farness* are triggered on "pig" too. The final expression of the result of computation is "*S(2) = +++*** > S(1)* = +*", where "*S(2)*" is stronger than "*S(1)*" by four stress values. Accordingly, "pig" will bear secondary stress and "men" no stress. The stress pattern *pìgmentátion* (2010) is

gained.

In the analysis and computation of *trànsfôrmátion* (2310) in (15), only *transfórm* (V) and *tránsform* (V) are given as base forms of *transformation*; while in the analysis and computation of *pìgmentátion* (2010) in (19), *pigmént* (V), *pígment* (V), *pígment* (N) are listed as the base forms. The differences are as follows:

(20) a. transform: transfórm (V)   (I)[9]

            tránsform (V)   (I)

            tránsform (N)   (II)

     b. pigment: pigmént (V)   (I)

            pígment (V)   (II)

            pígment (N)   (I)

In (20a), *transfórm* (V) and *tránsform* (V) are classified into a primary category, which is indicated by "(I)"; while *tránsform* (N) is put into a secondary category, which is marked by "(II)". In other words, *transfórm* (V) and *tránsform* (V) are assigned identical category-levels. The definition of *Category Selection Process* in (14a) states that "if identical category-levels are assigned to a lexical item, a category and a type must be appropriately selected in the lexicon before the lexical item is sent to morphology." As a

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[9] I, following Yamada (2010b), mark a primary category as "(I)" and a secondary category as "(II)." Yamada (2010b) mainly takes American English as the data source, so his data are a little bit different from mine. For example, according to Yamada (2010b), *transform* (V) only has one stress pattern, *transfórm* (V). Since the stress pattern *tránsform* (V) does not exist in American English according to Yamada (2010b), it is not included in Yamada (2010b) and thus impossible for it to be assigned a primary or secondary category in Yamada (2010b).

result, a selection has to be carried out between *transfórm* (V) and *tránsform* (V) before the computation in (15) for the stress pattern of *trànsfôrmátion* (2310). In (20b), *pigmént* (V) and *pígment* (N) are classified as the primary category, which is indicated by "(I)"; while *pígment* (V) is put into a secondary category, as denoted by "(II)." Consequently, a selection has to be carried out between *pigmént* (V) and *pígment* (N). The basic idea here is that "lexical items are categorized in the lexicon according to their order of preference for use when necessary, and that the most preferred lexical item is categorized into a 'primary category,' with the remainder categorized into a 'secondary category'" (Yamada (2010b: 264)).[10]

As stated in footnote 7, the definition of *Category Selection Process* in (14a) is not the same as Yamada (2010b). The original definition of *Category Selection Process* in Yamada (2010b: 265) is "[i]f identical category levels are assigned to a lexical item, a category must be appropriately selected in the lexicon before the lexical item is sent to morphology." In (14a), the definition is changed into "[i]f identical category-levels are assigned to a lexical item, a category and a type must be appropriately selected in the lexicon before the lexical item is sent to morphology." More explicitly, there are two revisions: (i) "identical category levels" is changed into "identical category-levels"; (ii) "a category must be appropriately selected" is revised into "a category and a type must be appropriately selected." The first revision is based on the reason that the expression *identical category levels* is ambiguous: it can be interpreted both as *identical category-levels* and *identical-category levels*. Since Yamada (2010b) used the expression *identical*

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[10] With regard to the question of how primary and secondary categories are determined, "one might seek an answer in the history of the English language or word formation"; however, "statistical investigation and further empirical evidence are necessary" (Yamada (2010b: 267, 269)). I will leave this question open here for future study.

category levels to indicate the same category-levels, I revised the expression into *identical category-levels*. This change is mainly based on grammatical concerns, so I will not discuss it further here. The second change is due to the differences between Yamada's (2010b) data and mine. Yamada (2010b) mainly focuses on American English data. According to Yamada (2010b), the stress patterns and word forms of *transform* are *transfórm* (V) and *tránsform* (N); *pigment*, no matter as a verb or as a noun, only has one stress pattern: *pígment* (V) and *pígment* (N); and *pigmentation* only has one stress pattern, *pìgmentátion* (2010). In Yamada (2010b), for the computation of one of the two stress variants in American English *trànsfôrmátion* (2310), both *transfórm* (V) and *tránform* (N) are assumed to be assigned a primary category. Since only one lexical item has to be selected when it is sent to morphology or phonology, *transfórm* (V) will be selected as the base form of *trànsfôrmátion* (2310). *Pigmentation* has only one stress pattern *pìgmentátion* (2010) in Yamada (2010b) and *pígment* (V) and *pígment* (N) share the same stress pattern, *Category Selection* is not activated for the computation of *pigmentation*. In other words, *Category Selection* is not utilized for the explanation of *pigmentation* in Yamada (2010).

Let us remind ourselves again that the stress pattern of *transform* is *transfórm* (V) and *tránsform* (N) in Yamada (2010b). However, according to my data, the stress patterns of *transform* are *transfórm* (V), *tránsform* (V), and *tránsform* (N). As shown in (20a), both *transfórm* (V) and *tránsform* (V) are assumed to be a primary category. If only a category is selected, then both *transfórm* (V), *tránsform* (V) will be selected as base forms of *trànsfôrmátion* (2310). A closer look at *transfórm* (V) and *tránsform* (V) will enlighten us. Their stress patterns are different, with *transfórm* (V) being iambic (i.e. an iambic type) and *tránsform* (V) being trochaic (i.e. a trochaic type). As a result, a type should

also be selected between these two stress patterns, and *transfórm* (V) is selected as the base form of *trànsfôrmátion*. And this is the reason that, in (14a), I revised the original definition in Yamada (2010b: 265) that "a category must be appropriately selected in the lexicon" into "a category and a type must be appropriately selected in the lexicon." Here is another example. As illustrated in (20b), *pigmént* (V) and *pígment* (N) are assumed to be a primary category, and *pígment* (V) is assumed to be a secondary category. If only a category is selected, then both *pigmént* (V) and *pígment* (N) will be selected as base forms of *pìgmentátion* (2010). In fact, *pigmént* (V) is iambic and *pígment* (N) is trochaic, so a type is also selected between them and *pígment* (N) is selected as the base form of *pìgmentátion* (2010).

The analyses and computations in (16) and (19) explain both stress patterns of *pigmentation*. Examples I have used, which include *condemnation*, *confirmation*, *conversation*, *pigmentation*, and *transformation*, are either those instances that have posed problems for *SPE* and MT or those that are not so convincingly explained by *SPE* and MT. It is important for PFT to provide a more explanatory mechanism for those examples that have called other theories into question. It is also necessary for PFT to explain those instances that are accountable by other theories. Thus, I will refer to an example that is well explained by *SPE* and MT, i.e. *expectation*. *Expectation* has only one stress pattern in Wells (2000), *èxpêctátion* (2310). The secondary stress on "e" of the syllable "pec" is explained in *SPE* and MT as because of the primary stress on "pec" in the base form *expéct*. The analysis and computation in (21) will present the interpretation of the stress pattern *èxpêctátion* (2310) in terms of PFT:

(21) èxpêctátion (2310) (< expéct) (Yamada (2010b: 225))

```
*
+          *
+          +
+          +
ex ——— pec ——— ta ——— tion ——→
2          1          0

h(2)=+    h(1)=+     ┤  Heaviness
          t(1)=+     ┤  Trace
          vas(1)=*   ┤  Velar-Alveolar Sequence
r(2)=+*              ┤  Rhythm
f(2)=*              ┤  Farness

S(2)=++** > S(1)=++*
```

In (21), syllables "ex" and "pec" trigger the application of *Heaviness* since they are both heavy syllables. *Trace* is activated on "pec" due to the primary stress on the syllable in the base form *expéct*. Another Positional Function, *Velar-Alveolar Sequence*, can as well be triggered on "pec," whose definition is in (22):

(22) *Velar-Alveolar Sequence* (*VAS*) (Yamada (2010b: 306))

If a velar consonant of the coda of the syllable in question is immediately followed by an onset alveolar consonant of the primary stressed syllable, and at the same time if a *Trace* is activated on the syllable in question, stress is

assigned to the syllable ending with the velar consonant, by means of the formula *vas(x)* = *.

To put the definition in (22) in other words, there are four conditions for the application of *Velar-Alveolar Sequence*:

(23) Conditions for the Application of *Velar-Alveolar Sequence*:

  a. the coda of the syllable in question is a velar consonant;

  b. *Trace* is applied to the syllable in question;

  c. the syllable in question is immediately followed by the primary stressed syllable;

  d. the onset of the primary stressed syllable is an alveolar consonant.

I will examine whether the syllable "pec" satisfies all four conditions for the application of *Velar-Alveolar Sequence* in (23): (23a) the coda of the syllable "pec," /k/, is a velar consonant; (b) *Trace* is applied to "pec"; (c) "pec" is immediately followed by the primary stressed syllable "ta"; (d) the onset of the primary stressed syllable "ta," /t/, is an alveolar consonant. In conclusion, all four conditions for the application of *Velar-Alveolar Sequence* have been met; and *Velar-Alveolar Sequence* is applied to "pec." After the application of *Heaviness*, *Trace*, and *Velar-Alveolar Sequence*, the syllable "pec," the one immediately preceding the primary stressed syllable, bears stress value "++*", so *Rhythm* is applied to the leftmost syllable of the word "ex." The syllables "ex" and "pec" are two consecutive heavy syllables; thus *Farness* is triggered on "ex." These are all Positional Functions that can be applied to this word. The final expression of the result of

computation is "*S*(*2*) = ++** > *S*(*1*) = ++*", where "*S*(*2*)" is stronger than "*S*(*1*)" by one stress value. Consequently, "ex" will bear secondary stress and "pec" tertiary stress. The correct stress pattern *èxpêctátion* (2310) is gained.

The stress pattern of *expectation* is accountable within the framework of *SPE* and *MT*. The analysis and computation in (21) for the word *expectation* demonstrates that PFT can also explain the stress pattern of this word.

The examples for PFT being referred to, namely, *cònversátion*, *cònfirmátion*, *còndêmnátion*, *còndemnátion*, *trànsfôrmátion*, *trànsformátion*, *pìgmêntátion*, *pìgmentátion*, and *èxpêctátion*, share the following three common points: (i) they all bear secondary stress on their first syllables; (ii) their syllable count is four; (iii) they all only have one base word. To diversify instances for PFT, four new examples will be utilized, *âccèssibílity* (320100), *elèctrícian* (0210), *orìginálity* (020100), and *sûpèrîórity* (323100), all of which are quite different from the examples I have used. Firstly, the word *âccèssibílity* will be used to introduce the Positional Function *Edge Exemption II*. Secondly, the example of *orìginálity* will be utilized to make an introduction to the Positional Function *Edge Exemption I*. Then the analysis and computation of *elèctrícian* will be given, along with the explanation of another Positional Function, *Bare Nucleus Avoidance*. Finally, the stress pattern *sûpèrîórity* will be accounted for by use of the Positional Function *Binarity* and other related Positional Functions.

First of all, the analysis and computation of *âccèssibílity* (320100) will be given in (24):

(24) âccèssibílity (320100) (< áccess, accéssible) (Yamada (2010b: 245))

$$
\begin{array}{cccccc}
& * & & & & \\
+ & + & & & & \\
+ & + & & & & \\
\text{ac} & \text{(ce} & \text{ssi)} & \text{bi} & \text{li} & \text{ty} \longrightarrow \\
3 & 2 & 1 & 0 & &
\end{array}
$$

h(3)=+		*Heaviness*
t(3)=+	t(2)=+	*Trace*
	b(2)=+	
	eeII(2)=*	*Edge Exemption II*

S(3)=++ < S(2)=++*
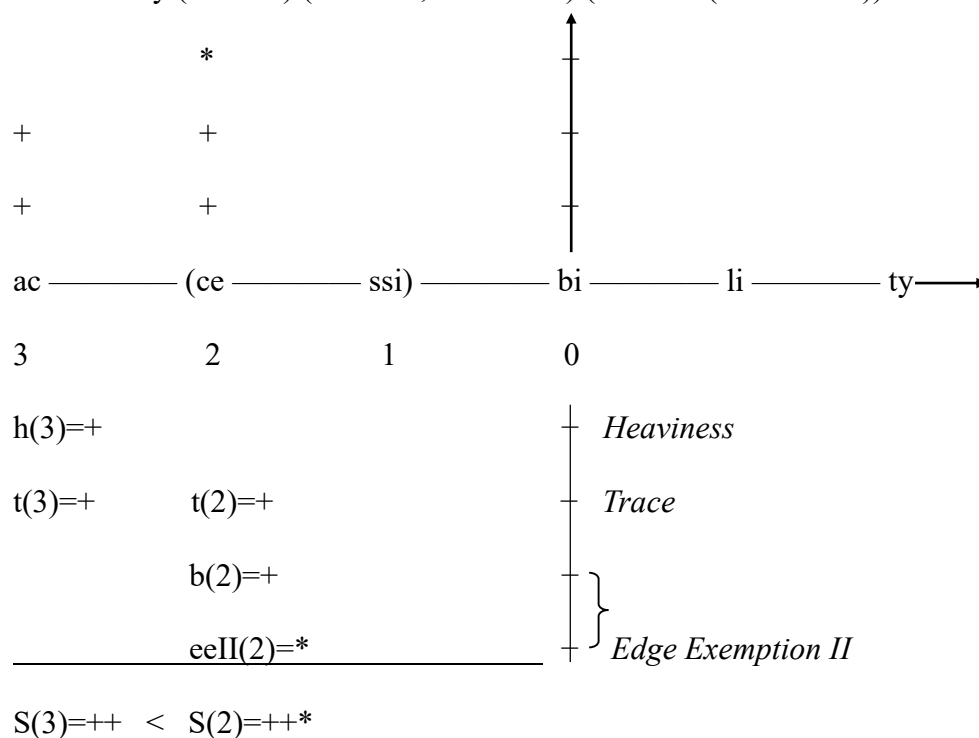
Heaviness is triggered on "ac" because it is a heavy syllable. *Trace* is activated to "ac" and "ce" since they respectively bear the primary stress in the base form *áccess* and *accéssible*. Another Positional Function that can be applied to "ce" is termed *Edge Exemption II*, which is defined below:

(25) *Edge Exemption II* (*EE-II*) (Yamada (2010b: 306-307))

　　a. If a binary constituent can be constructed by combining two successive light syllables – the first of which has a *Trace* – that are immediately preceded by a heavy syllable at the left edge of the word, the first syllable is exempted from bearing more stress.

　　b. As a result of *Edge Exemption II*, a relative stress mark "*" is added to the left head of the binary constituent by means of the formula *eeII*(x) = *, along

with "+" vacuously assigned to the binary constituent by means of the

formula $b(x) = +$.

The definition of *Edge Exemption II* in (25) states that there are three conditions for its

application:

(26) Conditions for the Application of *Edge Exemption II*:

    a. a binary constituent can be constructed by combining two successive light

       syllables;

    b. the first of the two successive light syllables has a *Trace*;

    c. the two successive light syllables are immediately preceded by a heavy

       syllable at the left edge of the word.

In (24), all the three conditions for the application of *Edge Exemption II* of (26) are

satisfied: (26a) a binary constituent can be constructed by combining two successive light

syllables, "ce" and "ssi"; (26b) the first of the two successive light syllables, "ce," has a

Trace; (26c) the two successive light syllables are immediately preceded by a heavy

syllable at the left edge of the word, that is, the syllable "ac." Therefore, *Edge Exemption

II* is triggered on the left head of the binary constituent, "ce," by means of the formula

"*eeII* (*2*) = ***", along with "+" vacuously assigned to the binary constituent by means of

the formula "$b(2) = +$". With the application of *Edge Exemption II*, syllables "ce" and

"ssi" are paired in parentheses to show the application of *Edge Exemption II* clearly. The

final expression of the result of computation is "$S(3) = ++ < S(2) = ++*$", which

demonstrates that "*S*(*3*)" is weaker than "*S*(*2*)" by one stress value. Due to the fact that the stress value difference between the two syllables is one, "*S*(*3*)" will bear tertiary stress and "*S*(*2*)" secondary stress; that is to say, the stress pattern gained is *âccèssibílity* (320100), which is correct.[11]

Focus will now be turned to another example, *orìginálity* (020100), whose analysis and computation is as follows:

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[11] Both syllables "ac" and "ce" are applied with *Trace*, so it seems that they are the same type of syllable that appears successively on the same level; to put it another way, it looks like that they meet the condition for the application of *Farness* in (6b). However, *Farness* cannot be triggered in (24). With the application of *Edge Exemption II*, the levels on which the *Traces* are triggered are distinct: the second syllable "ce" on which *Trace* is applied is within a binary constituent; by contrast, the first syllable "ac" on which the other *Trace* is applied is outside the binary constituent. This means the condition (6b) for the application of the Positional Function *Farness*, i.e. the same type of syllable on the same level, is not met in (24); namely, *Farness* cannot be triggered in (24). This discussion also implies that ordering relation does exist between Positional Function; more specifically, *Edge Exemption II* should be applied earlier than *Farness*. The application of *Edge Exemption II* destroys the necessary environment for the triggering of *Farness* and thus prevents *Farness* from being activated. Details of ordering relations between Positional Functions will be given in Chapter 7.

(27)   orìginálity (020100) (< órigin, oríginal) (cf. Yamada (2010b: 297))

```
          *                        ↑
                                   ┤
          +                        ┤
 +        +                        ┤
 o ——— (ri ——— gi) ——— na ——— li ——— ty ⟶
 3        2       1       0
 t(3)=+   t(2)=+          ┤ Trace
          b(2)=+          ┤⎫
 _____      ┤⎬ Edge Exemption I
          eeI(2)=*        ┤⎭
 S(3)=+  <  S(2)=++*
```
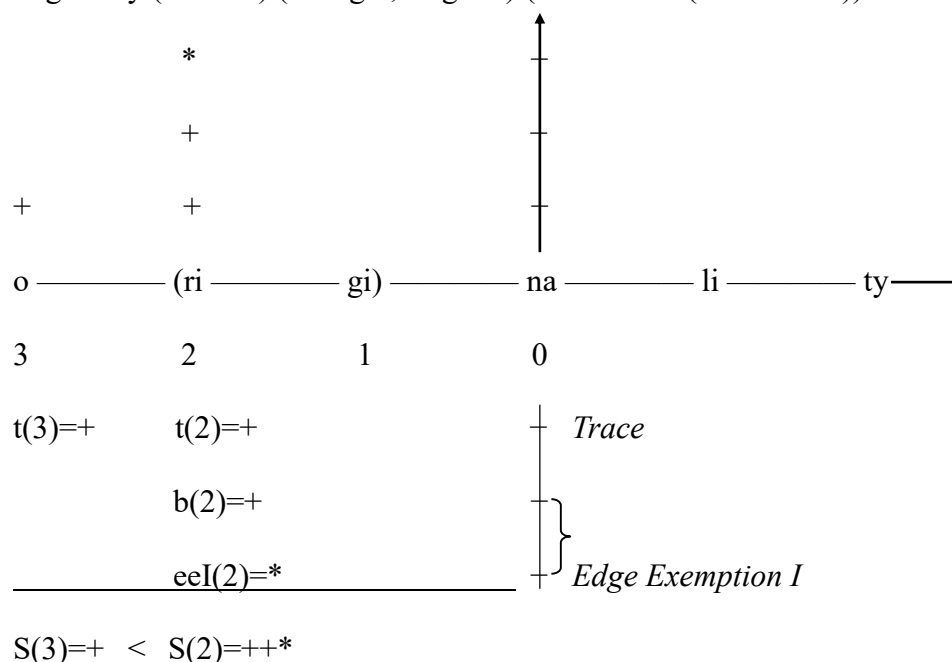
In (27), syllables "o" and "ri" are applied with *Trace*, due to the primary stress on "o" in the base form *órigin* and on "ri" in *oríginal*, respectively.[12] Another Positional Function

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[12] Yamada (2010b) triggered the Positional Function *Bare Nucleus Avoidance* to the syllable "o," which is incorrect. The definition of *Bare Nucleus Avoidance* is that "[s]tress assignment is avoided on a non-branching bare nucleus at the leftmost edge of a word by the formula $bna(x) = -$, provided that no intrinsic Positional Function is applied to the bare nucleus" (Yamada (2010b: 306)). In other words, if an intrinsic Positional Function has been applied to the syllable under discussion, *Bare Nucleus Avoidance* cannot be applied to the syllable. An intrinsic Positional Function expresses "an intrinsic characteristic of a syllable or syllables" (Yamada (2010b: 202)). Altogether, three Intrinsic Positional Functions can be witnessed in PFT, which are *Binarity*, *Heaviness*, and *Trace*. If any Positional Functions among *Binarity*, *Heaviness*, and *Trace* have been applied to the related syllable, *Bare Nucleus Avoidance* will be disqualified from the activation. In the analysis and computation in (27), *Trace* is triggered on the syllable "o," which excludes *Bare Nucleus Avoidance* from being triggered on "o." The Positional Function *Bare Nucleus Avoidance* will be detailed in the analysis of *elèctrícian* (0210) in (30). The analysis and computation in (27) appears to indicate that an ordering relation exists between *Bare Nucleus Avoidance* and the three Intrinsic Positional Functions, namely, *Binarity*, *Heaviness*, and *Trace*, with *Binarity*, *Heaviness*, and *Trace* prior to *Bare Nucleus Avoidance*. As stated in footnote 11, ordering relations will be specified in Chapter 7.

that can be activated is *Edge Exemption I*:

(28) *Edge Exemption I* (*EE-I*) (Yamada (2010b: 306))

   a. If a binary constituent can be constructed by combining two successive

       light syllables which are immediately preceded by a bare nucleus at the

       left edge of the word, the bare nucleus is exempted from bearing stress.

   b. As a result of *Edge Exemption*, a relative stress "*" is assigned to the left

       head of the binary constituent by means of the formula $eeI(x) = *$, along

       with a "+" given to the binary constituent by means of $b(x) = +$.

(28a) notes conditions for the application of *Edge Exemption I*, which are as follows:

(29) Conditions for the Application of *Edge Exemption I*:

   a. a binary constituent can be constructed by combining two successive light

       syllables;

   b. the two successive light syllables are immediately preceded by a bare

       nucleus at the left edge of the word.

In *originality*, the two successive light syllables "ri" and "gi" are immediately preceded

by "o," a bare nucleus at the left edge of the word. To put it another way, conditions for

the application of *Edge Exemption I* in (29) are satisfied. *Edge Exemption I* is triggered

on the left head of the binary constituent, "ri," along with a "+" given to the binary

constituent by means of "$b(x) = +$". With the application of *Edge Exemption I*, syllables

"ri" and "gi" are paired in parentheses to show the application of *Edge Exemption I*

clearly.[13] These are all Positional Functions that can be activated. The final expression of the result of computation is "$S(3) = + < S(2) = ++*$", where "$S(3)$" is weaker than "$S(2)$" by two stress values. Consequently, "o" will bear no stress and "ri" secondary stress. The correct stress pattern *orìginálity* (020100) is gained.

I will proceed to the example *elèctrícian* (0210) and another Positional Function related to it, *Bare Nucleus Avoidance*, whose analysis and computation is as follows:[14]

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[13] It appears that *Edge Exemption I* (28) and *Edge Exemption II* (25) are quite analogous to each other, which may make the two appear indistinguishable. As a matter of fact, the two are distinct from each other. For instance, condition (29b) of *Edge Exemption I* is that *the two successive light syllables are immediately preceded by a bare nucleus at the left edge of the word*; in other words, *Edge Exemption I* requires the leftmost syllable or the first syllable of the word be a bare nucleus. However, condition (26c) of *Edge Exemption II* states that *the two successive light syllables are immediately preceded by a heavy syllable at the left edge of the word*; to put it in another way, *Edge Exemption II* asks for the leftmost syllable or the first syllable of the word to be a heavy syllable. As a result, conditions for the application of *Edge Exemption I* and *Edge Exemption II* have distinguished them from each other. Take *âccèssibílity* (320100) and *orìginálity* (020100) as examples here. In *âccèssibílity*, the leftmost syllable or the first syllable of the word is "ac," a heavy syllable, which disqualifies *Edge Exemption I* from being applied, since *Edge Exemption I* requires a bare nucleus at the left edge of the word. In the word *orìginálity*, the leftmost syllable or the first syllable of the word is "o," a bare nucleus, which prevents *Edge Exemption II* from being applied, since *Edge Exemption II* asks for a heavy syllable at the left edge of the word. The examples of *âccèssibílity* (320100) and *orìginálity* (020100) illustrate that it is impossible for both *Edge Exemption I* and *Edge Exemption II* to be applied to the same syllable.

[14] *Electrician* has three variants in Wells (2000), namely, *elèctrícian* (0210), *èlêctrícian* (2310), and *èlectrícian* (2010). For the explanation of the other two stress patterns, *èlêctrícian* (2310) and *èlectrícian* (2010), refer to Chapter 6.

(30) elèctrícian (0210) (< eléctric) (Yamada (2010b: 227))

```
         *              |
                        |
         +              |
                        |
 *       +              |
                        |
 e ————— lec ————— tri ————— cian ——→
 2        1          0

        h(1)=+       ┤  Heaviness

        t(1)=+       ┤  Trace

        vas(1)=*     ┤  Velar-Alveolar Sequence

 r(2)=+*             ┤  Rhythm

 bna(2)=−            ┤  Bare Nucleus Avoidance
 ─────────────────

 S(2)=*  <  S(1)=++*
```
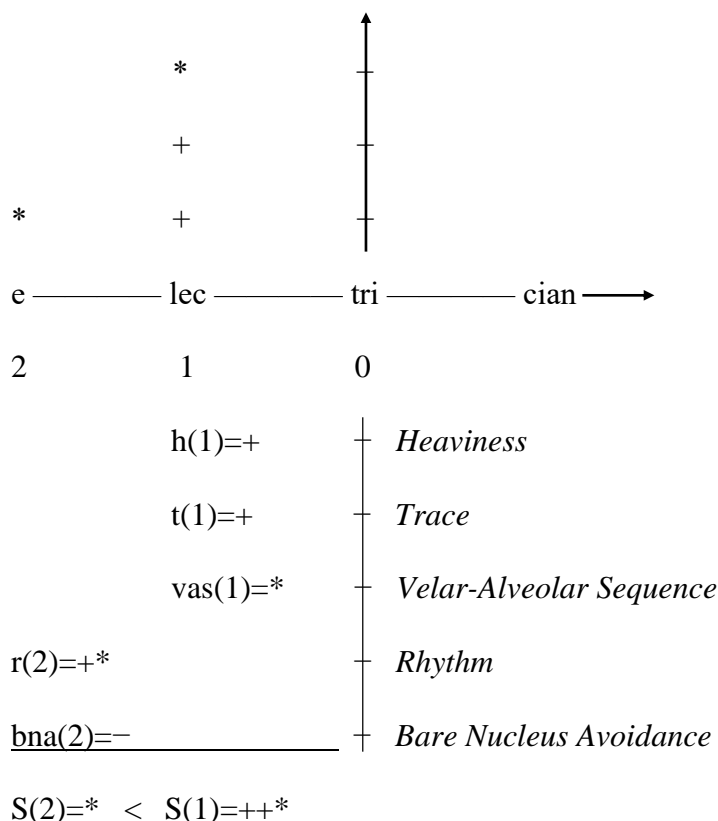
In (30), "lec" is a heavy syllable, so the Positional Function *Heaviness* applies here and

assigns stress "+" to "lec" by the formula "$h(x) = +$". *Trace* is applied to "lec" due to the

primary stress on the syllable in the underlying form *eléctric*. *Velar-Alveolar Sequence*

can also be triggered on "lec," because conditions for its application in (23) are met: (23a)

the coda /k/ of the syllable in question "lec" is a velar consonant; (23b) *Trace* is applied

to "lec," the syllable in question; (23c) the syllable in question "lec" is immediately

followed by the primary stressed syllable "tri"; (23d) the onset /t/ of the primary stressed

syllable "tri" is an alveolar consonant. Since all conditions are satisfied, *Velar-Alveolar*

Sequence is activated to "lec." After the application of *Heaviness*, *Trace*, and *Velar-*

Alveolar Sequence, "lec," the syllable immediately preceding the primary stressed

syllable bears stress value "++*"; consequently, *Rhythm* can be triggered on the leftmost syllable "e." The other Positional Function that can be activated on "e" is *Bare Nucleus Avoidance*, which is defined as below:

(31)   *Bare Nucleus Avoidance* (*BNA*) (Yamada (2010b: 306))

Stress assignment is avoided on a non-branching bare nucleus at the leftmost edge of a word by the formula *bna*(x) = −, provided that no intrinsic Positional Function is applied to the bare nucleus.

The definition in (31) implies the two conditions are necessary for the application of *Bare Nucleus Avoidance*:

(32)   Conditions for the Application of *Bare Nucleus Avoidance*:

a.   the non-branching bare nucleus is at the leftmost edge of a word;

b.   no intrinsic Positional Function is applied to the bare nucleus.

Condition (32a) is met since the syllable "e" is a non-branching bare nucleus at the leftmost edge of the word. Condition (32b) indicates that if an intrinsic Positional Function has been applied to the syllable under discussion, *Bare Nucleus Avoidance* will be inapplicable to the syllable. An intrinsic Positional Function expresses "an intrinsic characteristic of a syllable or syllables" (Yamada (2010b: 202)). Altogether, PFT consists

of three Intrinsic Positional Functions, which are *Binarity*, *Heaviness*, and *Trace*. "[I]n the case of *Heaviness*, the term itself indicates that the syllable is heavy; in the case of *Trace*, it shows that the syllable marked as *Trace* is morphologically related to the underlying base form of the derived word; and in the case of *Binarity*, the constructed constituent itself is binary" (Yamada (2010b: 202)). As for *Bare Nucleus Avoidance*, if any Positional Functions among *Binarity*, *Heaviness*, and *Trace* have been applied to the related syllable, *Bare Nucleus Avoidance* will be disqualified from the application. In the analysis and computation of (30), it is obvious that none of *Binarity*, *Heaviness*, and *Trace* has been triggered on the syllable "e." As a result, both condition (32a) and (32b) for the triggering of *Bare Nucleus Avoidance* are satisfied; and *Bare Nucleus Avoidance* is activated to "e." The final expression of the result of computation "$S(2) = * < S(1) = ++*$" indicates that the stress strength of "e" is weaker than that of "lec" by two; thus, "e" does not bear stress and "lec" bears secondary stress, which gives rise to the target stress pattern *elèctrícian* (0210).

Now my attention will be turned to *sûpèrîórity* (323100) and a new Positional Function *Binarity* related to it. The analysis and computation of *sûpèrîórity* is presented in (33):

(33)   sûpèrîórity (323100) (< súper, supérior)

$$+$$

$$+ \qquad\qquad +$$

su ——— (pe ——— ri) ——— o ——— ri ——— ty ⟶

3   2   1   0

t(3)=+   t(2)=+   ⊢ *Trace*

             b(2)=+   ⊢ *Binarity*

S(3)=+   <   S(2)=++
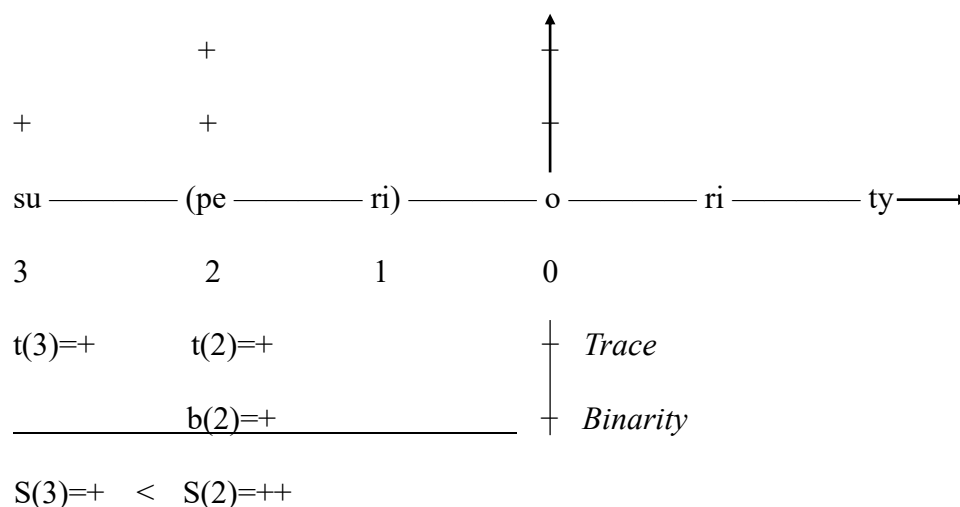
In (33), words *super* and *superior* are the base forms of *superiority*, so the primary stress on the syllable "su" in *súper* and "pe" in *supérior* will leave traces on "su" and "pe" in *superiority*, respectively. The Positional Function *Trace* is applied to both "su" and "pe." The other Positional Function that can be applied to the syllable "pe" is *Binarity*, which is defined as follows:

(34)   *Binarity* (*B*) (Yamada (2010: 305))

Add "+" under a syllable position where a Positional Function *Trace* is given, using the expression $b(x) = +$, if and only if the immediately following syllable is weak and unmarked for any other Function.

Following the definition of *Binarity* in (34), two conditions must be satisfied for the application of *Binarity*:

(35) Conditions for the Application of *Binarity*:

    a. *Trace* is given to the syllable in question;

    b. the syllable immediately following the syllable under discussion is weak and unmarked for any Positional Function.

Condition (35a) is met in both "su" and "pe," since *Trace* is triggered on both of them. With respect to condition (35b), the immediately following syllable of "su" is the syllable "pe," which is already marked with the Positional Function *Trace*. In other words, condition (35b) is not satisfied in the syllable "su." With regard to the syllable "pe," the immediately following syllable is "ri," which is weak and unmarked for any Positional Function. Since condition (35b) for the application of *Binarity* is also satisfied in "pe," *Binarity* is triggered on the syllable "pe." With the activation of *Binarity*, syllables "pe" and "ri" are paired in parentheses to show the application of *Binarity* clearly. The computation of stress value for each syllable is "$S(3) = + < S(2) = ++$", which indicates that the stress value of "su" is weaker than that of "pe" by one. Consequently, "su" will bear tertiary stress and "pe" secondary stress. In this way, the correct stress pattern *sûpèrîórity* (323100) can be gained.[15]

    So far, fourteen out of sixteen Positional Functions have been introduced. The two yet to be referred to are *Free Binarity* and *Sole Stress Reduction*. For these two Positional Functions, I will turn to two underived words, *Tennessee* and *bandana*, as instances to make exemplifications more comprehensive, since most examples I have made use of are

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[15] The tertiary stress on the syllable "ri" in *sûpèrîórity* (323100) is considered as being accounted for by a post-stress rule, such as a tensing rule before the primary stressed vowel.

derived words.

The stress pattern of *Tennessee* is *Tènnessée* (201) in Wells (2000); and its analysis and computation is as follows:

(36) Tènnessée (201)
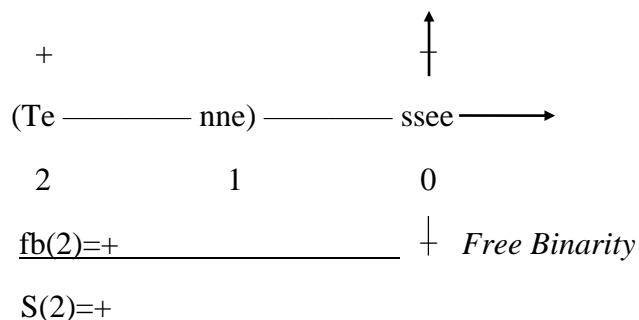
The only Positional Function that can be triggered on *Tennessee* is *Free Binarity*, which is defined as:

(37) *Free Binarity* (*FB*) (Yamada (2010a: 548))[16]

In a successive sequence of light syllables before a primary stressed syllable, an intrinsic Positional Function *Free Binarity* is triggered on the left head of each binary constituent created leftward from the primary stressed syllable, placing a stress for each binary constituent by the formula *fb*(x) = +.

The description in (37) implies that there are two steps for the application of *Free Binarity*:

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[16] The definition of *Free Binarity* is first presented in Yamada (2010b: 307), and is later revised in Yamada (2010a: 548). Since the revision in Yamada (2010a: 548) is the latest revision, I will quote it here.

(38) The Two Steps for the Application of *Free Binarity*:

 a. binary constituents should be created leftward from the primary stressed

  syllable;

 b. *Free Binarity* is triggered on the left head of each binary constituent.

By following step (38a), the first binary constituent is created between syllables "Te" and "nne" in (36). In fact, this is the only binary constituent that can be built since there are only two light syllables before the primary stressed syllable. For the binary constituent (Te nne), the left head is "*Te*"; thus *Free Binarity* is applied to the syllable "Te" in line with the statement in (38b). The next step is to calculate the stress value. As "Te" is the only syllable with stress value, it bears secondary stress; the stress pattern obtained is *Tènnessée* (201), which is in accordance with empirical facts.

 I will now turn to the final Positional Function, *Sole Stress Reduction*, which will be illustrated with the instance of *bandana*. *Bandana* has two stress patterns in Wells (2000), *bàndána* (210) and *bândána* (310). The analysis and computation for *bàndána* (210) is as follows:

(39) bàndána (210)

$$+ \qquad\qquad \uparrow$$

$$\text{ban} \rule{2em}{0.4pt} \text{da} \rule{2em}{0.4pt} \text{na} \longrightarrow$$

$$1 \qquad\qquad 0$$

$$\underline{h(1)=+} \quad + \ \textit{Heaviness}$$

$$S(1)=+$$
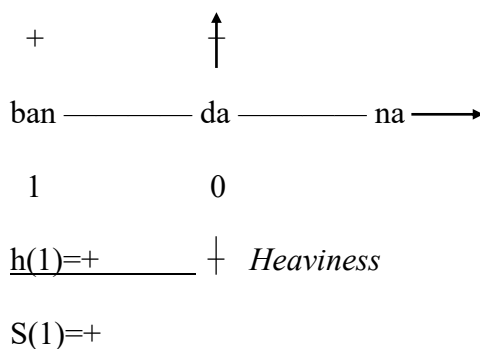
In (39), *Heaviness* is triggered on "ban" since it is a heavy syllable. The correct stress pattern *bàndána* (210) is gained.

In order to account for the other variant, *bândána* (310), *Stress Reduction* in (12) and *Sole Stress Resistance* will be activated. The analysis and computation is as below:

(40)   bândána (310) (Yamada (2010b: 296) cf. (192a))

$$\uparrow$$

ban ——————— da ——————— na⟶

　1　　　　　　0

h(1)=+　————　$+$　*Heaviness*

S(1)=+

sr(1)=−　　　$+$　*Stress Reduction*

ssr(1)=@　————　$+$　*Sole Stress Resistance*

S(1)= @
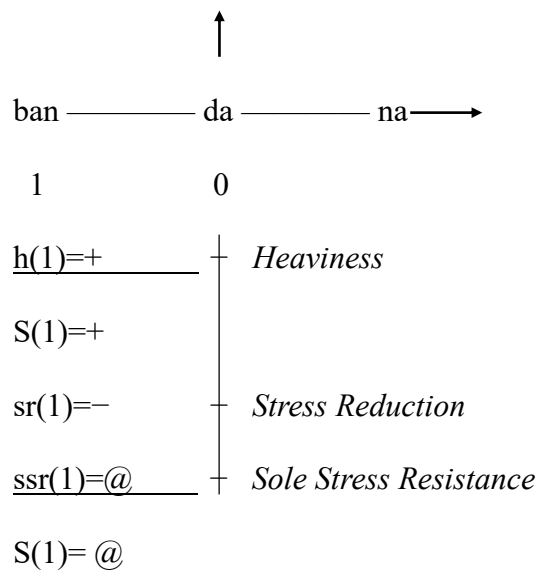
With the activation of *Stress Reduction*, the stress value of the syllable "ban" is zero, which is ungrammatical. Thus, the Positional Function *Sole Stress Resistance* will be utilized in (40) to mark a stress as not reducible to zero:

(41)   *Sole Stress Resistance* (*SSR*) (Yamada (2010b: 308))

Application of *Stress Reduction* (*SR*) is blocked by *Sole Stress Resistance* (*SSR*) by means of the formula *ssr*(*x*) = @ if the stress to be reduced is the sole stress before the primary stress.

Sole Stress Resistance is triggered on "ban." Though the computation of stress value of "ban" is zero, the stress will not be reduced to zero due to the activation of *Sole Stress Resistance*; the syllable "ban" thus bears tertiary stress. The stress pattern *bândána* (310) is explained in (40).

4.3 Summary

In this chapter, I have presented all the sixteen Positional Functions in PFT with various examples. I also revised the definition of *Category Selection Process*, based on differences between my data and the data in Yamada (2010b). Examples as *condemnation*, *confirmation*, *conversation*, *pigmentation*, and *transformation* are either beyond *SPE* and MT or not convincingly provided with an explanation within their framework. Another exemplification *expectation* is accountable by *SPE* and MT; and it can be explained by PFT as well. To diversify instances in this dissertation, stress patterns which are quite distinct from previous ones as *âccèssibílity* (320100), *elèctrícian* (0210), *orìginálity* (020100), and *sûpèrîórity* (323100) were utilized too. Except for examples of derived words, underived words like *Tennessee* and *bandana* were also referred to. Consequently, this chapter does not only present an introduction to PFT, but also partly proves the validity of PFT.

To further or even fully justify PFT, the most urgent task is to prove the credibility of its Positional Functions, since these Positional Functions are the basis of the theory. Other topics that cannot be circumvented include the treatment for variants, ordering relations among Positional Functions, and so on. In the following chapters, I will develop answers to these questions one by one.

Chapter 5

Justification for Positional Function Theory

5.0 Introduction

PFT consists of two sets of stress assignment rule, the primary stress assignment rule (henceforth PSAR) and the subsidiary stress assignment rule (hereafter SSAR), where PSAR is composed of three "Positional Functions" (which is said to be a preliminary analysis in the Positional Function Theory with regard to primary stress assignment) and SSAR sixteen "Positional Functions" (Yamada 2010a, 2010b, 2012, 2013).[1] The sixteen Positional Functions of SSAR are composed of *Alveolar Consonant Sequence*, *Bare Nucleus Avoidance*, *Binarity*, *Category Selection*, *Double Stop*, *Edge Exemption I*, *Edge Exemption II*, *Farness*, *Free Binarity*, *Heaviness*, *Rhythm*, *Rhythmic Adjustment*, *Sole Stress Resistance*, *Stress Reduction*, *Trace*, and *Velar-Alveolar Sequence*. This chapter, based on British English data, presents justifications for SSAR in terms of the parameters of English stress assignment and English data.

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[1] The three Positional Functions of PSAR are *Bounded Binarity* (*BB*), *Heaviness* (*H*), and *Rhythmic Adjustment* (*RA*). In PFT, ordering relations exist between PSAR and SSAR. To put it more explicitly, firstly, PSAR is applied to a word to determine the position for its primary stress; secondly, SSAR is applied to the word to account for its subsidiary stress. Due to the fact that the primary stress assignment mechanism and thus PASR are not the focus of this dissertation, I will omit the discussion relevant to them.

5.1 Motivation for SSAR in PFT

5.1.1 The Parameters of English Stress Assignment

The parameters of English stress assignment include weight-sensitivity, stress preservation, left foot head, and so on.

5.1.1.1 Weight-Sensitivity

Weight-sensitivity means that stress tends to fall on heavy syllables in English. This parameter is stated in the Positional Function *Heaviness*.[2] The word *torment* (verb) will be exemplified here. *Heaviness* can be triggered on the heavy syllable "tor" in *torment* (verb) for the subsidiary stress assignment, on the grounds that "tor" is a heavy syllable:

(1) tòrmént (21) (verb)

$$+ \qquad \uparrow$$

tor ——— ment ⟶

1 　　　　 0

$\underline{h(1)=+}$ 　 $\dagger$ *Heaviness*

S(1)=+
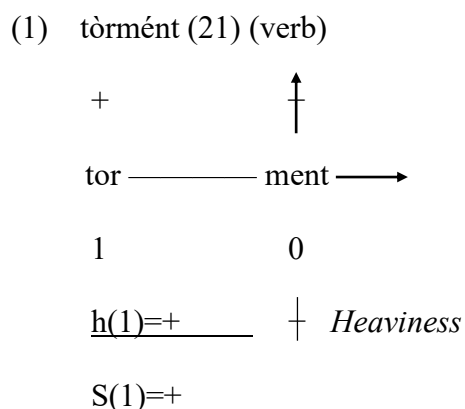
In (1), the heavy syllable "tor" is subject to the Positional Function *Heaviness*. Being the only syllable on which a Positional Function is triggered and thus the only syllable with stress value, "tor" bears secondary stress in *tòrmént* (verb).

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[2] The definition of *Heaviness* is "assign stress '+' to the heavy syllable by the formula $h(x) = y$ with the stress value '+', i.e. $h(x) = +$" (Yamada (2010b: 305)).

5.1.1.2 Stress Preservation

"Stress preservation" arguably means that English preserves a phonological "trace" of the stress given on an earlier cycle, which is stated in the Positional Function *Trace* of SSAR.[3] I will use the word *degeneration*, with the stress pattern *degènerátion* (02010) in Wells (2000), to present the justification for *Trace*:

(2) degènerátion (02010) (< degénerate) (Yamada (2010b: 192))

$$
\begin{array}{ccccc}
+ & & & & \uparrow \\
+ & & & & \\
\text{de} \text{———} & \text{(ge ———} & \text{ne)} \text{———} & \text{ra} \text{———} & \text{tion} \longrightarrow \\
3 & 2 & 1 & 0 & \\
& t(2)=+ & & & Trace \\
& b(2)=+ & & & Binarity \\
& S(2)=++ & & &
\end{array}
$$
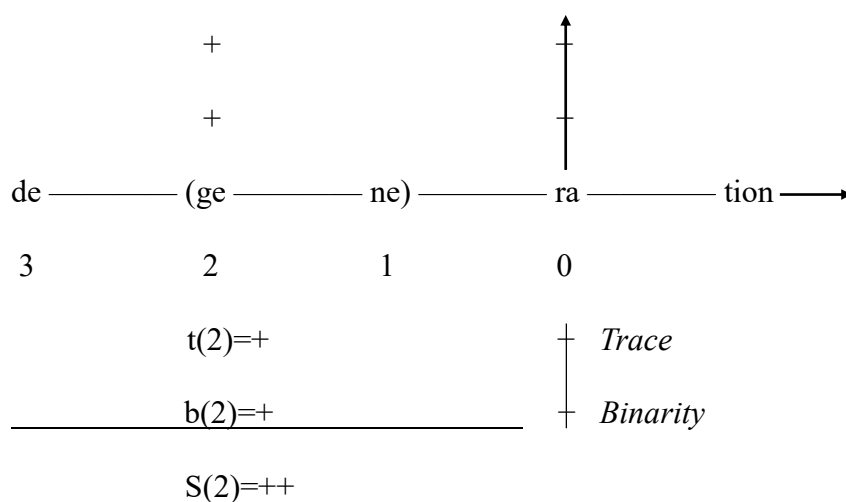
In (2), the Positional Function *Trace* is applied to the syllable "ge" in *degeneration*, because of the trace from the primary stress on "ge" in the base form *degénerate*. The next Positional Function that can be applied to "ge" is *Binarity*, which states that "[a]dd '+' under a syllable position where a Positional Function *Trace* is given, using the expression $b(x) = +$, if and only if the immediately following syllable is weak and unmarked for any other Function" (Yamada (2010b: 305)). Since "ne," the syllable

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[3] *Trace* is defined as "[s]tress the position of a trace with a value '+' using the expression $t(x) = +$, where a trace is defined as a position of stress given on an earlier cycle" (Yamada (2010b: 305)).

immediate following "ge," is weak and unmarked for any Function, the condition for the application of the Positional Function *Binarity* is met; and *Binarity* is applied to the syllable "ge." The syllables "ge" and "ne" are paired in parentheses to show the application of *Binarity*. Being the only syllable with stress value, "ge" bears secondary stress; thus, the correct stress pattern *degènerátion* (02010) is presented.

The instance *degènerátion* (02010) just discussed and other derived word exemplifications referred to in Chapter 4 can partly prove the validity of the Positional Function *Trace*. However, compared to the total number of derived words in English, the number of examples in this dissertation is incredibly small, which possibly leaves the Positional Function *Trace* subject to the criticism that it is opportunistic. To fully justify *Trace*, English data need to be taken into account of. Thus, in the present work, I will utilize CELEX Lexical Database 2 (Baayen, Piepenbrock and Gulikers (1995)) to examine stress patterns of derived words before drawing any conclusions.[4]

I will follow the next two steps. Firstly, I will examine stress preservation between base forms and derived forms of words with two cycles, i.e. *degénerate* and *degènerátion*.

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[4] Here, instead of turning to Wells (2000), I will use CELEX Lexical Database 2 (Baayen, Piepenbrock and Gulikers (1995)), based on three reasons. The first reason is that CELEX Lexical Database 2 is a database, so it is convenient to use softwares such as TeXstudio to gather and examine data that concern me; on the contrary, Wells (2000) only provides CD-ROM. The second reason is, to testify Positional Functions *Bare Nucleus Avoidance*, *Binarity*, *Edge Exemption II*, *Free Binarity*, *Trace*, *Velar-Alveolar Sequence*, and so on, I not only need the stress patterns of derived words, but also stress patterns of their base forms. Wells (2000), although supplying stress patterns of each word, does not indicate the base forms of derived words. However, the base forms of derived words and affixes of these words are clearly marked in CELEX Lexical Database 2. The last reason is that CELEX Lexical Database 2, just like Wells (2000), also provides British English data, which is in line with the requirement of this dissertation. Consequently, for the ease of study, I rely on data in CELEX Lexical Database 2 to examine the validity of Positional Functions in this chapter.

Secondly, I will gather all words with three cycles, for example, *accessibility* (*áccess*, *accéssible*) and examine stress preservation between and across different cycles.

According to my result, for words with two cycles, around 91% of words in this classification preserve stress from the first cycle, which seems to favor *Trace*. The result is shown as below:

(3) Data of words with two cycles

	count	percentage	example
proof	2900	91%	accòmmodátion (accómodâte)
anti-proof	285	9%	ìnformátion (infórm)

After completing the first step, I move on to the second step, that is, the examination of stress preservation for words with three cycles. For example, the word *accessibility*, which is exemplified in the analysis (24) of Chapter 4, is a word with three cycles: the first cycle is *áccess*, and the second cycle *accéssible*. In the analysis (24) of Chapter 4, it is claimed that both the primary stress on "a" in *áccess* and the primary stress on "ce" in *accéssible* will leave traces in *accessibility*. However, the treatment of *accessibility* is yet to be statistically verified, since it is not absolutely impossible that the primary stress from the first cycle will not be preserved in the third cycle or even none of stress from previous cycles will be preserved in the third cycle. As a result, I will divide words with three cycles into the following four subclassifications: (a) words which preserve stress from the first cycle, but not from the second cycle; (b) words which preserve stress from the second cycle, but not from the first cycle; (c) words which both preserve stress from the first

cycle and the second cycle; (d) words which neither preserve stress from the first cycle nor stress from the second cycle. The result is as follows:

(4) Data of words with three cycles

	count	percentage	example
a.	72	14.14%	àrtificiálity (ártifice, artifícial)
b.	40	7.80%	demòcratizátion (démocrat, demócratize)
c.	380	74.15%	pêrsònificátion (pérson, persónify)
d.	20	3.90%	èxhibitionístic (exhíbit, exhibítion)

The count for (d) is quite small, which is not unexpected. The count for (c) takes in the majority of words, which is in line with the assumption underlying *Trace*. In combination with the result of words with two cycles, the study here seems to suggest that derived words tend to preserve stress from all previous cycles, which provides me with justification to say that *Trace* appears to be supported.

5.1.1.3 Left Foot Head

Left foot head indicates: (1) each foot encompasses two syllables; (2) the foot head is on the left syllable. To put it another way, in each foot, the stress is on the left syllable.

For SSAR, the left-foot-head parameter is stated in Positional Functions of *Binarity*, *Edge Exemption I*, *Edge Exemption II*, *Farness*, *Free Binarity*, and *Rhythmic Adjustment*. Take the Positional Function *Binarity* as an example. The definition of *Binarity* is already presented in Section 5.1.1.2 as "[a]dd '+' under a syllable position where a Positional Function *Trace* is given, using the expression $b(x) = +$, if and only if the immediately

following syllable is weak and unmarked for any other Function" (Yamada (2010b: 305)).

The condition that "if and only if the immediately following syllable is weak and unmarked for any other Function" is in line with the nature of English of being a trochaic language. For ease of exposition, "the immediately following syllable" will be marked here as "Y"; the preceding syllable "X"; and the foot "(X Y)." In this way, the condition for the application of *Binarity* is that *add one stress value to the syllable X, if and only if Y is weak and unmarked for any other Function*. In other terms, *Binarity* adds one stress value to the left syllable in a foot. As a result, the way the *Binarity* assigns stress value is in line with the parameter of English foot typology. Take the word *anticipation,* with the stress pattern *ântìcipátion* (32010) in Wells (2000), as an example:

(5) ântìcipátion (32010) (< antícipate) (Yamada (2010b: 190))

In (5), the first syllable "an" is subject to the Positional Function *Heaviness* since "an" is a heavy syllable. Next the syllable "ti" is subject to the Positional Function *Trace* due to the primary stress on the syllable "ti" in its base form *antícipate*; at the same time, "ci,"

the immediate following syllable of "ti," is weak and unmarked for any Positional Function. Thus, the syllables "ti" and "ci" can form one foot "(ti ci)"; and the Positional Function *Binarity* is applied to the left syllable "ti" in the foot "(ti ci)." With the application of *Binarity*, syllables "ti" and "ci" are paired in parentheses to show the triggering of *Binarity* clearly. The computation of "$S(3) = + < S(2) = ++$" shows that the syllable "an" is weaker than "ti" by one stress value; accordingly "an" bears tertiary stress and "ti" secondary stress. The stress pattern of *ântìcipátion* (32010) is correctly given.

Another Positional Function that is in accordance with left-foot-head parameter is *Rhythmic Adjustment*, which is defined as "[w]hen an even-stressed pattern appears, augment the leftmost of the relevant syllables by one, by means of the formula $ra(x) = *$" (Yamada (2010b: 307)). In simple words, *Rhythmic Adjustment* assigns stress to the leftmost syllable, which is not at odds with the left-foot-head parameter for English stress assignment.

To convincingly support Positional Functions *Binarity*, *Edge Exemption I*, *Edge Exemption II*, *Farness*, and *Free Binarity*, we will turn to CELEX Lexical Database 2 to have a close look at English data and find out whether the statements in these Positional Functions are in accordance with the tendency in English data, since these Positional Functions, instead of simply adding stress to the left head in a foot, are more strictly conditioned. Take *Binarity* as an exemplification again. *Binarity* can be triggered to the syllable "X" in the foot (X Y), only if the syllable "Y" is weak and unmarked for any other Positional Function. Yamada (2010a, 2010b, 2012) does not justify the condition that the syllable "Y" is weak and unmarked for any other Positional Function; thus, my task here is to assertain whether what is stated in these Positional Functions are in line with data.

Firstly, the Positional Function *Farness* will be exemplified. Its definition and the condition for application is as below:

(6) a. *Farness* (Yamada (2010b: 305))

Subsidiary stress is placed as far left as possible from the position of primary stress, with the value "*" of the Function *Farness*, by means of the formula *f*(*x*) = *y*, i.e. *f*(*x*) = *.

b. Condition for the Application of *Farness* (Yamada (2010b: 241))

Farness is activated only when the same type of syllable appears successively on the same level.

As depicted in (6b), the condition for the triggering of *Farness* is that "the same type of syllable appears successively on the same level." Namely, several syllables of the same type can be witnessed on the same level. There are, generally speaking, two possibilities: (i) several neighboring light syllables on the same level, (ii) several neighboring heavy syllables on the same level. If condition (6b) is satisfied, stress will be "placed as far left as possible from the position of primary stress" in line with (6a); to put it more explicitly, stress will be placed to the leftmost syllable of the word.

If what is noted in (6) about *Farness* is in line with English data and thus correct, then the following points should be able to be witnessed in CELEX Lexical Database 2:

(7) a. when there are several consecutive heavy syllables to the left of the primary

        stressed syllable, the heavy syllable on the left edge tends to bear stress;[5]

    b. when there are several consecutive light syllables to the left of the primary

        stressed syllable, the light syllable on the left edge tends to bear stress.

In order to testify the tenability of the assumptions in (7), I calculate the count of words

that meet the following four descriptions, respectively:

(8) a. there are several consecutive heavy syllables to the left of the primary stressed

        syllable; and the heavy syllable on the left edge bears stress;

    b. there are several consecutive light syllables to the left of the primary stressed

        syllable; and the light syllable on the left edge bears stress;

    c. there are several consecutive heavy syllables to the left of the primary stressed

        syllable; and the heavy syllable on the left edge does not bear stress;

    d. there are several consecutive light syllables to the left of the primary stressed

        syllable; and the light syllable on the left edge does not bear stress.

What is stated in (8a) and (8b) is in line with the Positional Function *Farness*; while (8c)

and (8d) argues against *Farness*. Thus, if the count of (8a) and (8b) outnumbers the count

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[5] In (7a), it is stated that *there are several consecutive heavy syllables to the left of the primary stressed syllable*. Instead of describing the exact number of syllables, I use the term *several*. However, it is not difficult to tell that usually there are two or three syllables to the left of the primary stressed syllable in a word, in consideration of the length of English words. As a result, if there are several consecutive syllables of the same kind to the left of the primary stressed syllable, the count of syllables, under most circumstances, should be two or three. This does not only apply to the description in (7), but also to (8).

of (8c) and (8d), it can, at least, partly prove that *Farness* is tenable. In CELEX Lexical Database 2, the count of (8a) and the count of (8b) is 994 times; the count of (8c) and the count of (8d) is 44 times. The result is as follows:

(9) Data for *Farness*

	count	percentage	example
(8a) and (8b)	994	95.76%	brìgadíer (201)
(8c) and (8d)	44	4.24%	commèmorátion (02010)

The count of (8a) and (8b) outnumbers (8c) and (8d) greatly, which appears to support the claim (7a) that when there are several consecutive syllables of the same type to the left of the primary stressed syllable, the syllable on the left edge tends to bear stress.

As noted in the above, if (7) can be verified by use of CELEX Lexical Database 2, then the speculative nature of *Farness* can assert itself more firmly. This is due to the fact that what is assumed in *Farness* is in line with English stress assignment parameter and generally goes along with English data.

After the specification of how to support the validity of *Farness* by use of CELEX Lexical Database 2, I will move on to other Positional Functions in this section, namely, *Binarity*, *Edge Exemption I*, *Edge Exemption II*, and *Free Binarity*.

As analyzed in (5), the conditions for the triggering of *Binarity* are: (a) there is one syllable that bears the primary stress in the base form; (b) the syllable just discussed is immediately followed by a syllable which is weak and unmarked for any other Function; (c) if conditions (a) and (b) are both satisfied, stress will be given to the syllable that bears the primary stress in the base form. In order to testify to the validity of *Binarity*, I find

out all words that meet requirements in (a) and (b) in CELEX Lexical Database 2. The result is as follows:

(10) Data for *Binarity*

	count	percentage	example
proof	430	93.47%	pètrifáction (pétrify)
anti-proof	30	6.53%	ìmposítion (impóse)

The total number of words is 460, among which 430 words bear stress patterns that are in line with the description in (c). As a result, *Binarity* appears to be supported by data as well.

Edge Exemption I states that "[i]f a binary constituent can be constructed by combining two successive light syllables which are immediately preceded by a bare nucleus at the left edge of the word, the bare nucleus is exempted from bearing stress"; as a result of *Edge Exemption I*, "a relative stress '*' is assigned to the left head of the binary constituent by means of the formula $eeI(x) = *$, along with a '+' given to the binary constituent by means of $b(x) = +$" (Yamada (2010b: 306)). In plain terms, *Edge Exemption I* implies that: (a) the first syllable of the word is a bare nucleus; (b) two consecutive light syllables are next to the bare nucleus; (c) the bare nucleus is exempted from bearing stress; (d) stress will be assigned to the left of the two consecutive light syllables. As a result, if *Edge Exemption I* is plausible, I should be able to find a similar tendency for stress assignment in English data as noted in (c) and (d) for words which meet the conditions (a) and (b). The result is illustrated in (11):

(11)   Data for *Edge Exemption I*

	count	percentage	example
proof	166	71.24%	egàlitárian (02010)
anti-proof	67	28.76%	ìdiosýncrasy (02010)

The data from CELEX Lexical Database 2 illustrate that, among words that meet the conditions (a) and (b) for the application of *Edge Exemption I*, the count that is in accordance with the description in (c) and (d) is 166 times, while the count that goes against (c) and (d) is 67. Consequently, it seems fair to conclude that *Edge Exemption I* is, at least, not at odds with English data.

Edge Exemption II is specified as "[i]f a binary constituent can be constructed by combining two successive light syllables – the first of which has a *Trace* – that are immediately preceded by a heavy syllable at the left edge of the word, the first syllable [the first syllable of the word] is exempted from bearing more stress. As a result of *Edge Exemption II*, a relative stress mark '*' is added to the left head of the binary constituent by means of the formula $eeI(x) = *$, along with '+' vacuously assigned to the binary constituent by means of the formula $b(x) = +$" (Yamada (2010b: 306-307)). *Edge Exemption II* notes that: (a) the first syllable of the word is a heavy syllable; (b) two successive light syllables are next to the heavy syllable; (c) the first of the two light syllables is applied with *Trace*; (d) stress will be assigned to the first of the two consecutive light syllables. Analogous to *Edge Exemption I*, I will examine whether the stress assignment tendency is similar to what is stated in (d) for words which satisfy specifications in (a), (b), and (c). The details are as follows:

(12) Data for *Edge Exemption II*

	count	percentage	example
proof	45	90%	hûmànitárian (húman, humánity)
anti-proof	5	10%	sèxagenárian (sexágenary)

In CELEX Lexical Database 2, there are 58 words which meet the conditions in (a), (b), and (c). Among them, 45 words are in line with the stress assignment tendency noted in (d), while 5 words are opposite to the statement in (d).[6] The total number of proofs for *Edge Exemption II* may not be large, but the contrast between proof and anti-proof is sharp. Consequently, it seems fair to proceed to declare that *Edge Exemption II* can find its basis in empirical facts.

Free Binarity is described as "[i]n a successive sequence of light syllables before a primary stressed syllable, an intrinsic Positional Function *Free Binarity* is triggered on the left head of each binary constituent created leftward from the primary stressed syllable, placing a stress for each binary constituent by the formula $fb(x) = +$" (Yamada (2010a: 548)). Namely, for each binary constituent of two successive light syllables created

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[6] The remaining 8 words are neither proof nor anti-proof for *Edge Exemption II*; in other words, they are neutral. The word *humiliation* will be exemplified. *Humiliation* meets the conditions addressed in (a), (b), and (c) for the application of *Edge Exemption II*: (a) the first syllable "hu" is a heavy syllable; (b) two successive light syllables "mi" and "li" are next to the heavy syllable; (c) the first of the two light syllables "mi" is applied with *Trace*, due to the primary stress on the "mi" in the base form *humíliate*. Two stress patterns of *humiliation* can be witnessed in CELEX Lexical Database 2: *hûmìliátion* (32010) and *hùmiliátion* (20010). The first variant *hûmìliátion* (32010) shows a stress pattern that is in accordance with the description in (d), since stress is assigned to the syllable "mi," the first of the two consecutive light syllables; while the second one *hùmiliátion* (30010) is contrary to the description in (d), as stress is not assigned to "mi," the first of the two consecutive light syllables. Since both stress patterns of proof and anti-proof can be witnessed in one word, I name this kind of examples as neutral instances and will not include them as evidence for or against *Edge Exemption II*.

leftward from the primary stressed syllable, *Free Binarity* is triggered on the left head of each binary constituent; in other words, such binary constituents should be trochaic. If what is claimed in *Free Binarity* is in line with empirical facts, then I should be able to notice such stress assignment tendency in Celex Lexical Database 2. Details are as follows:

(13) Data for *Free Binarity*

	count	percentage	example
trochaic feet	3774	100%	jèremíad (201)
iambic feet	0	0%	

According to my study, the data appear to support *Free Binarity*, since the count for trochaic feet is 3774 and iambic feet zero, which is not unexpected in consideration of the left-foot-head parameter.

5.1.2 English Data

Positional Functions of *Alveolar Consonant Sequence*, *Bare Nucleus Avoidance*, *Double Stop*, *Rhythm*, *and Velar-Alveolar Sequence*, all of which belong to SSAR, can find their basis in English data.[7]

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[7] The dissertation is based on British English data, so I will only examine whether Positional Functions of *Alveolar Consonant Sequence*, *Bare Nucleus Avoidance*, *Double Stop*, *Rhythm*, *and Velar-Alveolar Sequence* show the stress assignment tendency in British English data, namely, in Celex Lexical Database 2. The examination of stress assignment tendency in American English data will be left for future research.

Take the Positional Function *Bare Nucleus Avoidance* as an example. This Positional Function is defined as "[s]tress assignment is avoided on a non-branching bare nucleus at the leftmost edge of a word by the formula $bna(x) = -$, provided that no Intrinsic Positional Function is applied to the bare nucleus" (Yamada (2010b: 306)). To put it more precisely, there are two conditions for the application of *Bare Nucleus Avoidance*:

(14) Conditions for the Application of *Bare Nucleus Avoidance*:

    a. the leftmost edge of a word is a non-branching bare nucleus;

    b. no Intrinsic Positional Function is applied to the bare nucleus.

Condition (14a) for the application of *Bare Nucleus Avoidance* states that *the leftmost edge of a word is a non-branching bare nucleus*; in other words, words that may trigger the activation of *Bare Nucleus Avoidance* must initiate with a non-branching bare nucleus syllable. For example, words such as *elastic* may trigger the activation of *Bare Nucleus Avoidance* to it, since it begins with the syllable "e," a non-branching bare nucleus syllable. On the contrary, words as *condensation* cannot trigger the application of *Bare Nucleus Avoidance* to it, since it initiates with the syllable "con," a branching syllable with an onset, a nucleus, and a coda.[8] Condition (14b) for the application of *Bare Nucleus Avoidance* is that no Intrinsic Positional Function is applied to the bare nucleus. There are altogether three Intrinsic Positional Functions: *Heaviness*, *Trace*, and *Binarity*.[9] Thus,

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[8] Words such as *inclination*, although beginning with the letter "i," is impossible to trigger the activation of *Bare Nucleus Avoidance*, due to the fact that the first syllable in *inclination* is "in," which is a branching syllable with a nucleus and a coda.

[9] For details about these three intrinsic Positional Functions and why they are termed as

condition (14b) means that neither *Heaviness*, *Trace*, nor *Binarity* should be applied to the bare nucleus. Consequently, conditions for the application of *Bare Nucleus Avoidance* in (14) can be reinterpreted as the following:

(15) Conditions for the Application of *Bare Nucleus Avoidance*:

    a. the leftmost edge of a word is a non-branching bare nucleus;

    b. The bare nucleus is not applied with *Heaviness*, *Trace*, or *Binarity*.

The definition of *Bare Nucleus Avoidance* states that the formula of *Bare Nucleus Avoidance* is "$bna(x) = -$". To put it differently, the formula of *Bare Nucleus Avoidance* reduces the stress value of related syllables, since the stress value assigned by it is "$-$", a minus. Therefore, *Bare Nucleus Avoidance* tends to ask related syllables to lose subsidiary stress.

Following the above discussion, if most words that meet the conditions for the application of *Bare Nucleus Avoidance* in (15) do not bear subsidiary stress on their first syllables, then the validity of *Bare Nucleus Avoidance* seems to be certified. On the other hand, if most words that meet the conditions for the application of *Bare Nucleus Avoidance* in (15) bear subsidiary stress on their first syllables, then *Bare Nucleus Avoidance* will be proven wrong.

Accordingly, in this section I examine all words that meet conditions in (15) and find out that 88% of those words do not bear subsidiary stress on their first syllables. Therefore, the Positional Function *Bare Nucleus Avoidance* reflects the tendency of

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intrinsic Positional Functions, refer to Section 4.2 of Chapter 4 and Yamada (2010b).

subsidiary stress assignment in British English data. Or in others words, the validity of *Bare Nucleus Avoidance* appears to be attested by empirical data. *Epìstemólogy* (020100), one of stress variants of *epistemology* in Wells (2000), will be used as an instance here:

(16)   epìstemólogy (020100)

$$
\begin{array}{c}
+ \qquad\qquad\qquad \uparrow \\[2pt]
\text{e} \rule[2pt]{2em}{0.4pt} \text{pis} \rule[2pt]{2em}{0.4pt} \text{te} \rule[2pt]{2em}{0.4pt} \text{mo} \rule[2pt]{2em}{0.4pt} \text{lo} \rule[2pt]{2em}{0.4pt} \text{gy} \rightarrow \\[2pt]
3 \qquad\quad 2 \qquad\quad 1 \qquad\quad 0
\end{array}
$$

h(2)=+   ┼ *Heaviness*

bna(3)=−   ┼ *Bare Nucleus Avoidance*

S(3)=− < S(2)=+
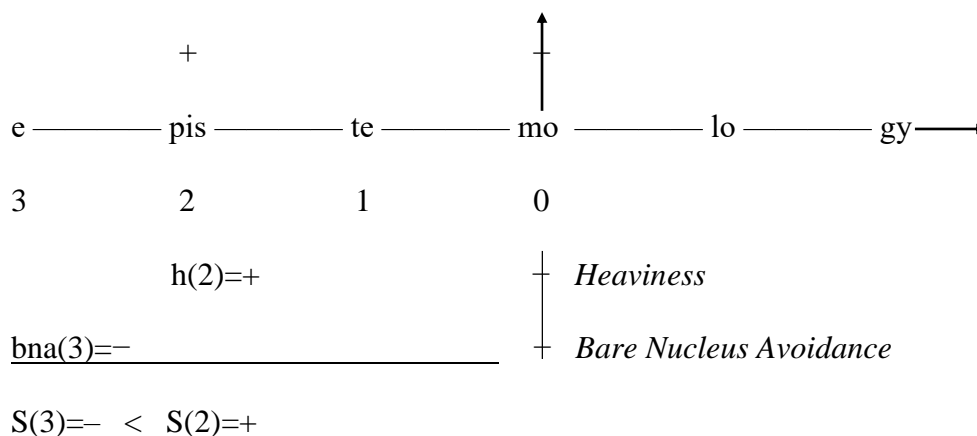
In (16), the syllable "pis" is subject to the Positional Functions of *Heaviness*. The first syllable "e" is a non-branching bare nucleus at the leftmost edge of the word and is not subject to any intrinsic Positional Functions. It, thus, satisfies the condition for the application of the Positional Function *Bare Nucleus Avoidance*, whose activation is expressed by the formula "*bna (3) = −*". The final computation of "*S(3) = − < S(2) = +*" indicates that the stress value of "e" is weaker than that of "pis" by two. Consequently, "e" bears no stress and "pis" secondary stress, which gives the correct stress pattern *epìstemólogy* (020100).

After justifying *Bare Nucleus Avoidance*, I will move on to the next few Positional Functions left in this subsection: *Alveolar Consonant Sequence*, *Double Stop*, *Rhythm*, and *Velar-Alveolar Sequence*.

Alveolar Consonant Sequence is defined as "[i]n an alveolar consonant

concatenation across distinct syllables, the stress value of a heavy syllable ending in a nasal consonant immediately followed by the primary stressed syllable is augmented by one if the onset consonant of the primary stressed syllable is voiceless, or if the coda consonant immediately preceding the syllable in question is voiceless" (Yamada (2010b: 306)). As a result, I firstly find out all words that meet the condition for the application of *Alveolar Consonant Sequence*; secondly, I make a close examination of the related syllables. If most syllables in question bear stress, then I may claim that *Alveolar Consonant Sequence* is based on phonological facts. The data appear to support me: the total number of relevant words is 75, with 22 as counterexamples and 53 as examples.

Double Stop notes that "[f]or a successive segmental sequence across the first and second syllables immediately preceding the primary stressed syllable, if the first syllable ends in the alveolar nasal stop consonant /n/ immediately followed by the second syllable with a stop consonant as its onset, a stress mark '*' is placed under the second syllable by the formula $ds(x) = *$" (Yamada (2010b: 307)). Following the definition of *Double Stop*, I look for words with two syllables immediately preceding the primary stressed syllable, where the first syllable ends in /n/ and the second syllable initiates with a stop consonant. Since the stress is assigned to the second syllable according to *Double Stop*, I examine whether the second syllables in respective words bear stress. The count for the second syllables with stress is 3648, while the count for the second syllables without stress is 401; thus the data appear to attest *Double Stop*.

Rhythm, with the formula $r(x) = +*$, "is activated on the leftmost syllable if the syllable immediately preceding the primary stressed syllable bears stress" (Yamada (2010b: 306)). Therefore, I examine the number of words that meet the following two conditions respectively:

(17)   a.   the syllable immediately preceding the primary stressed syllable and the first syllable of the word both bear stress;

         b.   the syllable immediately preceding the primary stressed syllable bears stress, but the first syllable of the word does not bear stress.

If the count for (17a) outnumbers (17b) largely, then it might be reasonable to claim that *Rhythm* could be supported by empirical data. The counts for (17a) and (17b) are 4996 and 245 respectively, which does not run afoul of *Rhythm*.

Velar-Alveolar Sequence is defined as "[i]f a velar consonant of the coda of the syllable in question is immediately followed by an onset alveolar consonant of the primary stressed syllable, and at the same time if a *Trace* is activated on the syllable in question, stress is assigned to the syllable ending with the velar consonant" (Yamada (2010b: 306)). Consequently, I examine whether the syllables ending with the velar consonants bear stress when conditions for the application of *Velar-Alveolar Sequence* are satisfied. Altogether, I find 25 words as proof, 11 words as anti-proof, and 13 neutral words. The number is not large, but still proof outnumbers anti-proof, so it appears that *Velar-Alveolar Sequence* is not at odds with empirical data.

The following table is a summary of data for *Alveolar Consonant Sequence*, *Double Stop*, *Rhythm*, and *Velar-Alveolar Sequence*:[10]

---

[10] The final stress pattern of a word is not decided by one Positional Function; it is determined by a combination of all relevant Positional Functions.

(18)	proof [percentage]	anti-proof [percentage]
Alveolar Consonant Sequence	53 [67.94%]	22 [32.06%]
Double Stop	3648 [90.09%]	401 [9.91%]
Rhythm	4996 [95.32%]	245 [4.68%]
Velar-Alveolar Sequence	25 [69.44%]	11 [30.56%]

5.2 Summary

Yamada (2010b) presents all the Positional Functions referred to in this chapter, but he does not go too much into motivations behind them. Without a clear statement about motivations, the validity of these Positional Functions cannot be proven. For example, the Positional Function *Bare Nucleus Avoidance* is first proposed with the example of *elèctrícian* (0210) in Yamada (2010b: 227), but Yamada (2010b) only states that the correct stress pattern of *electrician* and several other instances can be gained with the activation of *Bare Nucleus Avoidance*. In order to fill the gap, this chapter reveals the

motivation behind Positional Functions in terms of the parameters of English stress assignment mechanism and British English data.

Chapter 6

Methods to Account for Variants in Positional Function Theory

6.0 Introduction

It might be justified to state that the explanation of variants is an unavoidable task for all phonological theories, and this is why I will try to account for variant stress patterns within the framework of PFT in this chapter.

Section 6.1 will show that all variants of a word are closely related, and hence Section 6.2 will propose one stress pattern of a word as the default and all other variants, alternatives, as being obtained by setting Positional Functions as parameters differently from the default. The subsidiary stresses of the default of a word are given by PFT, without any optional Positional Functions or lexical treatment. The major instance for Section 6.2 is *electricity*. Section 6.3, by use of another exemplification, *segmentation*, further attests the validity of the treatment in this chapter. Section 6.4 presents a summary for the whole chapter.

6.1 Resemblances among Variants

The major exemplification for this chapter is *electricity*, which is chosen on the basis of the following two reasons. The first reason is that the focus of this chapter is how to account for variants. *Electricity* is a perfect example, since it has three variants. The second reason, as noted in Chapter 2 and Chapter 3, is that this word has called both

SPE and MT into question. If all the three stress patterns of this word can be provided with reasonable explanations within the framework of PFT, then it seems fair to declare that this word provides certain justification for PFT.

The three stress patterns of *electricity* in Wells (2000) are *elèctrícitŷ* (02103), *èlectrícitŷ* (20103), and *èlêctrícitŷ* (23103).[1] Several common points among the three variants can be noticed: (a) the position of primary stress is always on "tri"; (b) "ci," a syllable to the right of the primary stressed syllable "tri," does not bear stress; (c) *èlectrícitŷ* (20103) and *èlêctrícitŷ* (23103) both have secondary stress on the first syllable "e." Closer observation shows that these similarities are shared by all examples in (1):

(1) accessibility: accèssibílity   âccèssibílity

     adaptation: àdâptátion   àdaptátion

     affectation: àffêctátion   àffectátion

     condemnation: còndêmnátion   còndemnátion

     condensation: còndênsátion   còndensátion

     electricity: elèctrícitŷ   èlectrícitŷ   èlêctrícitŷ

     Epaminondas: Êpàminóndas   Epàminóndas

     ostentation: òstêntátion   òstentátion

     segmentation: sègmêntátion   sègmentátion

For all variant stress patterns of each word in (1), they resemble each other in the following three points: (i) the primary stress of all variants of one word is on the same

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[1] The tertiary stress on the final syllable "ty" is taken to be given by a rule outside the present system, i.e. the tensing rule in *SPE* and others.

syllable; (ii) syllables to the right of the primary stressed syllable do not bear stress; (iii) variants of one word share similar positions for subsidiary stresses.[2]

Those similarities appear to indicate that all stress patterns of a word are not isolated entities. Instead, they seem to be related to each other. Based on this assumption, it is proposed here that one variant with a specific stress pattern is the "default" of one word and all other stress patterns, termed "alternatives," are accounted for by making adjustments to the parameter settings for the default.

The idea underlying my treatment for variants here is that, on the one hand, I think different speakers set parameters in distinct ways, and this leads to variants. As a result, to account for variants, I must capture the differences in parameter settings. On the other hand, I notice that variants do share similarities with each other. Consequently, I think that although different variants are given rise to by different parameter settings, the differences in parameters may not be overwhelmingly large. If the differences between parameter settings are enormous, then stress patterns of variants may as well be quite distinct from each other. Following this supposition, I propose the concept of default variant and alternative variant. If the treatment here can provide a reasonable and systematic account for variants, then it may gain a certain credibility. In Section 6.2 and 6.3, I will proceed to details and examine whether my treatment is tenable or not.

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[2] More examples analogous to those listed in (1) are not difficult to locate in Wells (2000).

6.2 Default Variant and Alternative Variant

6.2.1 Default Variant

Firstly, the subsidiary stress rule in PFT, without any optional Positional Functions or lexical treatment, will be applied to the word *electricity* to account for its default variant.

(2) electricity (< eléctric) (cf. Yamada (2010: 297-298))[3]

```
        *               
                        
        +               
                        
*       +               
                        
e ————— lec ————— tri ————— ci ————— ty ——→

2        1        0
```

h(1)=+	*Heaviness*
t(1)=+	*Trace*
vas(1)=*	*Velar-Alveolar Sequence*
r(2)=+*	*Rhythm*
bna(2)=−	*Bare Nucleus Avoidance*

S(2)=* < S(1)=++*
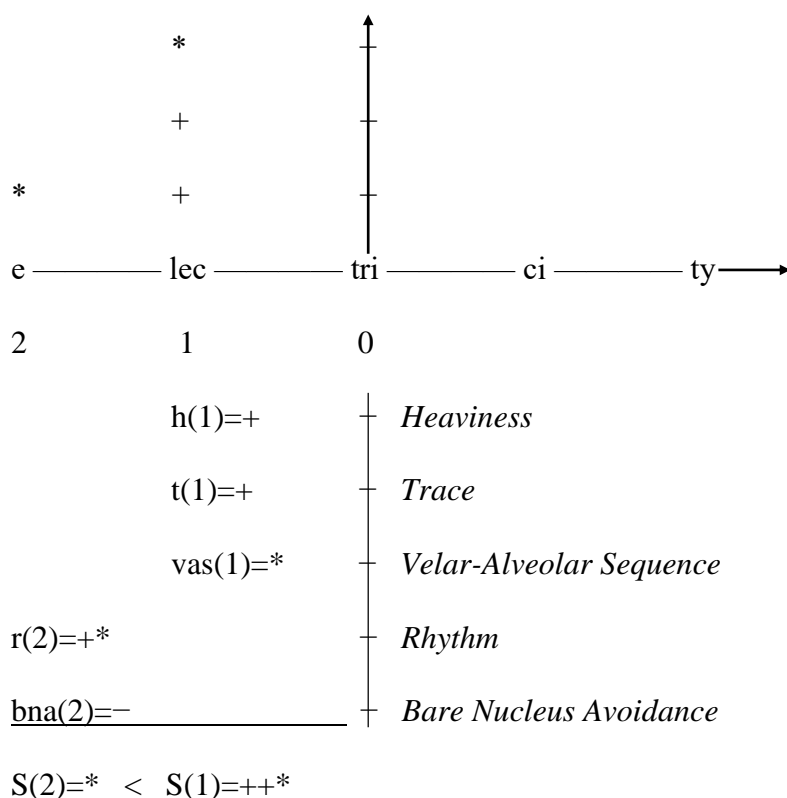
In (2), the second syllable "lec" is a heavy syllable, so the Positional Function *Heaviness* applies here and assigns stress "+" to "lec" by the formula "$h(x) = +$". *Trace* is applied to "lec" due to the primary stress on the syllable in the base form *eléctric*. *Velar-Alveolar*

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[3] Up until here, it is yet unclear which variant is the default variant of the word *electricity*, so no stress signs are marked on *electricity* in (2).

Sequence can also be triggered on "lec," since conditions for its application in (3) are all met:

(3) Conditions for the Application of *Velar-Alveolar Sequence*:

a. the coda of the syllable in question is a velar consonant;

b. *Trace* is applied to the syllable in question;

c. the syllable in question is immediately followed by the primary stressed syllable;

d. the onset of the primary stressed syllable is an alveolar consonant.

In the computation of (2), all the four conditions in (3) are satisfied: (3a) the coda /k/ of the syllable in question "lec" is a velar consonant; (3b) *Trace* is applied to the syllable in question "lec"; (3c) the syllable in question "lec" is immediately followed by the primary stressed syllable "tri"; (3d) the onset /t/ of the primary stressed syllable "tri" is an alveolar consonant. Consequently, *Velar-Alveolar Sequence* is activated on "lec." After the application of *Heaviness*, *Trace*, and *Velar-Alveolar Sequence*, "lec," the syllable immediately preceding the primary stressed syllable, bears stress value "++*". Therefore, *Rhythm* can be triggered on the leftmost syllable "e." The Positional Function *Bare Nucleus Avoidance* can also be activated on "e," due to the fact that the syllable "e" is a non-branching bare nucleus at the leftmost edge of the word.[4] The final expression of the result of computation "$S(2) = * < S(1) = ++*$" shows that the stress value of "e" is weaker

---

[4] *Bare Nucleus Avoidance* is defined as "[s]tress assignment is avoided on a non-branching bare nucleus at the leftmost edge of a word by the formula $bna(x) = -$, provided that no intrinsic Positional Function is applied to the bare nucleus" (Yamada (2010b: 306)).

than that of "lec" by two. Thus, "e" does not bear stress and "lec" bears secondary stress, which gives rise to the stress pattern *elèctrícitŷ* (02103).

All Positional Functions applied in (2), such as *Heaviness*, *Bare Nucleus Avoidance*, etc., are based on the phonological characters of respective syllables; none of them is an optional Positional Function or ad hoc treatment.[5] As a result, the stress pattern *elèctrícitŷ* (02103) given in (2) is the default of the word *electricity*. In other words, the first variant *elèctrícitŷ* (02103) of the word *electricity* in (1) is the default variant. Accordingly, the other two variants in (1), *èlectrícitŷ* (20103) and *èlêctrícitŷ* (23103) are alternative variants. Table (4) is presented to give a clear illustration of the default and alternatives of the word *electricity*:

(4) Default Variant: a. elèctrícitŷ (02103)

      Alternative Variants: b. èlectrícitŷ (20103)

                                 c. èlêctrícitŷ (23103)

6.2.2 Alternative Variant

Having given the default variant, *elèctrícitŷ* (02103), now I will move on to the comparison between the default variant and alternative variants for variant stress patterns. With reference to the variant stress patterns, adjustments have to be made to the set of Positional Functions for the default variant to account for alternative variants.

Details of adjustments to rearrange the Positional Functions as parameters in British English for alternative variants include: (i) vowels of syllables that gain subsidiary
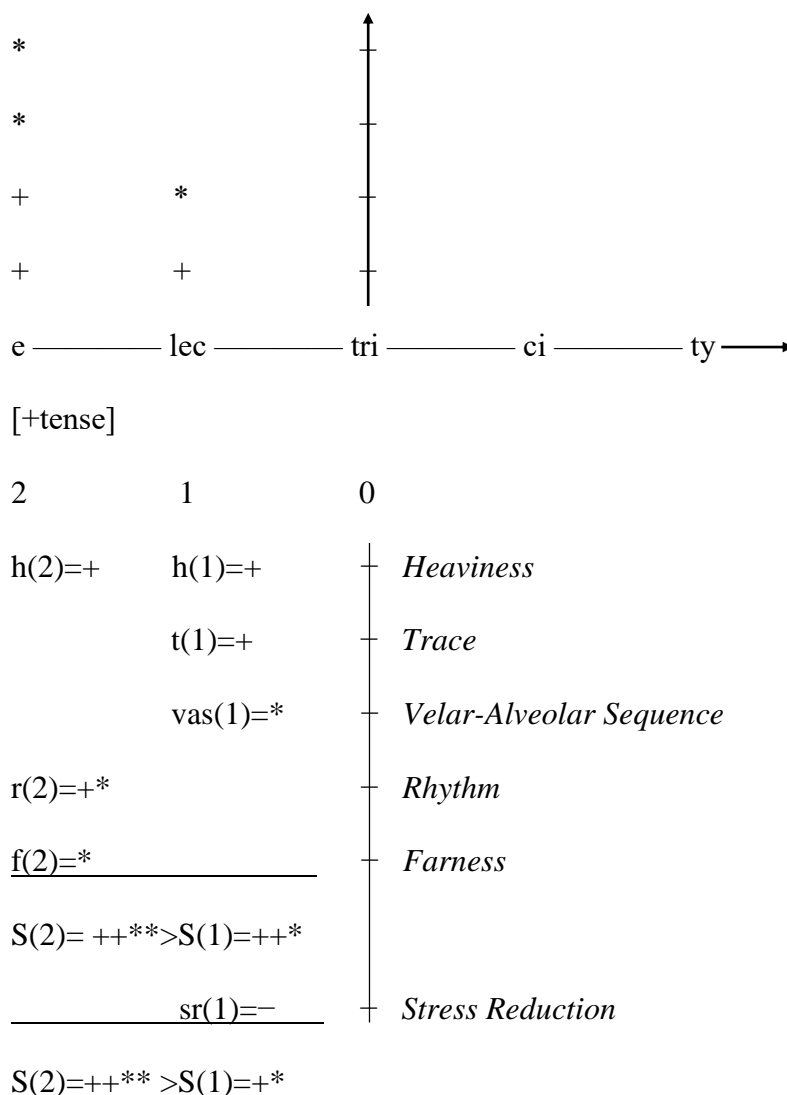
---

[5] Here, only Positional Functions closely related to this chapter are fully explained.

stress in alternative variants are assigned the distinctive feature [+tense], which refers to long vowels, so these syllables can be taken as heavy syllables and their stress value can be augmented with heavy-syllable-related Positional Functions; (ii) stress strength of syllables that lose subsidiary stress in alternative variants will be reduced with a lexically specified optional Positional Function, *Stress Reduction* (*SR*); (iii) except for the above two conditions, stress value of syllables will not be changed. As shown in (4), the word *electricity* comprises two alternative variants, *èlectrícitŷ* (20103) and *èlêctrícitŷ* (23103). Firstly, a comparison between the default variant *elèctrícitŷ* and the alternative variant (4b) *èlectrícitŷ* will be made as below:

(5) a. elèctrícitŷ (02103) (default variant)

b. èlectrícitŷ (20103) (alternative variant)

Compared with the default variant *elèctrícitŷ* (02103), the change of the stress pattern to the alternative variant *èlectrícitŷ* (20103) includes: (i) the first syllable "e" gains secondary stress; (ii) the second syllable "lec" loses secondary stress. Accordingly, adjustments to the parameter settings for this alternative variant include: (i) the first syllable "e" is endowed with the distinctive feature [+tense] in the lexicon for the speaker of this variant; (ii) the stress value of the second syllable "lec" will be reduced with the lexically specified Positional Function *Stress Reduction*; (iii) the stress value of "tri," "ci" and "ty" cannot be changed, which is shown by the fact that their stress patterns do not change between the default variant and this alternative variant. Namely, "tri" still bears the primary stress, "ci" no stress, and "ty" tertiary stress. The analysis and computation of *èlectrícitŷ* is given in (6):

(6) èlectrícitŷ (20103) (< eléctric)

```
*            
*            
+       *    
+       +    
e —— lec —— tri —— ci —— ty ⟶
```

[+tense]

```
2           1           0
```

h(2)=+	h(1)=+	*Heaviness*
	t(1)=+	*Trace*
	vas(1)=*	*Velar-Alveolar Sequence*
r(2)=+*		*Rhythm*
<u>f(2)=*</u>		*Farness*
S(2)= ++**>S(1)=++*		
	<u>sr(1)=−</u>	*Stress Reduction*
S(2)=++** >S(1)=+*		

In (6), *Heaviness*, *Trace*, and *Velar-Alveolar Sequence* are triggered on "lec" as in (2). With the assignment of the feature [+tense], the first syllable "e" can be taken as a heavy syllable, so the Positional Function *Heaviness* can be applied to it. Changes brought about by this newly applied Positional Function include: (i) *Farness* can be applied to "e," since "e [+tense]" and "lec" can be considered as the same type of syllable that appears

successively on the same level;[6] (ii) with the Positional Function *Heaviness* being applied to "e," *Bare Nucleus Avoidance* cannot be triggered to "e," due to the fact that the condition for its application is not satisfied. The condition for the triggering of *Bare Nucleus Avoidance* is no intrinsic Positional Function, namely, *Binarity*, *Trace*, or *Heaviness*, is applied to the related syllable; however, *Heaviness* has been applied to "e." The stress value of the second syllable "lec" is reduced with an optional Positional Function, *Stress Reduction*.

Because of the above adjustments, the difference of the stress value between *S(2)* and *S(1)* is reversed, and now "*S(2)*" is stronger than "*S(1)*" by 2 stress values, which means "*S(2)*," that is, "e," can bear secondary stress and "*S(1)*," namely "lec," no stress. In this way, the alternative variant (4b) *èlectrícitŷ* (20103) is accounted for by the analysis and computation in (6).

The yet unresolved variant is *èlêctrícitŷ* (23103) in (4c). Similar to the alternative variant (4b), a comparison between the default variant *elèctrícitŷ* and this alternative variant will be made:

(7) a. elèctrícitŷ (02103) (default variant)

c. èlêctrícitŷ (23103) (alternative variant)

In (7), compared with the default variant *elèctrícitŷ* (02103), the change of the stress pattern to the alternative variant *èlêctrícitŷ* (23103) includes: (i) since the first syllable "e"

---

[6] The definition of *Farness* is "[s]ubsidiary stress is placed as far left as possible from the position of primary stress, … by means of the formula ... *f(x)* = *" (Yamada (2010b: 305)). "*Farness* is activated only when the same type of syllable appears successively on the same level" (Yamada (2010b: 241)).

gains secondary stress, it will be presumed to be assigned the feature [+tense] lexically for the speaker of the variant; (ii) the second syllable "lec" changes its stress value from secondary stress to tertiary stress; however, since the stress pattern change of "lec" neither meets the condition for the assignment of feature [+tense] nor the application of *Stress Reduction*, its stress value will not be changed; (iii) stress value of "tri," "ci," and "ty" cannot be altered, which is shown by the fact that stress does not change between the default variant and this alternative variant. In simple terms, "tri" still bears primary stress, "ci" no stress, and "ty" tertiary stress. The analysis and computation of *èlêctrícitŷ* is as the following:

(8) èlêctrícitŷ (23103) (< eléctric)

```
*
*           *
+           +
+           +
e ——— lec ——————— tri ——— ci ——— ty⟶
[+tense]

2           1           0

h(2)=+    h(1)=+        ┼  Heaviness

          t(1)=+        ┼  Trace

          vas(1)=*      ┼  Velar-Alveolar Sequence

r(2)=+*                 ┼  Rhythm

f(2)=*                  ┼  Farness

S(2)= ++**>S(1)=++*
```
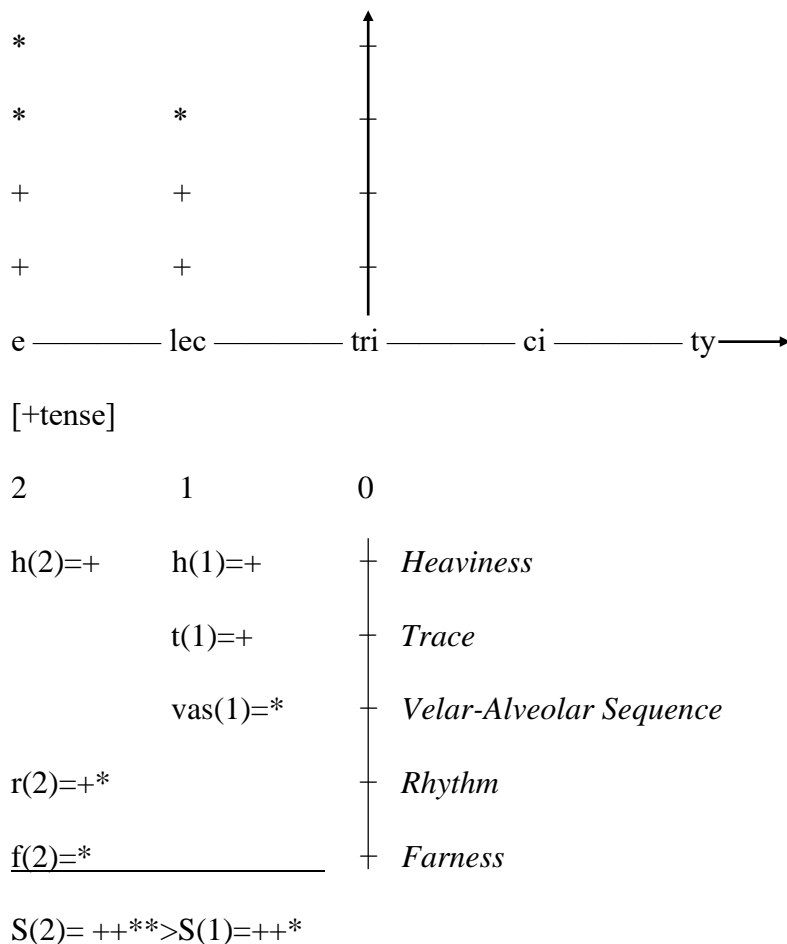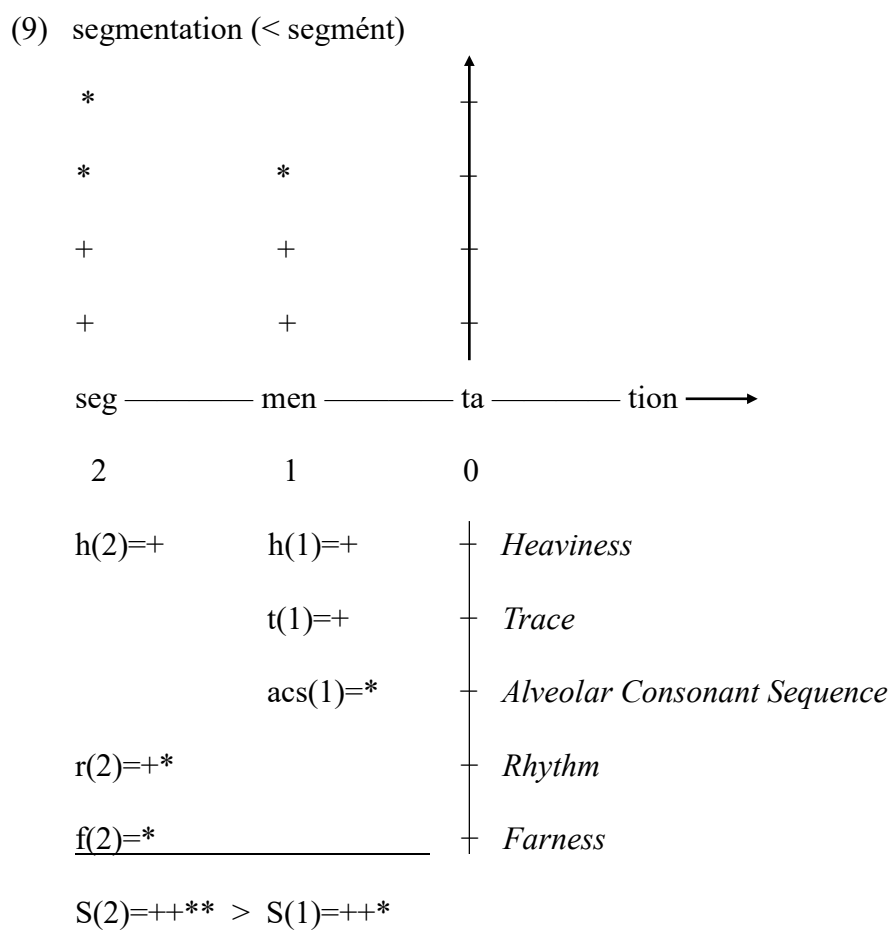
Analogous to the computation in (2), *Heaviness*, *Trace*, and *Velar-Alveolar Sequence* are triggered on "lec." In (8), the first syllable "e" is given the feature [+tense], so it can be taken as a heavy syllable and triggers the Positional Function *Heaviness*. *Rhythm* can be applied to the leftmost syllable "e," since "lec," the syllable immediately preceding the primary stressed syllable, bears stress value "++*" after the application of *Heaviness*, *Trace*, and *Velar-Alveolar Sequence*. *Farness* is activated on "e" on the ground that both "e [+tense]" and "lec" can be considered as heavy syllables. Distinct from the analysis in (2), *Bare Nucleus Avoidance* cannot be triggered to "e," since its condition for application that no intrinsic Positional Function is applied to the related syllable is not met in (8). The final expression of the result of computation "*S(2)* = ++** > *S(1)* = ++*", with the difference of stress value being one, provides the result that *S(2)* "e" will bear secondary stress and *S(1)* "lec" tertiary stress. The final result is *èlêctrícitŷ* (23103), which is correct and, more importantly, the variant sought.

6.3 One More Instance: *Segmentation*

In Section 6.2, by use of the concept default variant and alternative variants, all the three variants of *electricity* have been explained. If only one word can be accounted for by use of the concept default variant and alternative variants, then the validity of this chapter will be null. Consequently, in this section, another example from (1) will be utilized to examine the tenability again. To diversify exemplifications for this chapter, the word *segmentation* will be chosen, since it is quite distinct from *electricity*: (i) the syllable count of *segmentation* is four, while it is five for *electricity*; (ii) *segmentation* is derived from the verb *segment*, while *electricity* is from the adjective *electric*; (iii) the

phonological structure of the initial syllable in *segmentation* is CVC, while it is V in *electricity*. The list of differentiations between the two words can still go on in addition to the above three points.

Firstly, the analysis and computation of the default variant of *segmentation* will be spelt out in (9), without the application of any optional Positional Functions.

(9) segmentation (< segmént)

```
*
*              *
+              +
+              +
seg ——— men ——— ta ——— tion ⟶
 2          1         0

h(2)=+     h(1)=+      ┼  Heaviness
           t(1)=+      ┼  Trace
           acs(1)=*    ┼  Alveolar Consonant Sequence
r(2)=+*                ┼  Rhythm
f(2)=*_____ ┼  Farness
S(2)=++** > S(1)=++*
```

Heaviness is triggered on both "seg" and "men." The primary stress on "men" in the base form *segmént* activates the application of *Trace* to it. *Alveolar Consonant Sequence* is

applied to "men" as all the three conditions for its application are met.[7] Positional Function *Rhythm* and *Farness* are triggered on "seg" too. The final expression of the result of computation is "$S(2) = ++** > S(1) = ++*$", where "$S(2)$" is stronger than "$S(1)$" by one stress value. Accordingly, "seg" will bear secondary stress and "men" tertiary stress. The stress pattern *sègmêntátion* (2310) is gained, which is the default variant.

Segmentation has two stress patterns: *sègmêntátion* (2310) and *sègmentátion* (2010). Since *sègmêntátion* is the default variant, the other stress pattern *sègmentátion* is the alternative variant. The comparison between the default variant and the alternative variant will be made in the following:

(10) a. sègmêntátion (2310) (default variant)

b. sègmentátion (2010) (alternative variant)

In comparison with the default variant *sègmêntátion* (2310), the difference in the stress pattern of the alternative variant *sègmentátion* (2010) lies in that the second syllable "men" loses tertiary stress. Consequently, to gain the alternative variant *sègmentátion*, the adjustment is that the stress value of the second syllable "men" will be reduced with lexically specified *Stress Reduction* for the speaker of the variant. The analysis and computation for *sègmentátion* (2010) is as below:

---

[7] The three conditions for the application of *Alveolar Consonant Sequence* are: (i) the syllable in question is a heavy syllable ending in a nasal consonant; (ii) the syllable in question is immediately followed by the primary stressed syllable; (iii) the onset consonant of the primary stressed syllable is voiceless, or the coda consonant immediately preceding the syllable in question is voiceless.

(11)   sègmentátion (2010) (< segmént)

```
 *
 *
 +          *
 +          +
seg ——————— men ——————— ta ——————— tion ——→
 2          1          0
h(2)=+     h(1)=+          Heaviness
           t(1)=+          Trace
           acs(1)=*        Alveolar Consonant Sequence
r(2)=+*                    Rhythm
f(2)=*     _____       Farness
S(2)=++**  >  S(1)=++*
           sr(1)=−         Stress Reduction
S(2)=++**  >  S(1)=+*
```

In (11), *Heaviness* is applied to the two heavy syllables, "seg" and "men." *Trace* and *Alveolar Consonant Sequence* are as well applied to "men." The Positional Functions *Rhythm* and *Farness* are triggered on "seg," too. The expression of the result of computation is "*S(2)* = ++** > *S(1)* = ++*". As already noted, the lexically specified Positional Function *Stress Reduction* will be applied to "men" in (11) to reduce the stress value of the syllable for the speaker of the variant. The final expression of the result of computation is "*S(2)* = ++** > *S(1)* = +*"; and "seg" will bear secondary stress and "men" no stress. The target stress pattern *sègmentátion* (2010) is obtained.

The analyses and computations in (9) and (11), in combination with the concept of default variant and alternative variant, account for both variants of *segmentation*, just as the analyses and computations in (2), (6), and (8), which explain all the three variants of *electricity*.[8]

6.4 Summary

The main innovative point in this chapter is the concept of default variant and alternative variant. The default variant of one word is given by the subsidiary stress rule in PFT, without any optional Positional Functions or lexical treatment. As noted at the end of Section 6.1, I think that variants are due to different parameter settings of distinct speakers. In other words, I think that different parameter settings lead to variants. Following this logic, it appears that a close look at resemblances and differences between variants can give me a hint about differences in parameter settings between variants. And this is why I compare alternative variants with their respective default variants. Details are as follows. Firstly, for vowels of syllables that gain subsidiary stress in an alternative variant, I think that the speaker of this variant assigns these vowels the distinctive feature [+tense], which refers to long vowels. Within the framework of PFT, the subsidiary stress on these syllables can be explained by heavy-syllable-related Positional Functions which

---

[8] Computations and detailed discussions about how to obtain stress patterns of all the other instances in (1) are omitted here. Three reasons lead to the final decision of exclusion: (i) it is clear now how these stress patterns can be accounted for within the framework of PFT; (2) some words, i.e. *condemnation*, have already been referred to in Chapter 4; for example, the analysis of *còndêmnátion* is presented in (8) in Chapter 4 and the analysis of *còndemnátion* presented in (11) in Chapter 4; (3) some words in (1), e.g. *condensation*, will be used as key instances in Chapter 7.

are activated due to the assignment of the distinctive feature [+tense]. Secondly, for syllables that lose subsidiary stress in an alternative variant, I think that the speaker of the variant reduces the stress value of these syllables. With respect to PFT, the loss of subsidiary stress on these syllables will be accounted for by an optional Positional Function, *Stress Reduction*. Thirdly, except for situations of gaining or losing subsidiary stress, stress value of syllables between the default variant and alternative variants will not be changed.

The above analysis demonstrates that all stress patterns of *electricity* and *segmentation*, among others exemplifications in (1), can be accounted for with reference to the newly introduced concept of default variant and alternative variant in a systematic way. Given this fact, it might be tenable to state that the speculative component of the concept of default variant and alternative variant can assert itself more strongly now. As noted in Chapter 2 and Chapter 3, *electricity* has not just posed a trivial problem for both *SPE* and MT, while variants of the word are provided with a more explanatory mechanism by use of the concept of default variant and alternative variant in this chapter. It might be rational to claim that the explanation of variants is a compulsory task for phonological theories. Therefore, it seems to be the case that the preference of phonological theories should be given to a theory that is able to account for variants in a systematic way, over those theories that seem unable to deal with variants. Following this line of logic, it might be fair to conclude here that the concept of default variant and alternative variant seem to be able to handle variants systematically and thus attested.

Chapter 7

Ordering Relations among Positional Functions

7.0 Introduction

Phonological theories are meant to account for all the phonological patterns of world languages (Chomsky (1967), Chomsky and Halle (1968), Frampton (2008), Frawley (2003), Mascaró (2011), Odden (2011)). With respect to the explanation of phonological phenomena, two devices generally are available for these phonological theories, i.e. constraints and rules; among which, "[r]ules are procedures that alter a specific element or sequence of elements in a specific fashion" (Stemberger (2000: 213)).[1] As for theories that make use of rules, PFT is one among them. PFT is claimed to be able to account for stress patterns of words by means of phonological rules, which are composed of Positional Functions in PFT (Yamada (2010a, 2010b, 2012, 2013)).[2]

An unavoidable issue related to the topic of rules is rule ordering. Chomsky (1967: 107) claims that "rules are linearly ordered and applied strictly in the given order." This linear ordering relation is well manifested in the classical work *SPE*. In this chapter, I seek to articulate that I agree with Chomsky (1967) and Chomsky and Halle (1968) on the point that linear ordering does exist, but I argue that not all rules are linearly ordered. Some rules are non-interacting with each other and thus do not

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[1] According to Stemberger (2000: 213), "[c]onstraints are statements that a phonological form may not have certain properties …, or must have certain properties."
[2] An outstanding example of a theory that makes use of constraints is Optimality Theory (OT). In OT, constraints are ranked and violable and optimal candidates are those that violate the lower-ranked constraints (Burzio (1992, 2000), LaCharité and Paradis (2000), Prince and Smolensky (1993), Stemberger (2000)).

bear an ordering relation with each other.

7.1 Rules and Rule Ordering

This section will spell out the definition of rules, provide evidence for the necessity of rule ordering, and additionally mention two principles governing rule ordering in Chomsky (1967).

Generative phonological theory, with *SPE* as the classical work, holds the concept that grammar is composed of linearly ordered re-write rules that map substrings onto other substrings (Chomsky and Halle (1968), Frampton (2008), Frawley (2003), Mascaró (2011), Odden (2011)). *Re-write* means that rules are statements which alter substrings by mapping underlying representations into surface representations. In other words, a rule implies a certain change (Odden (2011)). Rules, instead of being random, are ordered because ordering can simplify grammars and express linguistic generalizations more fully (Mascaró (2011)). Another vital character of rules is that they are not independent from each other; they may interact with each other (Anderson (1969, 1974), Frawley (2003), Mascaró (2011), Vaux (2008)). "[B]oth the applicability and the result of application of a rule can depend on the application of previous rules" (Mascaró (2011: 1749)). That is to say, whether a rule can be applied or not depends on the output of previous rules. The interaction among rules also verifies rule ordering as different orderings of rules may produce different phonetic results. The correct ordering should be the one that presents phonetic outputs that accord with empirical facts (Chafe (1968), Iverson (1995)).

In Chomsky (1967: 103, 105), two principles governing the organization of phonological rules, Principle 1 and Principle 2′, are presented:

(1)　a.　Principle 1: The rules may be linearly ordered.

　　　b.　Principle 2′: The rules of the grammar must be partially ordered.

Principle 1 makes the assertion that it is possible for the rules of a grammar to be "given in a linear sequence 1, …, n, and applied in this order, where each rule applies to the string that is produced by application of the preceding rule …, with no loss of generality" (Chomsky (1967: 103)). Chomsky (1967) adduces examples of velar softening that converts [k] to [s] and [g] to [ǰ] before non-low front vowels and vowel shift to support Principle 1 and 2′. The formulations of the two rules are as follows (Chomsky (1967: 105-106)):

(2)　a.　Velar Softening[3]

$$\begin{Bmatrix} k \rightarrow s \\ g \rightarrow \check{\jmath} \end{Bmatrix} / \underline{\hspace{1cm}} \begin{bmatrix} - \text{ grave} \\ - \text{ compact} \end{bmatrix}$$

　　　b.　Vowel Shift

$$\begin{Bmatrix} \bar{\imath} \rightarrow \bar{a}y \\ \bar{e} \rightarrow \bar{\imath}y \\ \bar{æ} \rightarrow \bar{e}y \end{Bmatrix}$$

According to Chomsky (1967), the rule in (2a) involves the alternations as these indicated by capital letters in *critiCal – critiCize*, *funGus – funGivorous*, and so on.

---

[3] The Velar Softening Rule (2a) is formulated without a dash in Chomsky (1967: 106). The lack of a dash in (Chomsky (1967: 106)) may be taken as a typographical error, based on two reasons: (i) the dash indicates that the target of a rule should be between the slash and the square bracket; (ii) a rule similar to the one in this dissertation can be found on page 426 of *SPE*, whose formulation contains a dash between the slash and the left square bracket. As a result, a dash is inserted between the slash and the left square bracket in (2a).

Take *critiCize* and *mediCate* as instances to discuss the ordering between (2a) and (2b). The underlying form of the two capitalized segments is /k/. If the rule (2b) of vowel shift is ordered before (2a) of velar softening, the representations of *criticize* and *medicate* after the application of vowel shift should be /kritikāyz/ and /medikēyt/ respectively. The capitalized segment in question in *critiCize* should not undergo velar softening, since it precedes, instead of a non-low front vowel, the low back vowel [ā]; while the segment in question in *mediCate* should undergo velar softening, since it precedes a non-low front vowel [ē]. In short, velar softening will apply to *medicate* only. Ordering the rules so that (2b) precedes (2a) gives "incorrect phonetic output[s]" (Chomsky (1967: 104)). If the order is reversed so that the rule (2a) of velar softening precedes (2b) of vowel shift, "the underlying representations of *criticize* and *medicate*" will be "/kritikīz/ and /medikǣt/ respectively" (Chomsky (1967: 107)). Velar softening will only apply to *criticize*, since velar softening cannot be triggered by the low vowel /ǣ/ in *medicate*. After velar softening, the vowel-shift rule will turn /ī/ to [āy] in *criticize* and /ǣ/ to [ēy] in *medicate*. The result of the rule ordering in which (2a) precedes (2b) can find its basis in facts and is correct.

Based on the analysis of (2), Chomsky (1967: 107) concludes that "[c]onsequently, it seems reasonable to propose as a general principle of phonology that the rules are linearly ordered and applied strictly in the given order, each rule applying to the string formed by application of the last rule that has applied. This general principle provides a rational explanation for the facts which support its two consequences, Princs. 1 and 2′." These two principles governing rule ordering will be examined later in Section 7.2 along with the discussion of ordering relations among Positional Functions.

7.2   Ordering Relations in PFT

PFT proposes that PSAR (the primary stress assignment rule for words) is composed of three "Positional Functions" as a preliminary analysis and SSAR (the subsidiary stress assignment rule) of sixteen "Positional Functions" (Yamada (2010a, 2010b, 2012, 2013)).   For the computation of stress assignment, firstly, PSAR is applied to a word to determine the position of primary stress and then SSAR is applied to the word to account for its subsidiary stress. When PFT was originally conceived, it was assumed that there were no ordering relations among its sixteen "Positional Functions" in SSAR. However, now it has become clear that ordering does exist, as will be shown in this chapter.

This section, along with the discussion about ordering relations among Positional Functions, will use examples from Chapter 2 and 3, especially those that have posed problems for *SPE* and MT, namely *condensation* (*còndênsátion* (2310) and *còndensátion* (2010)) and *information* (*ìnformátion* (2010)), and consider whether they are explicable within the framework of PFT.

For both *còndensátion* (2010) and *ìnformátion* (2010), four Positional Functions, *Farness*, *Heaviness*, *Rhythm*, and *Trace*, will be employed. In addition to the above four Positional Functions, *còndensátion* (2010) will require the application of other two Positional Functions, *Alveolar Consonant Sequence* and *Stress Reduction*. Consequently, ordering relations among the above six Positional Functions will be the focus of my exploration in this section.

However, if ordering relations among all the six Positional Functions are presented simultaneously, the discussion may be too complex to understand, and thus in Section 7.2.1 my discussion will target three Positional Functions, *Heaviness*,

Rhythm, and *Trace*.

7.2.1 Ordering Relations among *Heaviness*, *Rhythm*, and *Trace*

In this section, my discussion will focus on three Positional Functions, *Heaviness*, *Rhythm*, and *Trace*, with the example of *ìnformátion* (2010), to develop an answer to the question of whether ordering relations exist in PFT. If ordering relations do exist, we will proceed to inquire into whether the ordering relations conform to the principles in Chomsky (1967).

Firstly, the definitions of *Heaviness*, *Rhythm*, and *Trace* will be listed in (3):

(3) a. *Heaviness* (*H*) (Yamada (2010b: 305))

Assign stress "+" to the heavy syllable by the formula $h(x) = y$, with the stress value "+", i.e. $h(x) = +$.

   b. *Rhythm* (*R*) (Yamada (2010a: 305-306))

The Positional Function *Rhythm*, with the formula $r(x) = y$, is activated on the leftmost syllable if the syllable immediately preceding the primary stressed syllable bears stress. The stress value of $r(x) = y$ is "+*", i.e. $r(x) = +*$.
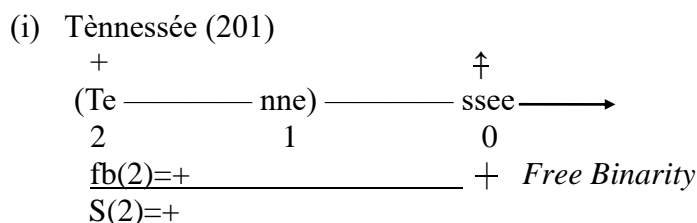
   c. *Trace* (*T*) (Yamada (2010a: 305))

Stress the position of a trace with a value "+" using the expression $t(x) = +$, where a trace is defined as a position of stress given on an earlier cycle.

The definition in (3b) indicates that the only condition for the application of *Rhythm* is that *the syllable immediately preceding the primary stressed syllable bears stress*; that is to say, the syllable immediately preceding the primary stressed syllable has triggered

the activation of, at least, one Positional Function. Among the sixteen Positional

Functions in SSAR, *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop*,

Heaviness, *Trace*, and *Velar-Alveolar Sequence* are the only six Positional Functions

to be applied to the syllable immediately preceding the primary stressed syllable.[4]

Among the six, only *Heaviness* and *Trace* will concern the discussion in this section,

and therefore reasons why these two Positional Functions can be applied to the syllable

immediately preceding the primary stressed syllable will be spelt out. If the syllable

immediately preceding the primary stressed syllable is a heavy syllable, it can trigger

the activation of *Heaviness*. This is why *Heaviness* can be applied to the syllable

immediately preceding the primary stressed syllable. The reason is similar for *Trace*.

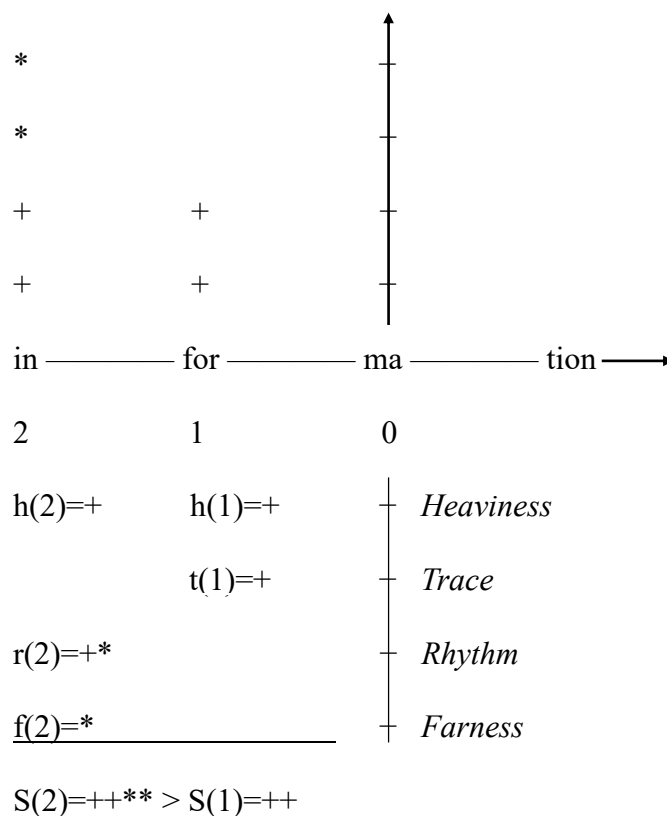If the syllable immediately preceding the primary stressed syllable bears the primary

---

[4] It is impossible for the other ten Positional Functions to be applied to the syllable immediately preceding the primary stressed syllable. Take *Free Binarity*, among the ten Positional Functions, as an instance. *Free Binarity* is defined as "[i]n a successive sequence of light syllables before a primary stressed syllable, an intrinsic Positional Function *Free Binarity* is triggered on the left of each binary constituent created leftward from the primary stressed syllable, placing a stress for each binary constituent by the formula $fb(x) = +$" (Yamada (2010b: 548)). The description means that there are two steps for the application of *Free Binarity*. Firstly, binary constituents should be created leftward from the primary stressed syllable; secondly, *Free Binarity* is triggered on the left head of each binary constituent. Take the word *Tènnessée* (201) in Wells (2000), as an example.

(i) Tènnessée (201)

$$
\begin{array}{cccc}
+ & & \ddagger & \\
\text{(Te} \text{———} & \text{nne)} \text{———} & \text{ssee} \longrightarrow & \\
2 & 1 & 0 & \\
\underline{fb(2)=+} & & + & \textit{Free Binarity} \\
S(2)=+ & & &
\end{array}
$$

In (i), by following the two steps given above, the first binary constituent is created between the syllables "Te" and "nne." This is also the only binary constituent that can be created since there are only two light syllables before the primary stressed syllable. For the binary constituent (Te nne), the left head is "*Te*"; thus *Free Binarity* is applied to the syllable "*Te*," which is not the syllable immediately preceding the primary stressed syllable. In fact, *Free Binarity* should be applied to every even-numbered syllable to the left of the primary stressed syllable.

stress in the base form of the word in question, it can trigger the activation of *Trace*. If one or more of the above six Positional Functions, *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop*, *Heaviness*, *Trace*, and *Velar-Alveolar Sequence*, are applied to the syllable immediately preceding the primary stressed syllable, then the syllable immediately preceding the primary stressed syllable will bear stress value and meet the condition for the application of *Rhythm*. In this section, the focus will be exclusively on *Heaviness* and *Trace*, two of the six Positional Functions that may trigger the application of *Rhythm*, and their ordering relation with *Rhythm*. The example *ìnformátion* (2010) and its computation is as below:

(4) ìnformátion (2010) (< infórm) (Yamada (2010b: 210))

*				
*				
+	+			
+	+			
in	for	ma	tion	→
2	1	0		
h(2)=+	h(1)=+		*Heaviness*	
	t(1)=+		*Trace*	
r(2)=+*			*Rhythm*	
f(2)=*			*Farness*	

S(2)=++** > S(1)=++

In (4), four Positional Functions are activated in five positions according to their respective conditions for application. Since "in" and "for" are heavy syllables,
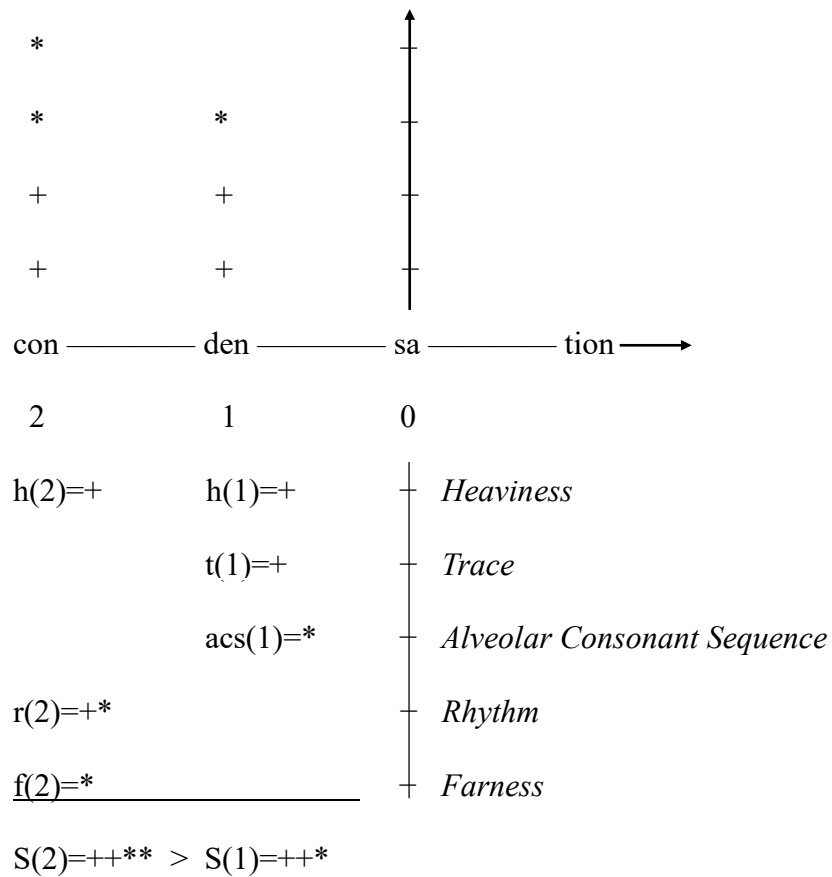
Heaviness is triggered under each syllable by means of the formula "$h(2) = +$" and "$h(1) = +$". The word *infórm* is the base form of *ìnformátion*, and consequently the primary stress on the syllable "*form*" in *infórm* will leave a trace on "for" in *ìnformátion*. This is the reason why this Positional Function applied to "for" in *ìnformátion* is termed *Trace*, whose definition was already presented in (3c). After the application of *Heaviness* and *Trace*, the syllable "for," the one immediately preceding the primary stressed syllable, bears stress value "++". Thus, the condition for the application of *Rhythm* has been met and *Rhythm* is applied to the leftmost syllable of the word, "in." Another Positional Function that can also be activated on "in" is *Farness*. The condition for the triggering of *Farness* is "the same type of syllable appears successively on the same level" (Yamada (2010a: 241)). Syllables "in" and "for," both of which are heavy syllables, are the same type of syllable and appear successively on the same level, meeting the condition for the activation of *Farness*. *Farness* should be placed "as far left as possible from the position of primary stress, with the value '*' of the Function *Farness*, by means of the formula … $f(x) = *$" (Yamada (2010a: 305)). As a result, *Farness* is activated on the syllable "in," the leftmost syllable from the position of primary stress in *ìnformátion*. These are all Positional Functions that can be applied here. The final expression of the result of computation "$S(2) = ++** > S(1) = ++$", where the stress value of "*" is the same as that of "+", shows that the stress value of "in" is stronger than that of "for" by two; consequently, "in" will bear secondary stress and "for" no stress, which gives rise to the correct stress pattern *ìnformátion* (2010). Lack of stress on the syllable "for" meshes well with the fact that the vowel is reduced to schwa.

The previous paragraph presented how PFT accounts for *ìnformátion*. This paragraph will move on to ordering relations among *Heaviness*, *Rhythm*, and *Trace*, the

three Positional Functions triggered in the analysis of *ìnformátion* in (4). It has been sketched in Section 7.1 that a given rule cannot be treated in complete isolation from the other rules of the language, that is, whether a rule can be applied depends on the triggering of previous rules. With regard to *Heaviness*, *Rhythm*, and *Trace*, *Rhythm* is dependent on *Heaviness* and *Trace*. The condition for the application of *Rhythm* is that the syllable immediately preceding the primary stressed syllable bear stress. In other words, only after the application of certain Positional Functions to the syllable immediately preceding the primary stressed syllable, can *Rhythm* be activated. *Heaviness* and *Trace* are two Positional Functions that can be triggered on the syllable immediately preceding the primary stressed syllable, so their application creates the environment for the activation of *Rhythm*. To put it in simple words, the applicability of *Rhythm* depends on the triggering of *Heaviness* and *Trace*.

I will investigate the ordering relation of *Heaviness* and *Trace* against *Rhythm* by use of the two principles governing phonological rules proposed in Chomsky (1967), quoted as (1) in this chapter. The two principles argue that rules may be linearly ordered and applied in this order, with each rule applying to the string produced by the triggering of the preceding rule. The analysis in (4) shows that the activation of *Heaviness* and *Trace* creates the environment for the application of *Rhythm*, and *Rhythm* is triggered to the representation produced by the activation of the preceding Positional Functions, *Heaviness* and *Trace*. Therefore, the ordering relation of *Heaviness* and *Trace* against *Rhythm* is linear ordering, with *Heaviness* and *Trace* preceding *Rhythm* and not vice versa. With this ordering relation, as is shown in (4), the correct stress pattern of *ìnformátion* can be obtained. Given this fact, it seems reasonable to establish that an ordering relationship does exist among Positional Functions. Further confirmation comes from another instance, that of *còndênsátion* (2310).

(5) còndênsátion (2310) (< condénse) (Yamada (2010b: 209))

```
*

*              *

+              +

+              +

con ——————— den ——————— sa ——————— tion ——→

  2              1              0

h(2)=+       h(1)=+        ┼  Heaviness

             t(1)=+        ┼  Trace

             acs(1)=*      ┼  Alveolar Consonant Sequence

r(2)=+*                    ┼  Rhythm

f(2)=*_____     ┼  Farness

S(2)=++** > S(1)=++*
```

In (5), in six positions, five Positional Functions are triggered respectively according to their conditions for application. Because "con" and "den" are heavy syllables, *Heaviness* is activated under each syllable by means of the formula "$h(2) = +$" and "$h(1) = +$". The application of *Trace* to "den" is due to the primary stress on the syllable in the base form *condénse*. Also the Positional Function *Alveolar Consonant Sequence* is triggered on the syllable "den."[5] The conditions for the application of *Alveolar*

---

[5] The definition of *Alveolar Consonant Sequence*s "[i]n an alveolar consonant concatenation across distinct syllables, the stress value of a heavy syllable ending in a nasal consonant immediately followed by the primary stressed syllable is augmented by one if the onset consonant of the primary stressed syllable is voiceless, or if the coda consonant immediately preceding the syllable in question is voiceless. The *ACS* [*Alveolar Consonant Sequence*] is expressed by the formula $acs(x) = *$" (Yamada (2010b: 306)).

Consonant Sequence are as follows:

(6) Conditions for the Application of *Alveolar Consonant Sequence*:

    a. the syllable in question is a heavy syllable ending in a nasal consonant;

    b. the syllable in question is immediately followed by the primary stressed syllable;

    c. the onset consonant of the primary stressed syllable is voiceless, or the coda consonant immediately preceding the syllable in question is voiceless.

The three conditions for the application of *Alveolar Consonant Sequence* in (6) are all met in (5): (a) the syllable in question "den" is a heavy syllable ending in a nasal consonant /n/; (b) the syllable in question "den" is immediately followed by the primary stressed syllable "sa"; (c) the onset consonant of the primary stressed syllable "sa" is voiceless. Consequently, *Alveolar Consonant Sequence* is activated on "den" in (5). After the triggering of *Heaviness*, *Trace*, and *Alveolar Consonant Sequence*, the syllable "den," the one immediately preceding the primary stressed syllable, bears stress value "++*". As a result, the condition for the application of *Rhythm* has been met and *Rhythm* is activated on the leftmost syllable of the word, "con." Syllables "con" and "den" are two consecutive heavy syllables, and therefore they are the same type of syllable and appear successively on the same level. In other words, the condition for the triggering of *Farness* is satisfied and *Farness* is also applied to "con," the leftmost syllable. *Heaviness*, *Trace*, *Alveolar Consonant Sequence*, *Rhythm*, and *Farness* are all Positional Functions that can be activated here. The final expression of the result of computation "$S(2) = \text{++}** > S(1) = \text{++}*$" shows that the stress value of "den" is weaker than that of "con" by one. Accordingly, "den" will bear tertiary stress and "con"

secondary stress. The target stress pattern *còndênsátion* (2310) thus can be gained.

Likewise, the instance of *còndênsátion* (2310) supports the linear ordering of *Heaviness* and *Trace* against *Rhythm*. That is to say, the existence of ordering relation among Positional Functions is attested. It is now time to move on to a consideration of another Positional Function, *Stress Reduction* (*SR*), which is necessary for the clarification of the variant *còndensátion* (2010). By analyzing this Positional Function, I will further unfold ordering relations among Positional Functions.

7.2.2 Ordering Relations among *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace*

This section will forward the discussion in Section 7.2.1 and state ordering relations among *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace*.
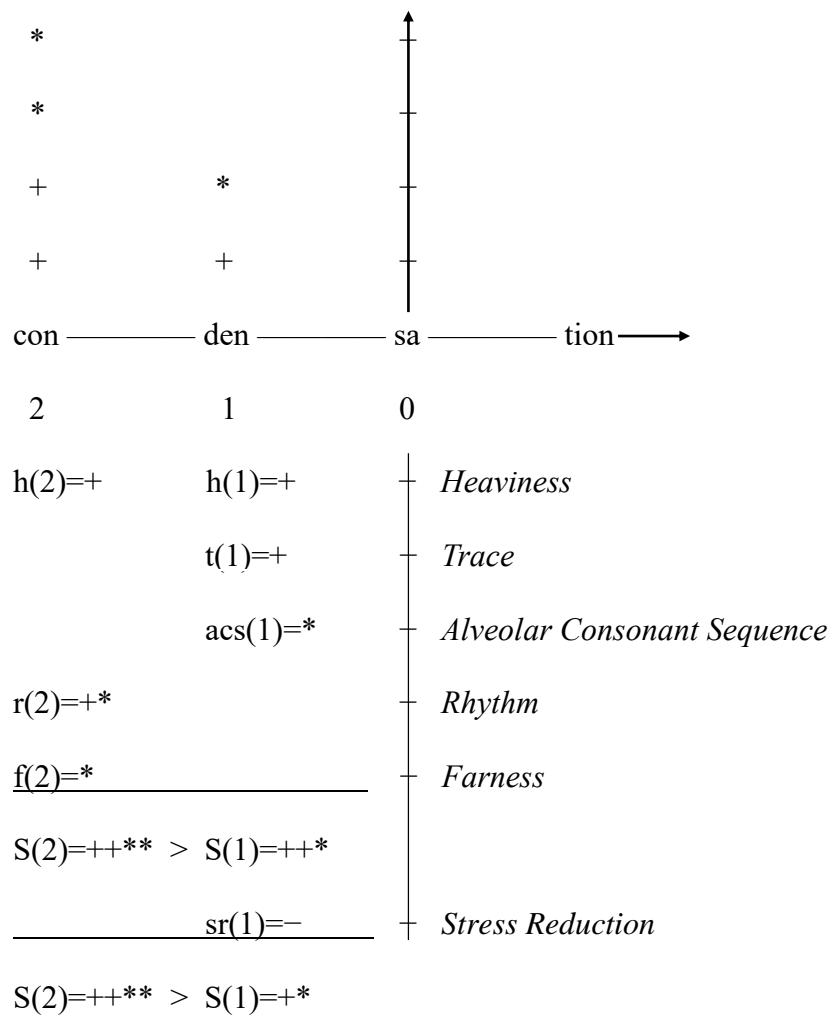
Recall that that there are two variants for *condensation*, i.e. *còndênsátion* (2310) and *còndensátion* (2010), as shown at the beginning of Section 7.2. The one that has been covered is *còndênsátion* (2310) in the analysis of (5). In order to account for the other variant, *còndensátion* (2010), another Positional Function, *Stress Reduction*, will be made use of. *Rhythmic Adjustment*, *Sole Stress Resistance*, and *Stress Reduction* are the three optional Positional Functions in PFT, and they examine the relationship of the resulting stress value of syllables after the first computation of stress value. Here, I will take *Stress Reduction* as an instance and explore its ordering relations with other Positional Functions. For ease of understanding, I will mainly refer to the ordering relation of *Heaviness*, *Rhythm* and *Trace* against *Stress Reduction*. The definition of *Stress Reduction* will be listed in (7):

(7)   *Stress Reduction* (*SR*) (Yamada (2010a: 307-308))

Reduce weaker stress by one, by means of the formula $sr(x) = -$ (or ¬*).

According to the definition in (7), *Stress Reduction* reduces *weaker stress*. To put it another way, if syllables bear different stress value after the first computation of stress value, some with stronger stress value and some with weaker stress value, *Stress Reduction* can be *optionally* applied to the syllable with weaker stress value. For example, in the analysis of (5), the result of the first computation of stress value is "*S(2)*=++** > *S(1)*=++*", where the syllable "*S(1)*" is weaker than "*S(2)*" by one stress value, so *Stress Reduction* can be applied to the syllable with weaker stress value, i.e. "*S(1)*," to provide an explanation for the other variant *còndensátion* (2010).

(8) còndensátion (2010) (< condénse)

```
 *

 *

 +              *

 +              +

con ───────── den ───────── sa ───────── tion ⟶

 2              1              0

h(2)=+        h(1)=+           │  Heaviness

              t(1)=+           │  Trace

              acs(1)=*         │  Alveolar Consonant Sequence

r(2)=+*                        │  Rhythm

f(2)=*    _____         │  Farness

S(2)=++** > S(1)=++*           │

              sr(1)=−          │  Stress Reduction
        _____

S(2)=++** > S(1)=+*
```

In (8), *Heaviness* is activated on "con" and "den," since both of them are heavy syllables. *Trace* is applied to the syllable "den" in *condensation* because of the primary stress on "dense" in the base form *condénse*. *Alveolar Consonant Sequence* is triggered to the syllable "den," as all of the three conditions for its application in (6) have been met. With the activation of *Heaviness*, *Trace*, and *Alveolar Consonant Sequence*, the syllable "den," the one immediately preceding the primary stressed syllable, bears stress value "++*", so *Rhythm* is triggered to the leftmost syllable of the word, "con." *Farness* is applied to "con," because "con" and "den" both are heavy syllables that appear successively on the same level. The result of the first computation of stress value "$S(2)$ = ++** > $S(1)$ = ++*" shows that the stress value of "den" is weaker than that of "con" by one. Under this circumstance, *Stress Reduction* can be activated to the syllable with weaker stress value, that is, the syllable "den." After the triggering of *Stress Reduction*, the result of the second computation of stress value is "$S(2)$ = ++** > $S(1)$ = +*", with stress value of "den" weaker than that of "con" by two. Following this result, "con" will bear secondary stress and "den" no stress, which gives rise to the correct stress pattern *còndensátion* (2010).

In (8), the result of the first computation "$S(2)$ = ++** > $S(1)$ = ++*", with $S(1)$ and $S(2)$ bearing different stress values, creates the environment for the application of *Stress Reduction*. Since the first computation of stress value can only be made after the triggering of *Heaviness*, *Rhythm*, *Trace*, and other related Positional Functions, it is justifiable to claim that the applicability and the result of application of *Stress Reduction* depend on the triggering of *Heaviness*, *Rhythm*, and *Trace*. Therefore, the ordering relation of *Heaviness*, *Rhythm*, and *Trace* against *Stress Reduction* is that *Heaviness*, *Rhythm*, and *Trace* are ordered before *Stress Reduction* and not vice versa. Incorporating the conclusion in Section 7.2.1 that *Heaviness* and *Trace* are ordered

before *Rhythm*, the ordering among *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace* should be: (i) *Heaviness* and *Trace* precede *Rhythm*; (ii) *Rhythm* precedes *Stress Reduction*, which is as well shown in the following table.[6]

(9) *Heaviness*, *Trace* < *Rhythm* < *Stress Reduction*

7.2.3 Ordering Relations among all Positional Functions in SSAR

In Section 7.2.1 and Section 7.2.2, ordering relations of four Positional Functions, *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace* were specified, using the examples of *ìnformátion* (2010) and *condensation* (*còndênsátion* (2310) and *còndensátion* (2010)), which not only proves that linear ordering relation exists in PFT, but also clarifies instances that have posed problems for *SPE* and MT. In this section, ordering relations among all Positional Functions in SSAR will be explored.

The sixteen Positional Functions will be classified into four groups. Reasons for the ordering among the four groups will be laid out respectively.

(10) a. Group (a)

   Alveolar Consonant Sequence (*ACS*), *Category Selection* (*CS*), *Double Stop* (*DS*), *Heaviness* (*H*), and *Trace* (*T*)

   b. Group (b)

   Binarity (*B*), *Edge Exemption I* (*EE-I*), *Edge Exemption II* (*EE-II*), *Rhythm* (*R*), and *Velar-Alveolar Sequence* (*VAS*)

   c. Group (c)

   Bare Nucleus Avoidance (*BNA*), *Farness* (*F*), and *Free Binarity* (*FB*)

---

[6] The ordering relation between *Heaviness* and *Trace* will be discussed in Section 7.2.4.

d. Group (d)

Rhythmic Adjustment (*RA*), *Sole Stress Resistance* (*SSR*), and *Stress Reduction* (*SR*)

7.2.3.1 Group (a)

The application of Positional Functions *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop*, *Heaviness*, and *Trace* in Group (a) in (10a) is only related to the phonological property of the syllable in question. Consider in this regard the Positional Function *Heaviness*. In the analysis of (4), *Heaviness* is triggered on syllables "in" and "for" because they are heavy syllables. The activation of *Heaviness* does not depend on the application of any other Positional Functions. Neither does the triggering of *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop* and *Trace* rely on the activation of any other Positional Functions. As a result, *Alveolar Consonant Sequence*, *Category Selection*, *Double Stop*, *Heaviness*, and *Trace* should be the first group of Positional Functions to be applied to relevant syllables.

7.2.3.2 Group (b)

Almost all Positional Functions in Group (b) in (10b) require the triggering of one Positional Function in Group (a) as one condition for application. Take the Positional Function *Rhythm* of Group (b) as an example. It was shown in Section 7.2.1 with the example *ìnformátion* that *Heaviness* (Group (a)) and *Trace* (Group (a)) should be activated before *Rhythm*, because their triggering on the syllable immediately preceding the primary stressed syllable creates the environment for the activation of *Rhythm*. Consequently, *Rhythm* should be applied later than Positional Functions in Group (a) and be included in Group (b).

7.2.3.3   Group (c)

With respect to the Positional Functions in Group (c) in (10c), i.e. *Bare Nucleus Avoidance*, *Farness*, and *Free Binarity*, they should be applied later than *Binarity*, *Edge Exemption I*, and *Edge Exemption II* in Group (b), which is why they are classified in Group (c). Here, *Bare Nucleus Avoidance* will be instantiated to inspect its order with *Binarity* (Group (b)). Firstly, the definition of *Bare Nucleus Avoidance* will be presented in (11):

(11)   *Bare Nucleus Avoidance* (*BNA*) (Yamada (2010a: 306))

Stress assignment is avoided on a non-branching bare nucleus at the leftmost edge of a word by the formula $bna(x) = -$, provided that no intrinsic Positional Function is applied to the bare nucleus.

It can be inferred from the definition in (11) that if an intrinsic Positional Function has been applied to the syllable under discussion, *Bare Nucleus Avoidance* cannot be applied to the syllable. Intrinsic Positional Functions express "an intrinsic characteristic of a syllable or syllables" (Yamada (2010a: 202)). Altogether, there are three Intrinsic Positional Functions, and these are *Heaviness*, *Trace*, and *Binarity*. "[I]n the case of *Heaviness*, the term itself indicates that the syllable is heavy; in the case of *Trace*, it shows that the syllable marked as *Trace* is morphologically related to the underlying base form of the derived word; and in the case of *Binarity*, the constructed constituent itself is binary" (Yamada (2010a: 202)). If any Positional Functions among *Heaviness*, *Trace*, and *Binarity* have been applied to the related syllable, *Bare Nucleus Avoidance* will be disqualified from activation. The description points to the fact that the applicability of *Bare Nucleus Avoidance* depends on the triggering of previous

Positional Functions, *Heaviness*, *Trace*, and *Binarity*. Only when none of them is activated can *Bare Nucleus Avoidance* be triggered. Following this line of reasoning, *Bare Nucleus Avoidance* should be applied later than *Heaviness* (Group (a)), *Trace* (Group (a)), and *Binarity* (Group (b)), and is thus placed in Group (c), as illustrated in (12).

(12)　*Heaviness* (Group (a)), *Trace* (Group (a)) < *Binarity* (Group (b)) < *Bare Nucleus Avoidance* (Group (c))
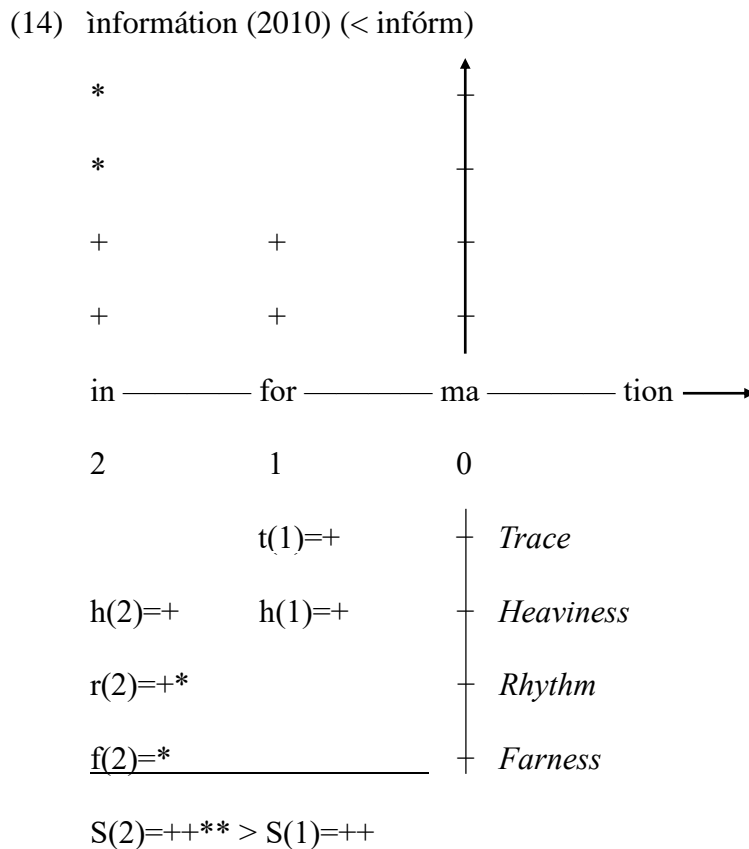
7.2.3.4　Group (d)

Positional Functions *Rhythmic Adjustment*, *Sole Stress Resistance*, and *Stress Reduction* in Group (d) in (10d) should be applied after the first computation of stress value, since they inspect the relationship of the resulting stress value of syllables. *Stress Reduction* and the analysis in (8) on the variant *còndensátion* will be given as an illustration. In (8), the result of the first computation of stress value is "$S(2)$=++** > $S(1)$=++*", with the stress value of "$S(1)$" weaker than that of "$S(2)$" by one. In such a case, *Stress Reduction* can be triggered to the syllable with weaker stress value, "$S(1)$." Namely, the first computation of stress value creates the environment for the activation of *Stress Reduction*. Since the first computation of stress value is made after the triggering of *Heaviness* (Group (a)), *Trace* (Group (a)), *Alveolar Consonant Sequence* (Group (a)), *Rhythm* (Group (b)), and *Farness* (Group (c)), *Stress Reduction* should be applied later than Positional Functions in Group (a), Group (b), and Group (c), and is thus classified in Group (d), which is shown in (13).

(13)   *Heaviness* (Group (a)), *Trace* (Group (a)), *Alveolar Consonant Sequence* (Group (a)) < *Rhythm* (Group (b)) < *Farness* (Group (c)) < *Stress Reduction* (Group (d))

7.2.4   Beyond Linear Ordering within the Framework of PFT

Section 7.2.1, Section 7.2.2, and Section 7.2.3 developed a description of the linear ordering relation among Positional Functions, with the ordering among *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace* as a typical example. In fact, even in *SPE*, "there were small departures from total strict order, most notably in the case of disjunctive ordering and simultaneous application in the case of infinite rule schemata" (Mascaró (2011: 1740)). "[I]n many cases some rules are not crucially ordered: the same surface form will result with the ordering A < B and B < A" (Mascaró (2011: 1740)), where "<" means earlier than. These small departures from strict linear order also exist in PFT. The ordering relation between *Heaviness* and *Trace* will be sketched as an exemplification. There is no ordering between them, because they are non-interacting with each other. The application of one of them will neither trigger nor block the application of the other. For example, *Heaviness* can be triggered only when the syllable in question is heavy; while *Trace* can only be activated when the related syllable bears the primary stress in the base form of the word. If a syllable is heavy, then it can trigger the application of *Heaviness*, regardless of whether the syllable bears the primary stress in the base form or not. Similarly, if a syllable bears the primary stress in the base form of the word, then it can activate *Trace*, no matter if the syllable is heavy or not. The example of *ìnformátion* (2010) will be utilized as an illustration. In (4), *Heaviness* is applied earlier than *Trace* and the correct stress pattern can be obtained. Now, I will examine what happens when the ordering between *Heaviness*

and *Trace* is reversed in (14):

(14) ìnformátion (2010) (< infórm)


```
*

*

+              +

+              +

in ——— for ——— ma ——— tion ——→

2              1              0

            t(1)=+           |  Trace

h(2)=+      h(1)=+           |  Heaviness

r(2)=+*                      |  Rhythm

f(2)=*                       |  Farness

S(2)=++** > S(1)=++
```

In (14), *Trace* is applied to "for," because of the primary stress on the syllable "for" in *infórm*. *Heaviness* is activated on "in" and "for," since they are both heavy syllables. After the application of *Trace* and *Heaviness*, the syllable "for," the one immediately preceding the primary stressed syllable, bears stress value "++", so the condition for the triggering of *Rhythm* has been met and *Rhythm* is applied to the leftmost syllable of the word, "in." *Farness* is activated as in (4) as well. The final computation is still "*S(2)* = ++** > *S(1)* = ++", the same as seen in the analysis in (4). Accordingly, it seems to be borne out by the above discussion that *Heaviness* and *Trace* are not crucially ordered: the same surface representation will result with the ordering "*Heaviness < Trace*" and "*Trace < Heaviness*." Anderson (1974: 165) explicates that

"[w]here two rules are completely unrelated, the grammar need contain no statement since the rules can equally well be applied in either order." Therefore, I conclude here that there is no ordering relation between *Heaviness* and *Trace*.[7]

7.3 Summary

In this chapter, I not only spelt out the definition of rules, but also the necessity of rule ordering. Following the previous discussion, the present chapter also outlined the establishment of ordering relations among Positional Functions in PFT in line with the ordering of rules in phonology. By highlighting the ordering relations among *Heaviness*, *Rhythm*, *Stress Reduction*, and *Trace*, this chapter showed that linear ordering relation exists among Positional Functions. On the other hand, Positional Functions in PFT are not totally strictly ordered. For example, the same surface representation will result with the ordering "*Heaviness < Trace*" or "*Trace < Heaviness.*"

The discussion on ordering relations between rules has a long history in phonology; "ordering allows for simplification of grammars and for a better expression

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[7] The ordering relations among Positional Functions are extrinsic. *Heaviness* and *Trace* will be used as examples to illustrate the point. It has been explained in Section 7.2.1 that the activation of *Heaviness* does not depend on the application of any other Positional Functions. As long as the related syllable is heavy, *Heaviness* can be triggered. The situation is similar with *Trace*: the triggering of *Trace* does not rely on the activation of any other Positional Functions either. If a syllable bears the primary stress in the base form of the word in question, *Trace* can be applied to it. As a result, without extrinsic ordering, *Heaviness* and *Trace* can be activated at any time; to put it more explicitly, without extrinsic ordering, *Heaviness* and *Trace* can be classified into the first group of Positional Functions to be applied to related syllables in Section 7.2.3.1, or the second group in Section 7.2.3.2, or the third group in Section 7.2.3.3, and so on. However, *Heaviness* and *Trace* are classified into the first group of Positional Functions in Section 7.2.3.1, because it is necessary to order *Heaviness* and *Trace* before *Rhythm* to create the environment for the activation of *Rhythm*, which has been captured in Section 7.2.1. The necessity of extrinsic ordering seems to be instantiated by this piece of evidence.

of linguistically significant generalizations" (Mascaró (2011: 1737)). This chapter, by use of several examples from *SPE* and MT, has sought to articulate that correct stress patterns of words can be accounted for within the framework of PFT with an appropriate ordering among Positional Functions.

Conclusion

This dissertation discusses the subsidiary stress assignment in English words by use of the Positional Function Theory (Yamada (2010a, 2010b, 2012, 2013)). In PFT, stress assignment is computed through an algorithm in which a certain number of Positional Functions interact. To be more specific, firstly, the primary stress assignment rule is applied to a word to determine the position of primary stress and then the subsidiary stress assignment rule is applied to the word to account for its subsidiary stress. This dissertation develops the above notions in altogether seven chapters.

Chapter 1 presents a brief introduction to the concept of stress. Chapter 2 and Chapter 3 give a brief review of *SPE* and MT, two pioneer theories, address problems lying in them, and thus show that a new theory might be needed to provide a more explanatory mechanism for those words that *SPE* and MT have failed to explain.

Chapter 4 to Chapter 7 is the central part of this dissertation. Chapter 4 spells out an introduction to the sixteen Positional Functions of the Positional Function Theory. Yamada (2010a, 2010b, 2012, 2013) proposed these sixteen Positional Functions, but he did not explain the theoretical motivation behind them, neither did he justify these Positional Functions. Some of these Positional Functions, such as *Heaviness* and *Trace*, are in line with stress assignment parameters in English, and thus are not so controversial. Others, namely *Bare Nucleus Avoidance*, *Rhythm*, etc., are subject to doubt, since they are neither in accordance with stress assignment parameters in English nor justified by Yamada (2010a, 2010b, 2012, 2013). In this dissertation, I notice that it seems that Positional Functions as *Bare Nucleus Avoidance*, *Rhythm*, and so on, is in accordance with the stress assignment tendency in English. Therefore, I turn to Celex

Lexical Database 2 to examine the stress assignment tendency in data and whether the descriptions of these Positional Functions comply with it. According to my study, it appears that the data support these Positional Functions, which not only provides these Positional Functions with the justification, but also deepens the understanding of English stress assignment mechanism.

Chapter 6 contains one original idea that is worth mentioning: the new concept of default variant and alternative variant. Chapter 6 proposes one stress pattern of a word as the default and all other variants, alternatives, as being obtained by setting Positional Functions as parameters differently from the default. By use of this new concept, variant stress patterns of words are gained. Since the explanation of variants seems to be a compulsory task for phonological theories, it may be fair to state that the concept of default variant and alternative variant seems to be necessary and shown to be attested, in light of its success in dealing with variants.

Chapter 7 deals with the ordering relations among Positional Functions. I may not be able to grant this chapter originality, since study into ordering relations among rules has a long history in phonological field. However, discussions of ordering relations among Positional Functions may help the understanding of ordering relations among rules more deeply.

The above description gives the main content of the dissertation and also the innovative points in it. Needless to say, along with the discussion in the dissertation, classical examples, especially those instances that cannot be explained by use of *SPE* and MT, are referred to and proven to be accountable with related proposals in this dissertation.

Last but not least, the phonological system of English is so large and complex; the study into stress system of English has long been proceeding from a variety of

perspectives. What I have dealt with and referred to in this dissertation is just a fragment of it. As a result, what is proposed in this dissertation is not to substitute *SPE* or other classical theories, but to supplement it with more ideas and possibilities. However, it is worthwhile to emphasize the proposals in this dissertation, within the framework of PFT, appear to have successfully accounted for stress patterns that have posed problems for *SPE* and MT; consequently, the explanations offered here must have a certain plausibility.

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