

PHASES AT THE WORD LEVEL

1. INTRODUCTION

The central issue in this paper is how to account for the preservation of stress and vowel quality in English affixation and what differences exist between the »classic derivational« and Optimality Theory approach to the matter. The phenomenon in question is illustrated in (1). Words in English may but need not change the position of primary stress when affixed. In (1) the word *government* is derived from the word *govern* and the position of primary stress is not changed in derivation. When *governmental* is derived from *government*, primary stress shifts from the first to the pre-final syllable. In (2), primary stress is shifted in each of the two derived words, *instrumental* and *instrumentality*.

- | | | | |
|-----|------------|--------------|-----------------|
| (1) | góvern | góvernment | gòvernmentál |
| (2) | ínstrument | ínstrumentál | ínstrumentálity |

Furthermore, even if the position of primary stress is changed with affixation, the syllable bearing primary stress at some point in the derivation preserves the stress in the form of secondary stress (e.g. gòvernmentál, ínstrumentál) and is at the same time prevented from being reduced to a schwa (e.g. ínstrumentálity).

In this paper we offer an analysis of the phenomenon in (1) that is a natural extension of the classic derivational analysis found in Chomsky and Halle (1968) (SPE hereafter). The latter is supplemented with a theory of word structure as in Marantz (2001) and will be referred to as a phase analysis of the preservation of stress, where the claim is that stress facts result from an interaction of stress rules, stress properties of affixes and word structure, and in which the preservation of stress in affixation is crucially connected with the word structure. The proposal together with the theoretical background it adopts will be presented in detail in sections 2-6. The paper will also present a conceptually very different analysis of the phenomenon, the Optimality Theory analysis of English word stress in Burzio (1994), comparing the two proposals in the relevant points, sections 7-8.

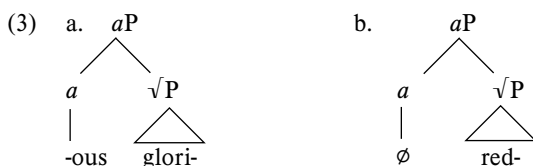
2. THEORETICAL BACKGROUND: THEORY OF WORD STRUCTURE

This paper is couched in the framework of Distributed Morphology, Halle and Marantz (1993), Halle (1997a), Marantz (1997), and its views on the word structure.

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The analysis in this study relies on the specific framework of word structure proposed in Marantz (1997) and Marantz (2001). In these two works Marantz argues for the unification of the inflectional and derivational morphology, which can be obtained if the two processes of word formation employ the same generative engine – the syntactic computation comprising the operations Merge, Move and Agree. In short, Marantz (2001) proposes that words are built by the Syntax performing all merger operations, including those between morphemes within a word.

A central innovation in Marantz (1997) is the treatment of roots and syntactic categories. In previous approaches to word formation syntactic categories such as V, N and A are properties of roots (stems) and affixes. In Marantz’s theory roots and affixes have no category per se, but are merged in the syntax with category-forming functional heads such as the ‘little’ *n*, *v*, *a* to form nouns, verbs and adjectives, respectively. These heads are typically realized by overt or phonologically null derivational affixes. For example, the adjectives *glorious* and *red* have the syntactic structures as in (3a,b), where $\sqrt{}$ stands for *Root* and the little *a* is filled with the derivational affix *-ous* in *glorious* and with a phonologically null affix in *red*.



3. PHASES AT THE WORD LEVEL

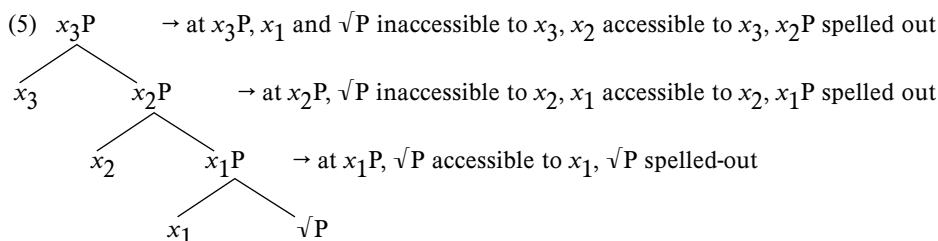
If words are treated as a result of syntactic processes, they are expected to show similar syntactic phenomena as found on the sentence level. One of such is Chomsky’s (2001) phase-by-phase spell-out, where the main idea is that derivation of sentences proceeds in phases, where phases can be seen as (predetermined) chunks of syntactic structure that are spelled-out at the phonological and semantic level and after that point impenetrable for potential semantic or phonological operations that the structure built on top of them might cause. Marantz (2001) proposes that phrases such as little νP , *nP* and *aP* constitute such chunks, i.e. phases at the word level. Category changing morphology realizing these little phrases within a word thus yields phases, and cyclic phonological effects within words such as the preservation of stress and vowel quality can be seen as following from the cyclic operation of syntactic derivation by phase, as in Marvin (2002). For example, if a syllable is assigned stress in a particular phase, this stress should somehow be preserved even if the word is affixed later on and new syllables carrying stress emerge. With this as a leading idea, we now investigate the interaction of stress assignment and the structure of words in English, arguing that stress and vowel quality in English are diagnostic of spell-out domains within words, and that in turn syntactic domains predict the spell-out. The analysis proposed is essentially a modernized version of the proposal found in SPE, where the notion of Chomsky and Halle’s »cycle« corresponds to the »phase

at the word level« and the »phase spell-out« relates to the SPE notion »preservation of stress from earlier cycles«.

The idea that category-forming phrases constitute phases can be summarized as follows:

- (4) a. Phrases headed by word-forming functional heads, such as little *v*, little *n* and little *a*, constitute spell-out domains at the word level, Marantz (2001).
- b. Phrases at the word level are subject to Chomsky's (2001) Phase Impenetrability Condition.
- c. *Phase Impenetrability Condition at the word level*: H and its edge (specifiers, adjoined elements) are spelled out at the next strong phase. The domain of H is spelled out at the phase of HP. A head *h* adjoined to H is in the domain of H.

At the point of the merger of the category forming head *x* (where *x* stands for *v*, *n*, or *a*, and is supplied with derivational affixes), the complement of the little *x* is spelled out (i.e. meaning and pronunciation are determined) and from that point on inaccessible to heads attaching higher. The idea is schematized in (5).¹



4. STRESS ASSIGNMENT IN ENGLISH: FROM CYCLES TO PHASES

The standard example from SPE illustrating the phenomenon of the preservation of stress and vowel quality in English affixation is the 'minimal pair' *condensation - compensation*. SPE observes that in some dialects of English the boldfaced /e/ in *condensation* reduces to a schwa, while this is not the case in the word *compensation*, despite the fact that phonotactically and morphologically the two words are very similar. The vowel reduction is a consequence of the Vowel Reduction Rule, which reduces a lax vowel to a schwa in English. The explanation for this fact offered in SPE is that the difference between the two nominalizations follows from the stress of their constituents. That is, the nominalizations 'contain' verbs *condense* and *compensate*, which represent the first cycle in the formation of the nouns *condensation* and *compensation* and which have different stress patterns.²

¹ See Embick (2010) for a slightly different execution of the spell-out mechanism.

² The SPE notion 'cycle' can be roughly defined as the point of the application of stress rules to a certain constituent.

- | | | | |
|-----|-------------------------|----------------------|---|
| (6) | a. <i>condens</i> ation | (/e/ is not reduced) | <i>cond</i> ense → <i>cond</i> ensation |
| | b. <i>compens</i> ation | (/e/ is reduced) | <i>c</i> ompensate → <i>comp</i> ensation |

In the former verb, primary stress is found on *condense*, which consequently means that the stressed vowel cannot be reduced to a schwa in the cycle of the verb, where stress is assigned for the first time. In the latter verb, main stress is found on the first syllable of *compensate*, therefore the corresponding /e/ in *compensate* can be reduced to a schwa in the cycle of the verb. If the stress from earlier cycles is preserved, we now have a natural explanation for the different vowel quality in the two nominalizations. In *condensation*, the vowel /e/ has received stress on an earlier cycle, i.e. the verb cycle, and is therefore prevented from being reduced. In *compensation*, the vowel /e/ has been reduced on the earlier cycle and has remained the same in the nominalization.³

This paper links the insight from SPE to a finer grained syntax at the word level as proposed in Marantz (2001), producing what I term the phase analysis. In the phase analysis the phase spell-out and Phase Impenetrability Condition as in (4) apply to stress in connection with vowel reduction. Stress and vowel quality preservation in the sense of SPE and Kiparsky (1979) are a consequence of the phase spell-out mechanism—when a chunk of word to which the stress rules have applied is spelled out, the new affixation and Vowel Reduction cannot erase this information.

The stress in English words is a result of the interaction of the three factors in (7).

- (7)
- a. Building blocks with selectional and stress-related specification
 - b. Set of phonological rules
 - c. Structure of building blocks

The building blocks (affixes) have stress related specification, which means that they can be stress neutral or can trigger the application of stress rules when attached. The set of phonological rules comprises different rules of English stress and the order in which they apply (see section 4.1. for a detailed discussion). Some phenomena, such as the preservation of stress in derivation, cannot be accounted for only by the properties of building blocks and stress rules, requiring for their explanation also the third element, the structure of the building blocks. Specifically, we will try to show that when stress has been assigned in a particular chunk (little x in our analysis), neither the properties of building blocks attached to the chunk nor the stress rules can erase this information – once assigned, stress is preserved.

4.1. Preview: English stress in general

English is a language in which word stress depends on phonological properties and the position of syllables. Descriptively, English words fall into three groups with respect to stress, SPE, Burzio (1994), Halle (1998). Nouns and simple adjectives typ-

³ As to the Vowel Reduction Rule, SPE places it after the process of stress assignment within the word, i.e. in the non-cyclic block.

ically follow pattern (8a), while verbs and derived adjectives typically follow pattern (8b). There is a third group that consists of words with one primary and one secondary stress, as in (8c).⁴

- (8) a. Heavy penultimate: *agénd*a, *appénd*ix, *horíz*on
Antepenultimate: *améri*ca, *áster*isk
- b. Superheavy final: *prevént*, *decíde*, *obéy*, *annóy*
Penultimate: *inhábit*, *imá*gine, *parént*al, *governmént*al
- c. *mál*achite, *eléctr*ode, *monophýs*ite, *cóll*oid

The analysis of these three groups that I shall adopt is as in Halle (1998). Relying on the metrical theory in Idsardi (1992) and Halle and Idsardi (1995), Halle (1998) proposes that the English stress system is constituted by the Main Stress Rule (henceforth MSR) supplemented by two edge-marking rules. The MSR has two parts.⁵ The first part constructs a binary foot at the end of a string whose last asterisk projects a light syllable. If the last syllable is heavy or there are not enough syllables in the word to construct a binary foot, a unary foot is constructed. This part of the MSR is illustrated in (9). For example in the word *develop*, the last syllable is light, therefore a binary foot is constructed: *de(velop*. In the words *usurp* and *cajole*, on the other hand, the last syllables are heavy, therefore a unary foot is constructed: *u(surp*, *ca(jole*. In the rightmost column we find words with only one syllable, where only unary feet can be constructed regardless of the syllable weight: (*put*, (*black*.

(9)	*(**	*(*	*(*	*(*	
	devélop	usúrp	cajóle	pút	
	clandéstine	robúst	divíne	bláck	Halle (1998)

In addition to being subject to the MSR, the words illustrated in (10) and (11) are also subject to an edge-marking rule (henceforth EMR), which applies to a list of words before the MSR. The first of the two edge-marking rules, referred to as the *RLR* EMR, inserts a right parenthesis before the final syllable of the word if the syllable contains a short vowel, (10).

⁴ The secondary stress in derived words is not due to membership in group (8c).

⁵ Here I adopt a theory of stress following Liberman (1975), Prince (1983), Halle and Vergnaud (1987), Idsardi (1992), Halle and Idsardi (1995) and Halle (1997), in which stress contours of words are expressed by means of a metrical grid. The bottom line (line 0) is composed of projections of the stressable elements (syllables), and higher lines constructed by projecting certain of these elements upward (the heads). Feet are constructed by boundaries (left or right parentheses); they are left or right headed.

(10)	*(**)*	*(*)*	*(*)*	(*)*
	América	agénda	Tacóma	vílla
	cómpetent	consistent	cohérent	cúrrént
	oríginal	paréntal	anecdótal	móral

Halle (1998)

The second edge-marking rule, the *LLR* EMR, inserts a left parenthesis to the left of the rightmost syllable and applies in words where *RLR* EMR has not applied. This is illustrated in (11).⁶

(11)	(**[*	*([**	**([**	([**
	málachìte	stalágmìte	monophýsite	Hússite
	amýgdalòid	mollúscòid	epicýclòid	cóllòid
	plátinòid	eléctróde		ánòde

Halle (1998)

The EMR rules summarized in (12) apply first to a list of words; they are followed by the the MSR in (13), which applies to all words. Note that the feet constructed on line 0 are left-headed.⁷

(12) **Edge-marking rules**

a. *RLR* Edge Marking

Ø →] in env. * __ * ## line 0

Condition J: Final asterisk projects short vowel.

b. *LLR* Edge Marking

Ø → [in env. * __ * ## line 0

(13) **Main Stress Rule**

a. Ø → (in env. __ * * <P*> line 0

Condition K: Second asterisk projects vowel in a light rime.

b. Ø → (in env. __ * <P*> ## line 0

Halle (1998)

⁶ Examples in (11) have two stresses, one primary and one secondary. They are subject to the Rhythm Rule, Halle (1998), which places the main stress on the leftmost syllable on line 1 of the metrical grid. The Rhythm Rule in Halle (1998) is an extended Rhythm Rule proposed by Liberman and Prince (1977), applying in word sequences as well as within single words.

⁷ A few other minor rules are needed to account for certain groups of exceptions, for which the reader is referred to Halle (1998). Also, it is important to note that the rules proposed by Halle (1998) have a few lexical exceptions, as exemplified in (i) and (ii). These words are marked in the lexicon as special and cause problems to any theory of English stress.

(i) (*)* also: *modest, solemn, modern, auburn, covert* (unexpectedly subject to *RLR*)
góvern

(ii) (**)*
Cáthol-ic also: *Arabic, politic* (unexpectedly subject to *RLR*)

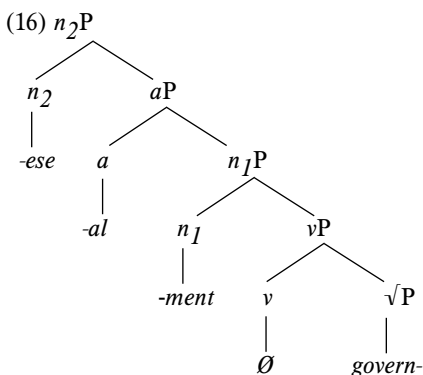
5. RULE BASED APPROACH AND PHASES APPLIED TO ENGLISH STRESS

In this part, we finally join the three elements summarized in (7) and claim the following:

- (14) a. Words are composed of little xPs, Marantz (2001);
 b. MSR and EMR apply at every xP if triggered by a diacritic marking on x;
 c. Vowel Reduction Rule takes place at the level of ‘prosodic word’;
 d. A ‘phase analysis’ (phase spell-out and Phase Impenetrability Condition) as in (4) applies to stress in connection with vowel reduction.

To illustrate the application of (14), the word *governmentalese* in (15) is fully derived in (17a-e). Following Marantz (2001), the structure of this word is as in (16).

- (15) *gòvernmentàlése*
meaning: complicated or obscurantist language thought to be characteristic of government bureaucratic statements
pronunciation: /gʌvərnmentəli:z/



At each phase the corresponding metrical grid is indicated after the illustration of rule application by using a diacritic, (e.g. *á*), to mark stressable elements that receive asterisks on line 1. The Vowel Reduction rule (which is non-cyclic in nature) takes place after the spell-out of n_2P .

At vP , where the root phrase is spelled out, the stress rules apply, which gives the root spell-out *govern*, illustrated in (17a).

- (17) a. at vP : *govern-(Ø)* → EMR → MSR → the root is spelled out as *góvern*

line 1 *
 line 0 (*]*
 govern

At the next phase, n_1P , the affix *-ment* is added to the structure and consequently to the metrical grid, but since this affix is non-cyclic, it does not trigger application of EMR and MSR. Thus the vP is spelled out as *govern*, as illustrated in (17b).

(17) b. at n_1P : *govern(ment)* → the vP is spelled out as *govern*

line 1	*		
line 0	(*	*	*
	govern ment		

The next spell-out, illustrated in (17c), occurs at aP , where the stress rules are triggered by the attachment of the cyclic affix *-al*. The underlying representation of the affix *-ment* is still accessible at this point, so after that syllable receives an asterisk on line 1, the vowel in *-ment* surfaces as a /ε/. The underlying representation of the root is inaccessible at this point, so even if the stress rule at this point assigns no asterisk on line 1 to the root *govern-*, the latter still retains the asterisk due to its already having been spelled out two phases ago, as in (17a). The resulting effect of this mechanism is that it appears as if the stress is preserved from the previous assignments.

(17) c. at aP : *government(al)* → EMR → MSR → the n_1P is spelled out as *gouvernément*.

line 1	*		*	
line 0	(*	*	(*] *
	govern ment al			

At n_2P , the complement aP is spelled out as *gouvernemental*, as illustrated in (17d). The affix *-ese* attached at this point triggers a reapplication of the stress rules, causing a projection of a line 1 asterisk on the syllable /ese/. However, since the chunk *gouvernement-* is inaccessible to the stress rules applying at n_2P all line 1 asterisks of n_1P are preserved in the grid.

(17) d. at n_2P : *governmental(ese)* → EMR → MSR → the aP is spelled out as *gouvernemental*

line 1	*		*		*
line 0	(*	*	(*	*	(*
	govern ment al ese				

Finally, at the next higher phase n_2P is spelled out. Stress rules have assigned a line 1 asterisk to *-ese*, while line 1 asterisks of aP are still preserved from previous phases. Since now we reach the end of the word, Vowel Reduction takes place. This is illustrated in (17e).

- (17) e. at the next higher phase: *governmentalese*: → EMR → MSR → Vowel Reduction
 → n_2P is spelled out as *gôvernmentálése* /gʌvərnməntəli:z/

If the asterisks assigned by stress rules on previous phases were erased, the Vowel Reduction rule would reduce the vowels in /gov-/ and /ment-/. However, these chunks of the word were spelled out in previous phases with the vowels in question receiving line 1 asterisks. Given Phase Impenetrability Condition, this information is automatically carried over to the last phase and thus these vowels are prevented from the Vowel Reduction.⁸

6. SOME CONCEPTUAL ISSUES IN PHASE ANALYSIS

6.1. Advantages

An analysis that makes use of a phase spell-out on the word level certainly has some advantages over theories that do not employ the word structure in the derivation of stress facts. First, in a phase analysis the stress preservation insights from SPE and Kiparsky (1979) can be directly linked to a finer-grained syntactic approach as in Marantz (2001), where the structure of words plays an active role in predicting the stress in derived words. A more global property of this approach is also the fact that a single generative engine is employed in producing words, phrases and sentences in contrast to the so-called lexicalist approaches that utilize two separate generative systems, one for words and one for phrases and sentences, e.g. DiSciullo and Williams (1987).

6.2. Problematic issues

As always, several problematic issues need to be taken into account. The first one is that not all stress-related processes can be subject to Phase Impenetrability Condition as in (4), one of such being the assignment of primary stress, which may change with affixation (e.g. *gôvernment* - *gòvernmentál*), even though stress is preserved once assigned – the first syllable of the word *governmental* carries a secondary stress as a result of once having been assigned a primary stress on that syllable in the word *government*. Similarly, the so called Rhythm Rule, Liberman and Prince (1977), Kiparsky (1979), can change the properties of the already spelled-out constituent, as can be seen in (18) for the word *thirteen*. Given these facts, it has to be the case that primary stress assignment is a phenomenon occurring at lines higher than line 1 in the metrical grid and is therefore not subject to the phase spell-out and the Phase Impenetrability Condition.

- (18) a. thirtéen
 b. thirtèen mén

⁸ In this derivation, we do not state explicitly what the difference between primary stress and subsidiary stress is, the term stress covering both of the two specific cases. See section 6.2. for a more detailed discussion in connection with this relationship.

The next issue to be discussed is that if one adopts Halle (1998) rules of stress assignment, one still depends on the idiosyncratic property of the individual affix as to whether its phase will or will not trigger the application of stress rules. For example, *-ment* as a stress neutral-affix does not trigger the stress rules, while *-al* as a stress-changing affix does. It would be perhaps desirable if every phase also meant the application of stress rules, however, this cannot be achieved in the present theory.

The last issue to be discussed is of empirical nature and relates to a small group of exceptions that cannot be explained by a phase analysis. If in example (19) the right-hand word is derived from the left-hand one, where the latter is already an xP, then we run into a problem of derived words either losing or acquiring stress on the parts that should be already spelled out.⁹

- | | |
|---|--|
| (19) a. <i>sólid</i> – <i>solidity</i> | b. <i>télegràph</i> – <i>télégraphy</i> |
| c. <i>catástrophe</i> – <i>catastróphic</i> | d. <i>compóment</i> – <i>componéntiality</i> |

For example, in the word *solidity*, consisting of the adjective *solid* and *-ity*, we expect the stress to be as in *sòlidity* with no vowel reduction of /ò/, but instead we get *solidity* with a reduced vowel. This problem is acknowledged already in SPE, where a solution is offered in the form of a series of rules applying to specific groups of words such as *solidity*. The important thing to note is that the groups of words that behave as *solidity* are not the general case, but exceptions that are very hard to capture in any theoretical background. In this paper I rely on the SPE treatment of exceptions as being somehow marked in the lexicon as exceptions to the standard set of rules that otherwise apply to a vast majority of words.¹⁰

7. ENGLISH STRESS IN OPTIMALITY THEORY

In this part we present the basic overview of a non-rule based approach, with special emphasis on stress assignment in derived words. The analysis of English stress considered is Burzio (1994), which belongs to the set of Optimality Theory-based analyses. Burzio's account makes use of interactive well-formedness constraints in the spirit of McCarthy and Prince (1993) and Prince and Smolensky (1993), where stress is not assigned by phonological rules, but is rather a result of the ranking of constraints which impose conflicting demands on representations. This section is intended as an illustration of the main principles rather than a detailed summary of the whole of Burzio's (1994) proposal.

⁹ The words that acquire subsidiary stress in the derivation of the type *condense-còndensation* and the words that lose subsidiary stress of the type *consult-cònsultation* can be accounted for by relating their stress to their internal structure. See SPE and Marvin (2002) for a proposal.

¹⁰ "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.", (SPE: 113).

7.1. English word stress in general

To begin with, let us summarize Burzio's (1994) analysis for underived words. Burzio proposes a typology of possible feet as in (20), where »H/L« stands for heavy/light syllables and vowels followed by colons are long.

(20) Possible feet	Non-rightmost	Rightmost
a. (Hσ)	mo(nòn ga)hé:la	àri(zó: na)
b. (σLσ)	(winnepes)sáukee	a(mé ri ca)

Burzio (1994)

The second component of his analysis is English specific existence of a special class of syllables, referred to as weak, which may or may not be metrified, as exemplified in (21), where the weak syllables are italicized. In the right-hand column, the final weak syllable is extrametrical, which is why these words appear as exceptional in terms of stress.

(21) a. a ris (to cra cy) / (ac cu ra)cy	
b. ob(ject <i>tive</i>) / (ad ject) <i>ive</i>	Burzio (1994)

Weak syllables are special also when not extrametrical. They form the so-called weak feet, which fail to attract primary stress, as illustrated in (22). In English, primary stress falls on the rightmost non-weak foot.

(22) a. (órho)(dòxy)	
b. (áchi)(tècture)	Burzio (1994)

The final postulate of the analysis is that all English words end in a vowel, leading to positing final null vowels in words such as *robust* or *develop*, as shown in (23).

(23) a. ro(búst∅) / (éarnes)t∅, (fré quen)ce	
b. de(vé lo p∅) / (ás te ris)k∅	Burzio (1994)

7.2. Constraint ranking

In this part the main constraints that regulate stress assignment in English are presented, first for non-affixed and then for affixed words.

7.2.1. No affixation

The highest ranked constraint is the so-called Metrical Well-formedness, which represents a set of possible feet in English and is summarized in (24):

(24) Metrical Well-formedness, Burzio (1994: 165):

	Feet	Non-rightmost	Rightmost
a.	mo(nòn.ga)héla	(Hσ)	(Hσ) a(gén.da)
b.	(wìn.ne.pes)sáukee	(σLσ)	(σLσ) a(mé.ri.ca)
c.	ac(cé.le)râte	(Lσ)	#(Lσ) h(ónes)t

Indeterminacies with respect to parsing, e.g. whether a certain chunk is parsed as (σLσ) or σ(Lσ) or to the metrification of weak syllables are resolved by further constraints that are ranked lower than Metrical Well-formedness. These are summarized in (25) as part of the Metrical Alignment constraint, Burzio (1994: 166) and will not be further summarized in this paper.

(25) *Metrical Alignment*

- a. Strong Retraction condition: ... (σσ)(HW)#
- b. Metrical Alignment: *(σ...H...)
- c. Metrification of verbs: ...ϕ#
- d. Exhaustive Parse: #(.../...)#

7.2.2. *Affixation*

Burzio (1994) notes the two familiar patterns of stress preservation under affixation, which he refers to as weak stress preservation and strong stress preservation, exemplified in (26) and (27), respectively. The first one is traditionally argued to occur when stress-changing suffixes are attached, while the second occurs with stress-neutral suffixes.

(26) napóleon na(pòle)ónic

(27) pròpagánda pròpa(gándis)t∅

When it comes to the interaction between stress and word-formation, Burzio (1994) argues that a major player in this domain is the principle that imposes consistent metrical characteristics on morphemes and in preservation of stem stress under affixation. The constraint regulating the preservation of stem stress under affixation is Metrical Consistency, which is aligned as in (28) with respect to the two other stress assigning constraints in his system.

(28) Metrical Well-formedness >> Metrical Consistency >> Metrical Alignment

In this system, Metrical Well-formedness is the most important property and no English suffix can evade metrification in any way. The difference between what we traditionally term stress-neutral and stress-changing suffixes (i.e. between (27) and (26)) is a reflex of the way in which the indeterminacy of final weak syllables can combine with the phonological structure of the suffix itself. Stem stresses are pre-

served if and only if they correspond to independently well-formed feet. In the word *napoleonic*, which contains a stress-changing affix *-ic*, the stem *napoleon* and the affix *-ic* interact in such a way that the constraint of Metrical Well-formedness requires a remetrification such as in (29).¹¹

- (29) ...ic
 a. ...σ0 (L1 L2 σ3) → ...σ0 (L1 L2)(σ3 i cə)
 b. na(póle)(ónicə)

In the word *propagandist*, with a stress-neutral affix *-ist* and the stem *propaganda*, the syllable from the affix overlaps with the syllable of the stem and the constraint of Metrical Well-formedness assigns stress as in (27) in a predictable fashion; no remetrification is needed, which results in an apparently complete preservation of stress.¹²

In Burzio's system the default case is that stress does not change with affixation unless the phonological properties of the stem and affix combination require a remetrification of the whole to obey the higher ranked well-formedness constraint. Affixes are thus neither stress neutral nor stress changing by nature as in the SPE approach, but appear as such due to the interaction with the stem and the tendency to obey the well-formedness constraint.

8. A comparison to a phase analysis

In this part we compare Burzio's analysis with the phase analysis as proposed in this paper, with special emphasis on the stress preservation phenomenon. To repeat, Burzio (1994) deals with stress assignment in English by combining metrical well-formedness and stem stress preservation in an Optimality Theory fashion (constraints in (28)), while the phase analysis as in Marvin (2002) utilizes a rule-based approach towards English stress as in Halle (1998), where stress preservation is connected to the word structure through the notion of word level phase, Marantz (2001). We shall see that although Burzio's analysis deals elegantly with the notion of stress neutral and stress changing affixes, eliminating this property by making it a result of stress related constraint ranking, the phase analysis crucially captures the connection between structure of words and stress when it comes to affixes with a mixed behavior as to causing a stress change – these are affixes that sometimes appear as stress-changing and sometimes as stress-neutral. In such cases Burzio's analysis fails to see the structure-stress connection, which in his system comes out just as a by-product of constraint ranking and affix-stem combination interplay.

¹¹ Other cases of weak preservation of stress are dealt with in a similar fashion in Chapter 6-7 of Burzio (1994). For the reasons of space we cannot give further examples in this paper.

¹² Other cases of strong preservation of stress are dealt with in a similar fashion in Chapter 8-9 of Burzio (1994). For the reasons of space we cannot give further examples in this paper.

8.1. Stress preservation and mixed suffixes

When it comes to stress preservation, Burzio (1994) introduces a constraint on stress preservation, which makes sure stress is preserved in affixation, but which can be superseded by the Metrical Well-formedness constraint, the result of which is what appears to be a stress shift in some cases. For Burzio such stress shift has traditionally been mistakenly ascribed to the properties of the affixes (whether they are stress changing or stress neutral). In the phase analysis, the phenomenon of cyclic preservation of stress is explained as a result of the stress rules, the properties of individual affixes and the structure. As one can see, albeit indirectly, Burzio (1994) appeals to word structure, introducing a constraint by which affixed words preserve stem stress, though all work in stress placement is done by the metrical consistency constraint and the connection between the constraint and the word structure appears random. It should also be noted that Burzio (1994) does not see stress preservation linked to vowel reduction in contrasting pairs such *cond[e]nsation* and *comp[ə]nsation*. He claims that the difference in vowel length follows from constraints of the preservation of segmental quality (from *cond[e]nse* and *comp[ə]nsate*) that is independent of preservation of stress. In this paper I limit the comparison between his analysis and the phase analysis to the position that the two take to the preservation of stress.¹³

Let us now turn to the case of mixed suffixes, where the two approaches to stress preservation crucially differ in their treatment. Mixed suffixes, such as *-able* or *-ist*, are suffixes that in some words appear as stress changing (e.g. *rémedy-remédiable*), while in other words they appear as stress neutral (e.g. *prevént-prevénable*).

Burzio (1994) solves this puzzle by referring to the metrical properties of the combination of the stem and the affix, claiming that *-able* is stress-neutral if the first syllable of *-able* replaces the null vowel, as in (30).

- (30) a. *pre(véntø) → pre(vénta)ble*
 b. *in(hábitø) → in(hábita)ble*

Otherwise, *-able* appears stress-changing, since it requires remetrification as in (31).

- (31) a. *(démon)(strá:te) → de(mónstra)ble* b. *(ímpreg)(nàte) → im(prégna)ble*
 c. *(rémedy) → re(mé:dia)ble* d. *(súrvey) → sur(véya)ble*

Burzio (1994) also notes the following generalization: mixed suffixes are systematically neutral with free stems but not neutral with bound ones, the property which in his system is captured by positing the two constraints as in (32).

¹³ For a detailed proposal, the reader is referred to chapters 4 and 10 in Burzio (1994) and to Burzio (2007). For problematic cases, such as the pair *inf[ɔ]rm – inf[ə]rmation*, which are elegantly dealt with by referring to the word structure in SPE and Marvin (2002), Burzio has to introduce further constraints to handle the non-preservation of segmental quality.

(32) Metrical consistency hierarchy: $a > b$

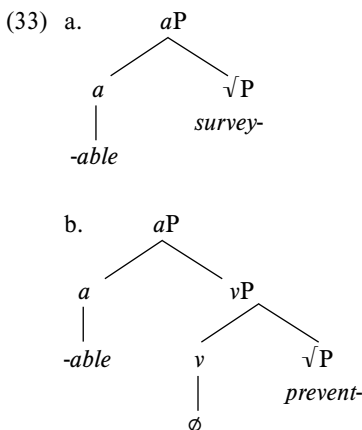
a. Stem consistency

b. Suffix consistency

Burzio (1994)

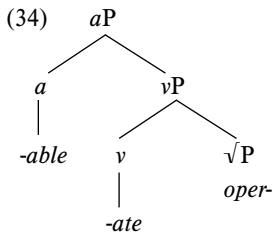
Mixed suffixes appear neutral when attached to a free stem, satisfying (32a) (e.g. *americanist* derived from *american*), but impose a fixed stress pattern otherwise, i.e. with bound stems, (e.g. *antagonist* derived from *antagon-*), satisfying (32b), when (32a) is irrelevant.

In the phase analysis the »mixed« behavior of suffixes such as *-able* is directly related to the structure of the word; it is a consequence of the attachment site of the affix. Namely, *-able* appears stress-changing in (33a) because it is introduced in the first phase (i.e. with bound stems); otherwise, when introduced on top of another phase (i.e. with free stems), it appears stress-neutral, (33b):



Similarly, such analysis explains the fact that base verbs in *-ate* are often (e.g. *comparable*), but not always truncated, as in *cultivable*, *emancipatable*, *operatable*, Plag (2003). The stress pattern of the non-truncated adjectives is predictable (*opératable*) and follows from the structure in (34). The affix *-able* is not attached to the root directly, but to an already made verb *opérate*, or in other words, it is introduced on top of the first phase, *vP*, and has thus, given (4), no bearing on the stress assigned in the previous phase.¹⁴

¹⁴ The primary stress assignment is not subject to (4), thus the changes in the position of primary change are allowed. What is important for this analysis is that stress is preserved, albeit as subsidiary stress.



The fact that mixed affixes appear stress-neutral with free stems and stress-changing with bound ones does not come about coincidentally in the phase analysis. This fact is seen as a cause rather than a consequence—the affix *-able* is in principle always stress-changing, however, it can only bring about the stress change if attached in a certain structural position (e.g. it can change the root stress is attached to the root directly, but not otherwise, (34 or 33b)).

8.2. Stress preservation in multiple suffixation

A phase analysis also deals straightforwardly with the following generalization from Burzio (1994), where he observes that neutral suffixes maintain their word integrity under further suffixation—if in the structure (35) suf_1 is neutral, then suf_2 can affect at most suf_1 , but not the stem, as seen from the example (36).

(35) stem + suf_1 + suf_2

(36) *desire* → *desirable* → *desirability*

In the phase analysis such generalization is directly predicted. Given (4) and (5), attached material can influence the stress of the previous phase, but not of the phase below the previous phase. In (35) it is therefore expected that suf_2 could influence the stress placement of the material in the suf_1 , but not of the stem, because the latter will be spelled out at the point where suf_1 is attached and thus become inaccessible for the changes that further suffixation might bring about. Again, what follows directly from the structural position of the affix in the phase theory is coincidental in the Optimality Theory analysis.

9. CONCLUSION

In this paper we presented an analysis of English stress preservation in derived words that is a natural extension of the classic derivational analysis found in SPE, supplemented with a theory of word structure as in Marantz (2001). The main idea of the proposal is that stress facts in English result from an interaction of stress rules, stress properties of affixes and word structure, and where the preservation of stress in affixation is crucially connected with the word structure. The paper also briefly presented an Optimality Theory analysis of English word stress, Burzio (1994), com-

paring the two proposals in how they deal with the preservation of stress phenomenon. To deal with the latter, Burzio (1994) introduces a constraint on stress preservation, which makes sure stress is preserved in affixation, but which can be superseded by the Metrical Well-formedness constraint, the result of which is what appears to be a stress shift in some cases. For Burzio such stress shift has traditionally been mistakenly ascribed to the properties of the affixes (their being either stress changing or stress neutral) and this is one of the points where the two proposals differ crucially. Another crucial difference between the phase and the Optimality Theory analysis is the predictions that the two make as to the so-called mixed suffixes. The phase analysis can account straightforwardly for the mixed behavior as following from the structural position that the affix takes in the word, while in the Optimality Theory analysis such instances appear either coincidental or are made to follow from further constraints that indirectly rely on the structure of words.

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Abstract

PHASES AT THE WORD LEVEL

This paper presents a view on word structure in which words are argued to exhibit the syntactic phenomenon of Chomsky's (2001) phase-by-phase spell-out in Marantz (2001) fashion, where category-forming phrases such as little *vP*, *nP* and *aP* constitute phases at the word level. Category changing morphology within a word thus yields phases, and cyclic phonological effects within words can be seen as following from the cyclic operation of syntactic derivation by phase, as in Marvin (2002). The paper investigates the interaction of stress assignment and the structure of words in English, arguing that stress and vowel quality in English are diagnostic of spell-out domains within words, and that in turn syntactic domains predict the spell-out. The analysis proposed is essentially a modernized version of the proposal found in Chomsky and Halle (1968), where the notion of Chomsky and Halle's "cycle" corresponds to the "phase at the word level" and the "phase spell-out" relates to the "preservation of stress from earlier cycles". The proposal is then compared to an Optimality Theory analysis of English word stress found in Burzio (1994), especially with respect to the analysis of stress preservation in English word-formation. Burzio (1994) deals with stress assignment in English by combining metrical well-formedness and stem stress preservation in the form of interacting constraints. In his system, contrary to the one in the phase analysis, the relationship between word stress and word structure appears random.

Povzetek
FAZE NA BESEDNEM NIVOJU

Članek obravnava pojav ohranitve naglasa v angleških izpeljankah v luči morfološke teorije, ki predpostavlja, da so besede zgrajene po postopkih skladenjske komponente slovnice in so kot take podvržene t.i. faznemu izpisu ("phase spell-out"), kot ga za stavčni nivo predlaga Chomsky (2001), za besedni nivo pa Marantz (2001). V tem pristopu so besede pojmovane kot besedne zveze t.i. malih glagolskih, samostalniških in pridevniških jeder *g*, *s* in *p*, ki jih tipično udeležujejo glagolske, samostalniške in pridevniške pripone pri izpeljavi. Male besedne zveze so faze, kar pomeni, da na stopnji, ko jih kot sestavnike dodamo v drevesno strukturo besede, hkrati izpišemo njihovo dopolnilo, ki je po tem trenutku nedostopno za fonološke in pomenske spremembe od nadaljnjih sestavnikov, ki se priključijo besedi. V takem pristopu lahko ciklične fonološke pojave, kot je na primer ohranitev besednega naglasa pri izpeljavi v angleških besedah, izpeljemo s pomočjo skladenjske strukture. Analiza s fazami na besednem nivoju je posodobljena analiza, ki jo za ciklične pojave najdemo v Chomsky in Halle (1968). V članku jo nadalje primerjamo z analizo angleškega besednega naglasa v okviru optimalnostne teorije, ki jo najdemo v Burzio (1994). Burzio (1994) predlaga, da je naglas v angleščini posledica omejitev glede možnih površinskih oblik, povezava med naglasom in besedno zgradbo pa je v njegovi teoriji le stranski produkt medsebojnega vpliva omejitev.