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On the nonuniformity of weight-to-stress and stress preservation effects in English*

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Introduction

Since Chomsky and Halle 1968, it has been agreed that syllable weight plays a determining role in main stress placement in English. Nouns, for example, are stressed on the penultimate syllable if it is heavy, where either a long vowel (1a), or a coda consonant (1b) makes a syllable heavy. When the penult is light (1c), stress is antepenultimate.

(1) a. aróma balaláika hiátus horízon aréna Minnesóta angína
b. agénda uténsil appéndix placénta synópsis amálgam
c. Cánada América cínema ársenal análysis jávelin vénison

The relationship of syllable weight to secondary stress is less straightforward, and so has been the subject of more dispute. As Halle and Kenstowicz (1991) emphasize, it is to some extent arbitrary whether heavy syllables bear secondary stress or not.[1] Corresponding to the stressed heavy syllables in (2a) are the unstressed heavies in (2b).

(2)	a.	ìncàrnátion	òstèntátion	chìmpànzée	Hàlicàrnássus	ròdomòntáde
	b.	Pènnsylvánia	rèpercússion	sèrendípity	Kìlimanjáro	Nèbuchadnézzar

Although the existence of these near minimal pairs does indicate that the lexicon has a role to play in the stressing of heavy syllables, the weight-to-secondary stress relationship is not entirely arbitrary. A clear demonstration of this comes from the fact that syllable weight does unequivocally determine secondary stress placement in some environments (more subtle arguments against simply arbitrary weight-to-stress for even the words in (2) are presented in §1 and §3). For example, the "initial dactyl" effect (3a; see Prince 1983:49), in which a ternary string of light syllables receives initial

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[1] I take the standard view that a syllable with a reduced vowel or a syllabic sonorant consonant is unstressed, and one with a full vowel is stressed, modulo the effects of word-finality (see Burzio 1994 for another stance). I will not discuss finer distinctions between levels of stress than secondary, primary, and the complete lack of stress because neither syllable weight, nor stem stress, seem to determine whether a syllable has tertiary or secondary stress (on the non-determination of the secondary/tertiary distinction by stem stress, see Halle and Vergnaud 1987 and Kager 1989; cf. Kiparsky 1979).

stress, is blocked when the second syllable is heavy, as in (3b) (Chomsky and Halle 1968: 114 and many subsequent others).

(3) a. Tàtamagóuchi àbracadábra Kàlamazóo Wìnnepesáukee Wàpakonéta dèlicatéssen
b. Monòngahéla Valènciénnes geròntophília Belùchistán

Stress preservation yields a strikingly similar pattern of sometimes arbitrary, and sometimes unequivocal determination of secondary stress placement. Whether or not stem stress is preserved on medial pretonic heavy syllables is basically arbitrary, as a comparison of the words in (4a) with those in (4b) bears out.

(4) a. àdvàntágeous àugmèntátion àuthèntícity còndèmnátion còndènsátion
b. ìnformátion làmentátion cònservátion fràgmentátion tràsportátion

However, stress preservation, like weight-to-stress, consistently overrides the preference for initial dactyls (Hammond 1989, Burzio 1994):

(5) accrèditátion imàginátion orìginálity medìcinálity divìsibílty phenòmenólogy

This brief sketch of English secondary stress is sufficient to show that principles of weight-to-stress, and stress preservation are not uniformly active or inactive, on or off. Nor is their application determined purely lexically (cf. Halle and Kenstowicz 1991); such an account would predict arbitrary variation in the application of these principles to the words in (3b) and (5), where none in fact exists.

To the extent that it has been dealt with, this *nonuniformity* (Prince 1993) of weight-to-stress and stress preservation effects has created tremendous complications in prior analyses of English stress.[2] For example, in the standard treatment of weight-to-stress nonuniformity, instituted by Liberman and Prince 1977 and Hayes 1982 (see also Halle 1973), primary stress is first assigned in a quantity-sensitive fashion, then secondary stress assignment proceeds without regard to quantity, followed by a set of very specific quantity-sensitive destressing rules (cf. Kager 1989).

Nonuniformity is problematic because of the usually implicit tenet of full satisfaction, or inviolability, which claims that when a linguistic principle is in force, it is never violated. A theory based on this tenet often has little to say about a principle that is only satisfied in certain contexts.

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[2] Burzio (1994) avoids the complications of these patterns of nonuniformity by denying that the syllables in (2a) and (4a) are in fact stressed, in conformance with his basic theoretical premise that a foot made up of a single heavy syllable is universally ill-formed (a premise which should rightly be attributed to Kager 1989: 129). This premise is at odds with most other work in metrical theory, and requires a number of equally idiosyncratic assumptions to maintain (e.g. that words like *bandana* have a null initial vowel, that vowel reduction is far more context-sensitive than usually assumed). This is not necesarily a criticism of Burzio's extremely thorough account of English stress; it is internally consistent, and contains a number of important descriptive and theoretical advances that have been made use of here. These idiosyncracies do, however, seriously impede any attempt to systematically compare Burzio's analysis with other analyses of English, as well as situate it in the wider cross-linguistic typology of stress systems (see e.g. Hayes 1981, Halle and Vergnaud 1987, Idsardi 1992, Hayes 1995).

Under full satisfaction, nonuniformity in the data tends to lead to the following theoretical consequences:

i. the proliferation of otherwise unmotivated derivational stages or levels between which the principle (rule/constraint/condition) is turned on and off
ii. a lack of generality in constraint or rule formulation: nonuniformity is simply stipulated
iii. descriptive gaps: nonuniformity is simply ignored

As will be detailed below, the particular cases of nonuniformity examined in this paper have in fact inspired instances of each of these less than elegant analytic moves.

As brought out most forcefully by Prince (1993), and McCarthy (1995), nonuniformity is an expected consequence of Optimality Theoretic constraint ranking and violability, instead of an unwelcome burden. The basic distinguishing characteristic of Optimality Theory (Prince and Smolensky 1993 – henceforth P&S 1993) is that it abandons full satisfaction in favor of minimal violation: a constraint is violated only to the extent necessary to satisfy a higher ranking one. In a theory based on minimal violation, nonuniformity receives an absolutely direct treatment. A constraint is violated in a particular environment because its satisfaction would conflict with the satisfaction of a higher ranked constraint. If in another context the higher ranked constraint makes no conflicting demands, the lower ranked one is obeyed.

The existence of nonuniformity thus provides compelling arguments against full satisfaction, and in favor of minimal violation. In this paper, I closely examine the massively nonuniform effects of syllable weight and stem stress preservation on secondary stress in English, and show that constraint ranking permits explanatory gains on a number of fronts:

i. stress assignment is integrated into a single level
ii. constraints are formulated in a very general fashion
iii. previously inexplicable data are made sense of

The paper is structured as follows. In §1 the usual, productive patterns of weight-to-secondary stress are accounted for in terms of a small set of ranked constraints. Section 2 contains a brief discussion of primary stress placement, demonstrating that quantity sensitive primary stress placement is compatible with the relatively low rank of the WEIGHT-TO-STRESS constraint that the facts of secondary stress placement require. With an account of the usual distribution of stress in hand, I then turn to the data for which Halle and Kenstowicz (1991) invoke lexically conditioned quantity sensitivity – lexical exceptions, and apparent cases of cyclic stress preservation. In this third section, I point out several empirical shortcomings of the Halle and Kenstowicz analysis, and argue for an account of these instances of special secondary stress based both on stress preservation, formalized as prosodic faithfulness, and on lexically specific constraint ranking. By interspersing prosodic faithfulness constraints, and lexically specific constraints, into the hierarchy established for regular stress, the same principles that determine regular prosodification can be used to straightforwardly and

precisely capture the distribution of lexical, and stem based stress. As a spur to further research, residual data, and issues, are discussed in appendices.

1.Weight-to-secondary stress

1.1 The 'Arab' rule

I will start with a particularly complex case of nonuniformity which has to this point defied principled analysis, and which can in fact be reduced to the ranking of a handful of basic metrical constraints. Kager (1989) cites data such as the following to show that an obstruent-final syllable (σ_o) is unstressed if it is preceded by a light syllable (6a), but stressed if preceded by a heavy syllable (6b):

(6) a. **(Lσ_o)-** àlexánder ànaptýxis àrithmétic (adj.) còllectánia Èpictétus Èrechtétum rèsignátion sùrreptítious Màzatlán mòlybdénum

b. **(H)(σ_o)-** dèlèctátion càòutchóuc ìncògníto (*alt.*) tìcktàcktóe Tìmbùcktóo

Post-tonically, this behavior of σ_o's produces what has been called the 'Arab' rule, due to the covariance of final syllable stress with the length of the initial vowel in two idiolectical pronunciations of 'Arab' (i.e. [æ]rab vs. [ey]ràb; see Fidelholtz 1967; Ross 1972).

Also relevant here are the following near minimal pairs:

(7) **a.** ànnexátion àdaptátion àffectátion

b. ìndèxátion rèlàxátion èxpèctátion

Though the stems of the vertically aligned words display nearly identical stress patterns, the derived words with initial light syllables (7a) can have stressless medial heavy syllables, while those with heavy initials (7b) must have stress on both of the first two syllables.[3]

Words in which the first two syllables are parsed as **(Lσ_o)** violate WEIGHT-TO-STRESS, since the heavy syllable is unstressed. Prince and Smolensky (1993:53) state this constraint as in (8).

(8) WEIGHT-TO-STRESS

Heavy syllables are prominent in foot structure and on the grid

This constraint requires that a heavy syllable be both the head of a foot, and dominated by an accentual grid mark indicating stress.[4] Under the premises of Optimality Theory, in which constraint violation must be compelled by some higher ranking constraint(s), English must have at least one

[3] Kenyon and Knott 1953 gives *annexation*, *adaptation*, and *affectation* with either a full or a reduced vowel in the second syllable. See the section 3 for discussion of variation in this domain.

[4] Headship and stress are not necessarily coextensive, even in a theory that recognizes the role of constituency in determining prominence on the grid (Kager 1989, P&S 1993). However, stressed non-heads will not figure in the present analysis (though see Appendix A).

other constraint ranked above WEIGHT-TO-STRESS, which this parsing manages to satisfy, and which would be violated if WEIGHT-TO-STRESS were respected.

One such constraint is PARSE-σ, which demands exhaustivity of constituent construction (see McCarthy 1993, Prince 1993, Mester 1994, Cabré and Kenstowicz 1995, and especially P&S 1993 on Latin for closely related PARSE-σ effects in other languages). In contrast with Halle and Vergnaud (1987), Halle and Kenstowicz (1991), and earlier work, Exhaustivity is recognized as a violable, rather than an inviolable principle in most recent work in metrical phonology, even outside of Optimality Theory (see Kager 1989, Idsardi 1992, Halle and Idsardi 1995, Hayes 1995, and especially Burzio 1994, where it plays an active role in determining the well-formedness of metrifications).PARSE-σ can be stated as in (9).

(9) PARSE SYLLABLE (PARSE-σ):
Syllables must belong to feet

Syllables not parsed by feet are assumed to be parsed by the Prosodic Word (Itô and Mester 1992, McCarthy and Prince 1993a).

If PARSE-σ is ranked above WEIGHT-TO-STRESS, the fully parsed **(Lσ_o)** is preferred to **L(σ_o)**, in which the heavy syllable is the head of the foot and bears stress. As things stand though, nothing discriminates against the parsing **(L)(σ_o)**, where the two syllables form separate feet, fulfilling the requirements of both constraints. What rules this out is FOOT BINARITY (P&S 1993: 47; see also McCarthy and Prince 1986 and 1993a):

(10) FOOT BINARITY (FTBIN):
Feet are binary at some level of analysis (μ, σ).

The requirement that a foot must contain at least two moras (μ) disallows the **(L)** foot needed for the **(L)(σ_o)** parsing, since a light syllable contains but one mora.

Furthermore, all of FTBIN, PARSE-σ, and WEIGHT-TO-STRESS could be satisfied by parsing **(Lσ_o)** as a single right-headed foot (e.g. *Alèxánder*). However, this would violate a constraint demanding left-headed feet, which could be formulated as either aligning the head syllable of a foot with its left edge (cf. McCarthy and Prince 1993b) or as Rhythmic Type = Trochaic (P&S 1993, McCarthy and Prince 1993a). As the exact formulation is of no consequence here, I will simply call the constraint 'TROCH'.

With FTBIN, PARSE-σ, and TROCH ranked above WEIGHT-TO-STRESS, left-headed **(Lσ_o)** is chosen as optimal, instead of **(L)(σ_o)**, **L(σ_o)**, or right-headed **(Lσ_o)**. The tableau in (11) illustrates this result for the pretonic string *Alex-* of *Alexander* (as primary stress placement is discussed in §2, the main stress parsing is left unindicated until then). Constraints separated by a solid line in the tableau are ranked with respect to one another, and those separated by a dashed line are unranked. Constraint violations are indicated by an asterisk, and an exclamation mark shows the violation that rules out a particular candidate. The optimal candidate, which is the grammatical form, receives a check mark.

(11) FTBIN, PARSE-σ, TROCH » WEIGHT-TO-STRESS

Input: *Alexander*	FTBIN	PARSE-σ	TROCH	WEIGHT -TO-STRESS
(Àlex)|ánder ✓				*
A(lèx)|ánder		* !		
(À)(lèx)|ánder	* !			
(Alèx)|ánder			* !	

Since the heavy syllable in the optimal form is unstressed, this candidate violates WEIGHT-TO-STRESS. As shown by the other candidates, the satisfaction of WEIGHT-TO-STRESS requires the violation of one of the higher ranking constraints – FTBIN, PARSE-σ, or TROCH.

When the initial syllable is heavy, stress on the pretonic syllable is correctly generated, as tableau (12) shows.

(12) Tableau for Hσ$_o$

Input: *Timbucktoo*	FTBIN	PARSE-σ	TROCH	WEIGHT -TO-STRESS
(Tìmbuck)|tóo				* !
Tim(bùck)|tóo		* !		*
(Timbùck)|tóo			* !	*
(Tìm)(bùck)|tóo ✓				

The difference here is that the initial syllable contains a coda consonant, so that it can be parsed alone as a bimoraic foot, without causing a violation of FTBIN. This eliminates the conflict between FTBIN and WEIGHT-TO-STRESS satisfaction, allowing the lower ranked WEIGHT-TO-STRESS to choose the candidate with heavy syllable stress. Thus, this complex case of nonuniformity, in which the weight of the preceding syllable determines whether a σ$_o$ gets stressed or not, is reduced to the ranking of three extremely well-motivated constraints above WEIGHT-TO-STRESS. The difficulty this case poses for a theory based on full satisfaction is attested to by the fact that in pre-Optimality Theoretic analyses, this generalization has either been left unaccounted for (see Prince 1985: 486 for an explicit discussion of the inability of then current theories to cope with it), or simply stipulated (amongst metrical theorists, see Hayes 1982: 256 and Kager 1989).

1.2 Sonorant-final syllables

As the obstruent-specific formulation of the Arab rule implies, sonorant-final syllables (σ_s) behave differently. The stressing of a σ_s does not depend on the weight of the preceding syllable. This is attested to by the data in (13), in which pretonic σ_s's preceded by both light and heavy syllables are uniformly unstressed.

(13) a. **(Lσ_s)** àffirmátion làmentátion dìssertátion rèpercússion sèrendípity sìmultáneous tàrantélla

b. **(Hσ_s)** còmpensátion ìnformátion ùsurpátion Pènnsylvánia Mòzambíque gòrgonzóla cònsultátion

With just the constraints introduced above, the string **Hσ_s** would be treated like **Hσ_o**, and parsed as **(H)(σ_s)**. However, the productivity of pretonic **(Hσ_s)** is demonstrated not only by the vast numerical superiority of **(Hσ_s)** over **(H)(σ_s)** (Kager 1989: 123), but also by the existence of derived words in which a syllable that is stressed in the stem becomes stressless, so as to conform to the **(Hσ_s)** pattern (e.g. *ìn**for**mátion* and *còn**sul**tátion* from *in**fór**m* and *con**súl**t* – see further §3).

To rule out **(H)(σ_s)**, there must be an active constraint that disfavours stress on the pretonic syllable. Such a constraint can be derived from the "Stress Well" environment of Halle and Vergnaud 1987: 238, which is used to target stressed syllables adjacent to the main stress for destressing and shortening (see also Liberman and Prince 1977: 285 and intervening work on English stress for similar notions). I assume the formulation in (14).

(14) STRESSWELL

No stressed syllable may be adjacent to the head syllable of the Prosodic Word

This constraint may be regarded as a slightly more specific instantiation of the general prohibition against adjacent stresses, or stress clash (Prince 1983, Hammond 1984). The evidence from within English for this specific formulation is that adjacent stresses *per se* are well tolerated. Words like *Tìcònderóga* show no tendency toward becoming clash-less; examples parallel to **Tìconderóga* are in fact completely unattested (see §3.3). Further exemplification of the strong dispreference for pretonic stress, and the lack of a parallel intolerance of mere adjacency, is provided in §3.2.

It is not easy to marshall cross-linguistic evidence for this constraint, as its effects are often indistinguishable from simple *CLASH. However, Hayes (1995: 157) notes that Maithili has specifically pretonic shortening, which could be reduced to the combined effects of STRESSWELL and WEIGHT-TO-STRESS, as pretonic shortening would result in the satisfaction of both of these constraints.

Before proceeding to rank STRESSWELL so as to produce **(Hσ_s)**, it must be ensured that its introduction does not alter the results obtained for obstruent-final syllables. The fact that a σ_o is usually stressed when adjacent to a primary stress, in defiance of STRESSWELL, can be attributed to the ranking of WEIGHT-TO-STRESS above STRESSWELL:

(15) WEIGHT-TO-STRESS » STRESSWELL

Input: *Timbucktoo*	WEIGHT -TO-STRESS	STRESSWELL
(Tìmbuck)|tóo	* !	
(Tìm)(bùck)|tóo ✓		*

This tableau shows that the heavy syllable stresslessness required to satisfy STRESSWELL leads to a violation of the higher ranked WEIGHT-TO-STRESS, and is thus ruled out.

The ease with which a σ_s is unstressed relative to a σ_o may at first seem unexpected, given the cross-linguistic generalization that if a subset of consonants is moraic, it is composed of the sonorants, rather than the obstruents (Prince 1985; see Prince 1983: 57, Zec 1988 on the typological facts). However, the shedding of a mora is not the only means by which the demands of WEIGHT-TO-STRESS can be escaped. The key here is the longstanding observation that in English, syllable-final sonorants are incorporated into the nucleus when unstressed (see recently Liberman and Prince 1977: 299, Travis 1983, Piggott and Singh 1985; Kager 1989: 166). As such, a σ_s incurs no WEIGHT-TO-STRESS violation, and STRESSWELL is free to choose pre-tonic stresslessness.

(16) Tableau for Hσ_s

Input: *Pennsylvania*	WEIGHT -TO-STRESS	STRESSWELL
(Pènnsl)|vánia ✓		
(Pènnsyl)|vánia	* !	
(Pènn)(sỳl)|vánia		* !

Following Liberman and Prince (1977), a sonorant nucleus is indicated by the omission of the vowel in the spelling.

From this perspective, the greater attraction of stress to σ_o's than to σ_s's can be derived from the cross-linguistic generalization that sonorants make better nuclei than do obstruents (P&S §8). To express this generalization, I will invoke a pair of constraints, and a universally fixed ranking between them (cf. P&S §8). If *SONNUC is violated by a nuclear sonorant consonant, and *OBSNUC by a nuclear obstruent, then the fixed ranking *OBSNUC » *SONNUC creates a universal dispreference for obstruent nuclei relative to sonorants. So long as *OBSNUC dominates WEIGHT-TO-STRESS and STRESSWELL, obstruents will resist integration into the nucleus, even at the cost of violating the latter two constraints. With *SONNUC ranked beneath these constraints, they will continue to compel sonorant nuclei. The tableau in (17) shows how this ranking stops obstruents from behaving like sonorants in the face of a STRESSWELL violation.

(17) *OBSNUC » STRESSWELL

Input: *Timbucktoo*	*OBSNUC	WEIGHT -TO-STRESS	STRESSWELL
(Tìmbck)|tóo	* !		
(Tìmbuck)|tóo		* !	
(Tìm)(bùck)|tóo ✓			*

The ranking *OBSNUC » STRESSWELL rules out a nuclear obstruent, as in the top candidate, in favor of pretonic stress, as in the final, optimal one. The final candidate would remain optimal if *OBSNUC and WEIGHT-TO-STRESS were unranked, since all that is necessary to rule out the second candidate is the ranking of WEIGHT-TO-STRESS » STRESSWELL. The necessary dominance of *OBSNUC is displayed only in a situation in which WEIGHT-TO-STRESS is violated by the optimal candidate:

(18) *OBSNUC » WEIGHT-TO-STRESS

Input: *Alexander*	*OBSNUC	WEIGHT -TO-STRESS
(Àlx)|ánder	* !	
(Àlex)|ánder ✓		*

Sonorant nuclei, on the other hand, continue to be preferred over pretonic stress, since STRESSWELL dominates *SONNUC:

(19) STRESSWELL » *SONNUC

Input: *Pennsylvania*	STRESSWELL	*SONNUC
(Pènnsl)|vánia ✓		*
(Pènn)(sỳl)|vánia	* !	

Before turning to further data and analysis, it is worth noting the contribution of the theoretical assumption of *Parallelism* (see P&S 1993, McCarthy 1993, Cohn and McCarthy 1994, McCarthy and Prince 1995) to this treatment of the σ_s/σ_o asymmetry. It appears to be crucial that syllabification and stress assignment be evaluated in parallel, rather than established and evaluated in sequence (see P&S 1993: §3.2 for arguments to this effect for Tongan). Whether the second syllable in a **H**σ-pretonic sequence is unstressed depends upon whether the syllable-final consonant can be parsed as

a nucleus. Whether a sonorant is parsed as a nucleus in turn depends upon whether it is unstressed. This sort of interdependence between the well-formedness of stress and syllable structure is extremely difficult to express in a theory in which syllabification derivationally precedes stress placement.

1.3 Other pretonic patterns
1.3.1 Odd-parity strings
Combining the rankings motivated thus far, the complete hierarchy stands as follows:

(20) FTBIN, PARSE-σ, TROCH, *OBSNUC » WEIGHT-TO-STRESS » STRESSWELL » *SONNUC

An interesting and encouraging property of this hierarchy is that it needs very little embellishment to generate the correct results for odd-parity pretonic strings of syllables. In accounting for the stressing of bisyllabic strings, we have established that PARSE-σ dominates WEIGHT-TO-STRESS (✔(Àlex)ander; *A(lèx)ander) and that WEIGHT-TO-STRESS dominates STRESSWELL (✔(Tìm)(bùck)too; *(Tìmbuck)too). This means that by transitivity, PARSE-σ dominates STRESSWELL, which leads to the prediction that a single pretonic syllable should be parsed, even at the expense of a STRESSWELL violation.

This prediction is borne out in the difference between a single pretonic σ_s, and one that is preceded by another syllable. As we saw in the last sub-section, when a σ_s follows another syllable, light or heavy, it is parsed as the weak member of a bisyllabic foot, in obedience to STRESSWELL. However, when there is but a single syllable, PARSE-σ forces it to be parsed alone, and stressed, in contravention of STRESSWELL. Illustrative data appear in (21), and an illustrative tableau in (22).

(21) **bàn**dána **Nàn**túcket **pòn**tóon **càn**téen **cèn**túrion **càn**tánkerous

(22) Tableau for σ_s-

Input: *bandana*	PARSE-σ	WEIGHT-TO-STRESS	STRESS WELL	*SON ADJ
(bàn)|dána✓			*	
bn|dána	* !			*
ban|dána	* !	*		

Note that the availability of a nuclear sonorant as an alternative to a WEIGHT-TO-STRESS violation has no effect on the outcome, because in this instance, PARSE-σ, rather than WEIGHT-TO-STRESS, is the constraint motivating heavy syllable stress.

When a σ_s is the last member of a trisyllabic pretonic string, it also usually receives stress, as the examples in (23) illustrate.

(23) **a. (σ σ)(σ$_s$)** Hàlicàrnássus ròdomòntáde pìthecànthrópus
b. (σ σ)(σ$_s$) àrgumèntátion ìnstrumèntátion sàcramèntátion sèdimèntátion èlephàntíasis

The words in (23b) are based on roots without stress on the final syllable, which precludes an analysis in which the stress is stored underlyingly, and points to the productivity of this pattern of secondary stress assignment (Kager 1989: 123). The productivity of pretonic stress in this environment also follows from the dominance of PARSE-σ:

(24) Tableau for σ σ σ$_s$

Input: *Halicarnassus*	PARSE-σ	WEIGHT-TO-STRESS	STRESS WELL	*SON ADJ
(Hàli)(càr)|nássus✓			*	
(Hàli)car|nássus	* !	*		
(Hàli)cr|nássus	* !			*
Ha(lìcr)|nássus	* !			*

Here too, leaving a syllable unparsed is fatal, due to the dominance of PARSE-σ over the other constraints. A fifth candidate, not shown in this tableau, in which all of the pretonic syllables are grouped into a single foot, would violate FTBIN, since such a foot is neither moraically nor syllabically binary (more on this below).

In this environment, a σ$_o$ behaves in the same way as a σ$_s$:

(25) **bàc**téria **Òc**tóber **èx**trínsic **còg**nítion àpo**thèg**mátic àni**màd**vérsion

This is as expected, since there is nothing in this analysis that differentiates σ$_o$ and σ$_s$ in relation to PARSE-σ. And as we will see in the next subsection, pretonic long vowels are also stressed in this environment, and stressless when preceded by a single syllable.

1.3.2 Pretonic long vowels

We have yet examine the stressing of pretonic open syllables. Syllables with underlying long vowels for the most part pattern with σ$_s$'s. Halle and Vergnaud (1987: 240) observe that long vowels usually retain their length and are stressed in initial position (26a), but surface as stressless and reduced medially, after both heavy and light syllables (26b).

(26) **a.** **prì**vátion **vò**cátion **cì**tátion **è**jéction **grà**dátion
b. dè**pri**vátion ìn**vo**cátion èx**ci**tátion rè**ve**látion dè**gra**dátion

There are, however, no reported monomorphemic words that have a pretonic long vowel in the same position as the stressed σ_s in *Hàli**càr**nássus*. Given the small number of underived words with trisyllabic pretonic strings, it is difficult to know if this is an accidental gap. In derived words, at least, we do find such pretonic long vowels (see further §3, and Appendix B):[5]

(27) rètro**grà**dátion cìvi**lì**zátion stàndar**dì**zátion pàra**sì**tólogy

To account for the patterning of long vowels with σ_s's, the constraint requiring the preservation of input vowel length in the output form can simply be placed in the same position in the hierarchy as *SONNUC: at the bottom. Following McCarthy (1995) and Urbanczyk (1995), a formulation of this constraint in terms of McCarthy and Prince's (1995) Correspondence Theory of faithfulness is provided in (28).

(28) WEIGHT-IDENT
If α is bimoraic, then $f(\alpha)$ must be bimoraic,
where *f* is the correspondence relation between input and output

This constraint states that if an input vowel is bimoraic, then the corresponding vowel in the output must also be bimoraic. In the following tableaux, vowel length is indicated by subscripted moras. When the long-voweled syllable is preceded by another syllable, they are parsed together, so as to satisfy STRESSWELL. The satisfaction of WEIGHT-TO-STRESS by the optimal candidate is even more obvious than in parallel σ_s cases (e.g. *Pènn**syl**vánia*), since the vowel surfaces as short and reduced. That vowel length is lost in this environment indicates that WEIGHT-IDENT, like *SONNUC, is dominated by STRESSWELL:

(29) STRESSWELL » WEIGHT-IDENT

Input: *depri$_{\mu\mu}$vation*	WEIGHT-TO-STRESS	STRESS WELL	WEIGHT-IDENT
(depri$_{\mu}$)|vátion ✓			*
(depri$_{\mu\mu}$)|vátion	* !		
(de)(pri$_{\mu\mu}$)|vátion		* !	

Again, the stressing of a single pretonic syllable is due to the requirement that it be parsed (PARSE-σ), rather than the need for heavy syllables to be stressed (WEIGHT-TO-STRESS), or for vowel length to be preserved (WEIGHT-IDENT):

[5] As will be discussed in §3, these words do have variant pronunciations in which the pretonic vowels are reduced. In this respect too, long vowels parallel σ_s's (e.g. the underlined syllable in *rèpre<u>sen</u>tátion* can be either stressed or not).

(30) Tableau for V:

Input: *pri$_{\mu\mu}$vation*	PARSE-σ	WEIGHT-TO-STRESS	STRESS WELL	WEIGHT-IDENT
(prì$_{\mu\mu}$)|vátion✓			*	
pri$_{\mu\mu}$|vátion	* !	*		
pri$_{\mu}$|vátion	* !			*

1.3.3 Pretonic light syllables and left alignment

So far, the dominance of PARSE-σ has played a central role in the analysis. It causes both the lack of stress on obstruent-final syllables when they are preceded by light syllables, and the presence of stress on lone pretonic heavies. Even this robustly satisfied constraint is not uniformly satisfied, however. Single light pretonic syllables, as exemplified by the words in (31), are almost always unstressed, and hence unparsed, under now standard representational assumptions (though cf. Appendices A and C).

(31) **a. L** **ba**nána **A**mérica **te**rrífic **ce**rámic **Fe**llíni **la**góon **go**rílla **Ja**máica **cre**vásse
b. (LL)L Tàta**ma**góuchi àbra**ca**dábra Kàla**ma**zóo Wìnne**pe**sáukee Wàpa**ko**néta dèli**ca**téssen Lòlla**pa**lóoza

Satisfaction of PARSE-σ in these instances leads to a violation of FOOTBIN, as the resulting foot consists of a single monomoraic syllable.[6] With FOOTBIN » PARSE-σ, these syllables remain unparsed:

(32) FOOTBIN » PARSE-σ

Input: *banana*	FOOTBIN	PARSE-σ
ba|nána✓		*
(ba)|nána	* !	

Yet to be accounted for is the initial stress in *Tàtamagóuchi* and the other words in (31b). This disruption of the usual pattern of alternating stress is ascribed by McCarthy and Prince (1993b) to

[6] Also needed here, and anywhere else that FTBIN is invoked to rule out a non-final monomoraic foot, is a high ranking ONSET constraint, which would rule out bàn.ána, and, if ambisyllabicity is permitted, a constraint to rule out ambisyllabicity across a foot boundary. See McCarthy and Prince (1993b), and Pater (1994) for relevant discussion.

one of a family of Align constraints, which in this case forces the alignment of the left edge of the prosodic word with the left edge of a foot:

(33) ALIGN (PRWD, L, FT, L) - ALIGN-LEFT
'Align the left edge of the prosodic word with the left edge of a foot.'

When the initial string is made up of three light syllables, FTBIN demands that one of them must remain unparsed. This is because FTBIN states simply that a foot must be binary, so that constituents must be not only minimally binary at either the syllabic or moraic level, but maximally binary at one of these levels as well (P&S 1993: 47 - this restates the principle of Strict Binarity of foot size proposed by Prince 1985; see also Itô and Mester 1992). The job of ALIGN-LEFT is to ensure that the unparsed syllable is not the initial one:

(34) Left-Alignment

Input: *Tatamagouchi*	FTBIN	PARSE-σ	ALIGN-LEFT
(Tàtama)|góuchi	* !		
Ta(tàma)|góuchi		* !	*
(Tàta)ma|góuchi ✓		* !	

This tableau shows that the ranking of ALIGN-LEFT beneath PARSE-σ is compatible with the initial dactyl data. To see why this ranking is necessary, we must consider other data, since left alignment in *Tatamagouchi*-type words will obtain under any ranking of these two constraints, as inspection of the above tableau should reveal. The data that motivate a low rank for ALIGN-LEFT are those in (35). Here we see that if the second syllable in a ternary pretonic string is heavy, it, rather than the initial syllable, is stressed. While there are few examples of this pattern, it appears to be exceptionless, and native speaker intuitions are strong on the unacceptability of initial stress for these words:

(35) **L(HL)** Monòngahéla Valènciénnes geròntophília Belùchistán

Since even a σ_s or a long vowel in the second syllable inhibits left alignment, ALIGN LEFT must be ranked at the bottom of the hierarchy. The tableau for *Monongahela* shows that the ranking between ALIGN LEFT and *SONNUC is crucial:

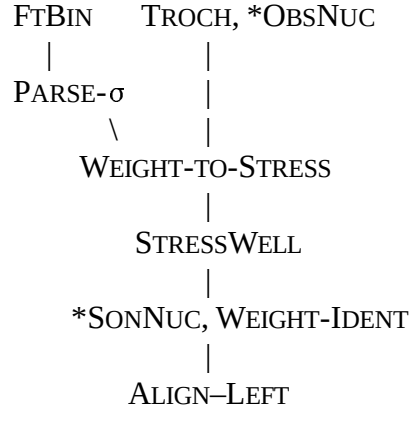
(36) *SONNUC » ALIGN-LEFT:

Input: *Monongahela*	FTBIN	PARSE-σ	WEIGHT-TO-STRESS	*SON NUC	ALIGN-LEFT
(Mònnga)|héla	* !				
(Mònon)ga|héla		*	* !		
(Mònn)ga|héla		*		* !	
Mo(nònga)|héla ✓		*			*

The topmost candidate is immediately ruled out by FTBIN. The remaining candidates all violate PARSE-σ, so evaluation is passed on to the next constraint, WEIGHT-TO-STRESS, which rules out the parsing **(LH)L**. With *SONNUC » ALIGN-LEFT, the candidate with left mis-alignment is correctly chosen over the one with the nuclear sonorant. In sum, even though a σ_s can behave as a light syllable in order to avoid a STRESSWELL violation, left alignment is not a sufficiently potent force in English to warrant the requisite violation of *SONNUC.

The addition of ALIGN-LEFT, and WEIGHT-IDENT, and of the ranking between FOOTBIN and PARSE-σ, is thus all that is needed to complete the account of the regular patterns of heavy syllable stress and stresslessness in secondary stress assignment (though see Appendix C on light syllable stress). The final hierarchy is as depicted in the tree diagram in (37), which is used because FTBIN and PARSE-σ are ranked with respect to one another, but both are unranked with respect to TROCH and *OBSNUC.

(37)



At this point, it is worth drawing attention to how another nonuniform weight effect (besides the Arab rule) has been dealt with here in terms of constraint ranking and minimal violation, and contrasting this analysis with one based on full satisfaction.

The most obvious source of nonuniformity comes from the different behaviors of heavy syllables in initial, and medial position. In initial position, heavy syllables are regularly stressed (e.g. Sỳlvánia, prìvátion); in between initial and tonic position, abstracting from σ_o's and the Arab rule,

they are usually unstressed (e.g. Pènnsylvánia, dèprivátion). Here this positional difference is derived from the ranking of PARSE-σ » STRESSWELL. STRESSWELL demands pretonic stresslessness, but is overruled when it would lead to non-exhaustive parsing.

Halle and Vergnaud (1987: 240) explicitly discuss the long vowel cases. They do account for them without making their rule of stress deletion refer to the word-medial environment; this is done, however, by positing a rule of shortening that applies only medially. Thus, the existence of nonuniformity is accounted for by stipulating it in the formulation of a rule.

More generally, the absence of medial heavy syllable stress is attributed to the quantity insensitive nature of secondary stress assignment, as expressed in Strong Retraction (Hayes 1982), and the set of rules Halle and Vergnaud (1987) dub "the Alternator". But as we have seen, in many environments, pretonic heavy syllables are regularly stressed. In fact, the only environment in which they are regularly unstressed is precisely the one under discussion: when they are adjacent to both the initial and tonic syllables. To produce the perhaps more usual cases of heavy syllable stress, Hayes (1982) invokes rules of pre- and post- stress destressing that are quantity sensitive (following in some respects Halle 1973 and Liberman and Prince 1977). Stress is assigned equally to bànána and bàndána, to Tàtàmagouchi and Mònòngahéla, but removed from only the light syllables.[7] Here we have the tack of positing a derivational stage during which the principle does not apply, and then turning it back on to trim back the misplaced stresses. Within a derivational theory, such a move is by no means illegitimate; it is actually the prime means by which both simple description, and descriptive gaps can be avoided in dealing with nonuniformity. However, we can surely count it as an advance if the facts can be accounted for more directly, and at the same time reduced to basic universal principles. By assuming minimal violation, instead of full satisfaction, just this sort of advance in the analysis of the nonuniform weight effects in English secondary stress is possible.

2. Weight-to-primary stress

An even more obvious source of nonuniform weight effects in English comes from the distinction between primary stress placement and secondary stress placement. A complete analysis of main stress placement, dealing with complexities such as stress retraction, and lexically and morphologically determined stressing, is beyond the scope of this paper (see Kager 1989 and Burzio 1994 for comprehensive references and discussion). However, in this section, I will discuss the basic pattern of main stress placement on nouns outlined in (1), because with WEIGHT-TO-STRESS, and related constraints, such as WEIGHTIDENT and *SONNUC, ranked so low in the hierarchy, one might wonder how quantity sensitive primary stress placement is to be explained.

To see why this could be a problem, recall that in words such as *agénda*, *synópsis*, and *aróma*, primary stress falls on the heavy penultimate syllable, but when the penult is light, as in *Cánada*, stress is antepenultimate. That stress is antepenultimate in *Canada* is usually explained by a rule of

[7] An important step forward is made by Kager (1989), who assumes strictly bisyllabic foot construction, so that the light syllables are simply left unparsed, rather than stressed and then destressed. Kager's premise that (H) feet are impossible prefigures Burzio's (1994) theory, though their approaches to dealing with apparent cases of (H) feet are quite different. Whereas Burzio posits empty syllable structure, Kager invokes a Weight-to-Stress principle that grants stress to unfooted heavy syllables.

Extrametricality (Hayes 1982), or a constraint of NONFINALITY (P&S 1993) that disallows the footing of the final syllable, so that the parsing *(Cána)da* occurs instead of *Ca(náda)* (cf. Burzio 1994). The apparent dilemma can be summarized in the following question: If PARSE-σ is ranked above WEIGHT-TO-STRESS and the other weight related constraints, then why aren't *a(gén)da*, *sy(nóp)sis*, and *a(ró)ma* more exhaustively parsed, and footed like *(Cána)da*?

McCarthy and Prince's (1993b) formulation of the constraint responsible for main stress placement in English allows a simple answer to this question. It is stated as follows:

(38) Align (PrWd, R, Head(PrWd), R) - ALIGN-HEAD
'Align the right edge of the Prosodic Word with
the right edge of the head of the Prosodic Word'

As in P&S 1993, headship is taken to be transitive, so that 'head of the Prosodic Word' is fulfilled not only by the foot that bears main stress, but also by the syllable that is the head of that foot. If ALIGN-HEAD were undominated, the head syllable of the Prosodic Word would be the rightmost syllable in the prosodic word, and main stress would be final. That English does not have final main stress indicates that this constraint is dominated.

NONFINALITY, formulated as 'the head of the Prosodic Word must not be final' (P&S 1993:52; cf. Hung 1994, Buckley 1995) is in direct competition with ALIGN-HEAD, and when ranked above it, forces main stress, and the main stressed foot, off the final syllable. Nonetheless, ALIGN-HEAD continues to demand that the main stressed syllable be as close as possible to the right edge of the word, with each syllable intervening between the head syllable and the edge counting as a violation (P&S 1993: 57, McCarthy and Prince 1993b, Prince 1993). Therefore, the minimal violation of ALIGN-HEAD, which satisfies NONFINALITY, is to have main stress on the penultimate syllable. The ranking NONFINALITY » ALIGN-HEAD is all that is needed to place main stress on the correct syllable of *agenda*, and the other words with bimoraic penults:

(39) NONFINALITY » ALIGN-HEAD

Input: *agenda*	NONFINALITY	ALIGN-HEAD
a(gén)da ✓		*
(ágen)da		**
(àgen)(dá)	* !	

With but a single violation of ALIGN-HEAD, the first candidate, with penultimate stress, is optimal. As noted above, a candidate like the second one, with initial stress, fares better in terms of exhaustivity than the optimal one does, as it leaves only the final syllable unparsed. This shows that ALIGN-HEAD dominates PARSE-σ.

With the penultimate stress on *agenda* explained, our original question is reversed. Why does *Canada* have antepenultimate stress? The answer is that penultimate stress would violate constraints whose high rank we have already established: either FTBIN, or TROCH.[8] If these constraints, along with NONFINALITY, outrank ALIGN-HEAD, antepenultimate stress is optimal:

(40) FTBIN, TROCH, NONFINALITY » ALIGN-HEAD

Input: *Canada*	FTBIN	TROCH	NONFINALITY	ALIGN-HEAD
(Cána)da✓				**
Ca(náda)			* !	*
Ca(ná)da	*!			*
(Caná)da		* !		*

"Quantity sensitive" primary stress placement is thus achieved by simply placing the independently necessary constraints of NONFINALITY and ALIGN-HEAD in the hierarchy established for secondary stress placement.[9] Crucially, ALIGN-HEAD must dominate PARSE-σ, so that primary stress does not shift to the left to incorporate a stray syllable (i.e. ✓a(gén)da, *(ágen)da), but must itself be dominated by FTBIN, TROCH, and NONFINALITY, so as to ensure antepenultimate stress with a light penult. This results in the hierarchy in (41).

[8] See Cohn and McCarthy (1994) and Kenstowicz (1994) for analyses of Indonesian in which an iambic foot is formed to place stress rightmost in the root, even though trochaic feet are preferred elsewhere.

[9] The facts of primary stress retraction do introduce some complications (see especially Kager 1989 for thorough discussion and references). When there is final stress, the main stress usually occurs on the next foot to the left. This is presumably an effect of NONFINALITY. With no elaboration, the present account would predict that main stress should land on the next legitimate foot, either a heavy syllable (e.g. staláctìte), or pair of lights (e.g. acétylène). However, main stress often ends up further to the left, skipping the heavy syllable (e.g. désignàte) or **LL** sequence (e.g. cátamaràn). One way to capture these cases of 'strong' and 'long' retraction would be to demote ALIGN-HEAD in the ranking, and to use a constraint demanding the alignment of the right edge of the Prosodic Word with a foot head, or a moraic trochee (cf. McCarthy 1995), to place the rightmost stress. As both stress retraction, and the weight-to-stress behavior of final syllables are quite complex, and rife with exceptionality, I abstract from these aspects of the English stress system in the present analysis.

(41) FTBIN, TROCH, NONFINALITY
|
ALIGN-HEAD
| *OBSNUC
PARSE-σ /
| /
WEIGHT-TO-STRESS
|
STRESSWELL
|
*SONNUC, WEIGHT-IDENT
|
ALIGN-LEFT

There are two especially salient points about the new additions to the hierarchy. First, it can be seen that by transitivity, ALIGN-HEAD dominates ALIGN-LEFT. This is in agreement with M&P (1993b)'s analysis of the preference for rightmost main stress placement over left alignment (as in *A(méri)ca*). Second, that quantity sensitive main stress placement can be attributed to the joint effects of FTBIN and ALIGN-HEAD, rather than to WEIGHT-TO-STRESS, underscores an important result of the previous section – the influence of syllable weight on stress can manifest itself either directly, through WEIGHT-TO-STRESS, or more indirectly, through FTBIN. Therefore, weight sensitivity cannot serve as a diagnostic of an active WEIGHT-TO-STRESS constraint, and the low-ranking of WEIGHT-TO-STRESS demanded by secondary stress placement does not impede an account of primary stress assignment. This integration of primary and secondary stress assignment can be contrasted with the analysis in Halle and Vergnaud 1987: 228, in which an entirely separate rule stratum is set up for secondary stress assignment, which differs from primary stress assignment almost exclusively in its lacking the weight-to-stress rule (the Accent Rule) that causes quantity sensitive primary stress placement.

In the next section, we turn to exceptional heavy syllable stress and stresslessness caused by the idiosyncracies of the English lexicon, and by the influence of stem stress on derived words. There, once again, a high ranking FTBIN constraint plays a central role, this time in controlling the extent to which lexical and stem stress can disturb the usual patterns of secondary stress. In addition, the relative rankings of other constraints in the hierarchy, such as ALIGN-HEAD, STRESSWELL, and ALIGN-LEFT, finds further support.

3. Special secondary stress

The generalizations about weight-to-secondary stress outlined in §1 are upset by two sets of words: lexical exceptions, and derived words that retain stress from their stems. In this section, I argue for a treatment of these special cases in terms of exactly two formal mechanisms: prosodic faithfulness, and lexically specific ranking. In this domain as well, minimal violation allows a principled account of nonuniformity that has been lacking from prior analyses.

3.1 Lexical and 'cyclic' stress as prosodic faithfulness

A classic example of cyclic stress preservation is *còndènsátion,* which conflicts with the clearly productive tendency for a pretonic σ_s to be unstressed and reduced in this environment (see §1.2). Since Chomsky and Halle 1968, the pretonic stress in *condensation* has generally been assumed to be due to the stress on the corresponding syllable of *condénse* (cf. *còntempláte -> còntemplátion*). In Chomsky and Halle's analysis, primary stress is assigned to *condense* on the first cycle, and preserved as a secondary stress when *-ation* is added on a subsequent cycle. Some additional examples of stem based exceptions like *condensation* are provided in (42).

(42) àdvàntágeous àugmèntátion àuthèntícity còndèmnátion

As pointed out by Halle and Kenstowicz (1991:460), parallel lexical exceptions also occur:

(43) ìncàntátion ìncàrnátion òstèntátion chìmpànzée

Since there are no independent stems of the form *incánt, incárn, ostént,* or *chimpán,* the pretonic stress in these words cannot be due to cyclicity (though cf. Fidelholtz 1967: 7). Halle and Kenstowicz (1991) draw attention to these cases in proposing a radically novel treatment of *condensation*-like words: that they too are simply lexical exceptions, subject to a lexically conditioned weight-to-stress rule.

However, using a lexically conditioned weight-to-stress rule for apparent cases of stress preservation, and denying that the stress pattern of the stem plays any role, leads to a missed generalization. As Liberman and Prince (1977: 299) note, while a σ_s can be productively destressed in this environment (e.g. *infórm -> ìnformátion*), there are no instances of such a syllable becoming stressed in a derived word. That is, there are no words like *còntempláte* that become *còntèmplátion,* with a stressed pretonic syllable (compare *árgument -> àrgumèntátion,* discussed in §1.2, and further in §3.2 below). Thus, while the presence of stress on the corresponding stem syllable does not ensure stress in this position, a lack of stress on the stem syllable does guarantee stresslessness. This generalization shows that contra Halle and Kenstowicz (1991), Chomsky and Halle (1968) were in fact correct in assuming that the stress patterns of *condénse* and *còntempláte* influence the stressing of *còndènsátion* and *còntemplátion*.

The extreme rarity of underived words with pretonic stress like those in (43), along with existence of derived words that productively destress, but none that stress, syllables in this position, demonstrates that this pattern of secondary stress is unproductive. I will now advance an analysis of these instances of lexical and "cyclic" stress preservation that relies on a single mechanism of prosodic faithfulness, which applies between lexical and surface forms, and between morphologically related items (cf. McCarthy 1995). One benefit of this analysis is that it is consistent with the unproductive nature of this pattern.

First of all, I assume that the lexical form of a word like *incantation,* or *chimpanzee,* includes stress on the pretonic syllable. In order for this stress to be preserved in the output, there must be a faithfulness constraint that outranks STRESSWELL, since STRESSWELL usually forces such syllables to be stressless (see the tableau in (19) above). McCarthy (1995) shows that prosodic faithfulness constraints can take at least two forms in the Correspondence Theory of faithfulness, which as

expounded in McCarthy and Prince (1995), premises correspondence relationships between segments only. The edge of the foot can be kept in the same place by requiring the correspondent of any edgemost segment to be edgemost itself (cf. Idsardi 1992), or else stress can be kept in the same place by requiring the correspondent of a segmental head of prosodic category to have the same role (cf. Halle and Vergnaud 1987). As either formulation, or indeed, any of a score of others, would suffice for present purposes, I will assume the relatively informal (44) (though see Appendix A for some evidence that English requires a formulation slightly different from those which McCarthy proposes).

(44) STRESSIDENT

If α is stressed, then $f(\alpha)$ must be stressed

As for the related WEIGHTIDENT constraint in (28), here *f* is the correspondence relation between input (lexical) and output (surface) strings of segments (see McCarthy and Prince 1995, McCarthy 1995 for formal details). The ranking STRESSIDENT » STRESSWELL leads to the preservation of underlying stress, even adjacent to the main stress:

(45) STRESSIDENT » STRESSWELL: Lexical stress preservation

Input: *chimpànzee*	STRESSIDENT	STRESSWELL
(chìmpn)(zée)	* !	
(chìm)(pàn)(zée)✓		*

With the added assumption that a correspondence relationship also exists between a stem and its derivative (Benua 1995; McCarthy 1995; cf. also Burzio 1994, Steriade 1994, Kenstowicz to appear), then an unstressed pretonic syllable in *condensation* also violates STRESSIDENT, and STRESSIDENT » STRESSWELL generates stem stress preservation as well as lexical stress preservation:

(46) STRESSIDENT » STRESSWELL: Stem stress preservation

Input: *condensation*	STRESSIDENT	STRESSWELL
(còndn)(sá)tion	* !	
(càn)(dèn)(sá)tion✓		*

Because stress on these pretonic syllables is driven by faithfulness to prosodic structure in either the lexicon, or in the stem of a derived word, stress will not emerge in this position when it is absent underlyingly, or in the stem of derived word. This analysis thus captures the similarity between lexical and stem stress based stress that prompted Halle and Kenstowicz (1991) to use a lexically specific weight-to-stress rule for both types of exceptionality, without sacrificing the generalization that words like *còntèmplátion* do not exist. For the data considered thus far, one could equally proffer an analysis

in terms of traditional derivational assignment and preservation of stress. However, in the next few subsections, which focus on nonpreservation, or 'unfaithfulness', the advantage of formalizing stress preservation in terms of a minimally violable constraint will become clear: it allows a precise and concise account of the circumstances under which preservation does and does not occur.

3.1.1 Unfaithfulness I: Lexically Specific Ranking

The first case of nonpreservation that we will examine is displayed in words like *ìnformátion*, that do not preserve the stress of their stems. To explain the destressing of these syllables, we need a way of formalizing the idea that STRESSIDENT exerts a greater influence on *condensation* than it does on *information*. I will discuss two possibilities: morphological reanalysis, and lexically specific ranking, and show that only the latter appears to be adequate.

An explanation based on morphological reanalysis would be that *information* has been (diachronically) reanalyzed as an independent word, and no longer stands in correspondence with *inform* (cf. Chomsky and Halle 1968: 112[10]; H&V 1987: 251). STRESSIDENT would not apply, and *information* would be free to obey STRESSWELL instead.

The chief flaw of this explanation is that it generates regularization through reanalysis in another environment, where none actually occurs. Transitivity of ranking entails that since STRESSWELL is dominated by STRESSIDENT, so is the lower ranked ALIGN-LEFT. The ranking STRESSWELL » ALIGN-LEFT produces the preference for stress preservation over left alignment that is exhibited by the words in (47), in which the non-aligned leftmost stress corresponds to a stressed syllable in the stem (i.e. *accrédit*, *imágine*, *oríginal*, etc.).[11]

(47) accrèditátion imàginátion orìginálity medìcinálity divìsibílty phenòmenólogy

That stress preservation is at work here can be clearly seen in the contrast between *àcademícian*, as derived from *àcadémic*, and *acàdemícian*, from *acádemy* (Fidelholtz 1967; Kager 1987: 170).

The fact that this instance of stress preservation falls out from rankings motivated on other grounds provides a welcome indication that our analysis is on the right track. However, what is of

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[10] Chomsky and Halle (1968: fn. 64) claim that *information* does not preserve the stress of its stem because "*information* is not the nominalized form of *inform*, but rather a single noun presumably represented as /inform+At+iVn/. Thus we cannot have phrases like **his information of my friend about the lecture* related to *he informed my friend about the lecture*, as we have *his relaxation of the conditions* related to *he relaxed the conditions*." Note, however, that *their conservation of the forest*, and *his lamentation of the loss* can be related to *they conserved the forest*, and *he lamented the loss*, even though the pretonic syllables of *lamentation* and *conservation* are reduced. A rejection of the idea that there is a correlation between the morpho-syntactic facts of nominalization, and stress preservation, is implicit in Halle and Vergnaud (1987:251)

[11] Lexical exceptions to left alignment also occur: *apòtheósis*, *Apòllináris*, *Epàminóndas* (Halle and Kenstowicz 1991: 492). By treating these as bearing a lexical stress, we must assume, contra Halle and Kenstowicz, that the vowel-initiality of these words is a coincidence. In connection with this, note that not all vowel initial LLL pretonic strings lack initial stress (e.g. *àbracadábra*), and that there is at least one exception to left-alignment that has an onset (an alternate pronunciation of *Navràtilóva* attested to by Alan Prince in personal communication).

interest at present, and remains to be accounted for, is the complete lack of derived words that value left alignment over stress preservation (Burzio 1994). If correspondence could simply be 'turned off' by reanalysis, then one would expect to find that just as words like *information* obey STRESSWELL when reanalyzed, words like *imagination* could be reanalyzed and left aligned.

This conundrum is avoided if instead of morphological reanalysis for *information*, we invoke a lexically specific version of STRESSIDENT for *condensation*.[12] Designating the set of words, including *condensation*, and *chimpanzee*, that are subject to the lexically specific version of STRESSIDENT as 'γ', this constraint can be referred to as STRESSIDENT-γ. By placing STRESSIDENT-γ above STRESSWELL, and the general version of STRESSIDENT between STRESSWELL and ALIGN-LEFT, we generate lexically based variation in stress preservation for the *information/condensation* cases, and strict obedience to STRESSIDENT for *imagination* and similar words. To show with maximal perspicuity the different effects this ranking has on these various sets of words, an example of each is placed in the single tableau in (48):

(48) STRESSIDENT-γ » STRESSWELL » STRESSIDENT » ALIGN-LEFT

Input: *condensation information imagination*	STRESS IDENT-γ	STRESS WELL	STRESS IDENT	ALIGN-LEFT
(còndn)(sá)tion	* !		*	
(còn)(dèn)(sá)tion ✓		*		
(ìnfr)(má)tion ✓			*	
(ìn)(fòr)(má)tion		* !		
i(màgi)(ná)tion ✓				*
(ìma)gi(ná)tion	(*!)		* !	

As *condensation* is subject to STRESSIDENT-γ, its ranking above STRESSWELL renders the stress preserving *còndènsátion* optimal, even with the attendant STRESSWELL violation. When STRESSIDENT-γ does not apply, as in *information,* the ranking STRESSWELL » STRESSIDENT creates a preference for pretonic stresslessness over stress preservation, leading to the grammaticality of *ìnformátion*. Finally, no matter whether a word like *imagination* is targeted by the lexically specific

[12] Lexically specific constraints appear to be formally equivalent to the constraint domains, or co-grammars, proposed in Itô and Mester (1995a&b), and discussed in Inkelas, Orgun, and Zoll (1994), and Pater (1994). I prefer the tack of proliferating constraints over that of proliferating grammars because I believe that it gives a clearer view of the limits that a language imposes on reranking, and especially because the proliferation of lexically specific constraints seems independently necessary (e.g. Alignment constraints that express the prosodic subcategorization requirements of specific morphemes; see McCarthy and Prince 1993b).

version of STRESSIDENT or not, stress preservation, as in *imàginátion*, is always more highly valued than left-alignment, as in *ìmaginátion*, because of the dominance of STRESSIDENT over ALIGN-LEFT.

The addition to the hierarchy of the prosodic faithfulness constraint STRESSIDENT, and a lexically specific version of the same constraint, allows us to capture the fact that pretonic stress preservation is subject to lexical conditioning, while stress preservation on syllables not adjacent to the main stress occurs without exception. This case of nonuniformity has never been explained before, except by denying that *còndènsátion* is an example of stress preservation (Burzio 1994: 185).[13]

In the present analysis, the lower bound of preservation is determined by the ranking of STRESSIDENT above ALIGN-LEFT: preservation is always valued over left alignment. The question to be addressed now is whether there is an absolute limit to faithfulness. Contrary to Liberman and Prince's (1977:286) claim that "the reluctance...to obscure the shape of unfamiliar words...can inhibit any reduction process in English", it turns out that there is an upper bound to stress preservation, which is provided by a constraint that rests at the top of the hierarchy established for regular stress: FOOT BINARITY.

3.1.2 Unfaithfulness II: FOOT BINARITY » STRESSIDENT-γ

In the vast majority of situations in which STRESSIDENT conflicts with FTBIN, FTBIN always triumphs. This can be seen both in the complete absence of lexical stress, and in the consistent failure of stem stress to be preserved, in certain environments. In particular, a light syllable is never stressed when it is the final member of bisyllabic or trisyllabic pretonic string. Lexical stress never turns up on the underlined syllable of words like *Mòntebéllo,* or *Tàtamagóuchi* (Selkirk 1984), and in derived words, these syllables are always destressed (Kager 1989). Corresponding to the absence of words like **Mòntèbéllo* are the following alternations:

(49) phonétic, phònetícian; còsmétic, còsmetícian; pathólogy, pàthológical; specífic, spècifícity
telépathy, tèlepáthic; mechánic, mèchanístic; philátely, phìlatélic; dìámeter, dìamétric

And to the **Tàtamàgóuchi* gap:

(50) àcadémic, àcademícian; thèorétic, thèoretícian; màthemátic, màthematícian;
hèmatólogy, hèmatológic; mìlitáry, mìlitarístic; Ìndiána, Ìndianápolis

As we saw in §1.3.3, the same absence of stress usually occurs in pretonic light syllables in word-initial position, such as in *banána*. Here too, we have productive destressing:

(51) grámmar, grammárian; órigin, oríginal; médicine, medícinal; nóvel, novélla;
cívil, civílian; májesty, majéstic; próphecy, prophétic; míracle, miráculous

[13] It is in fact not entirely clear whether this denial constitutes an explanation. Burzio (1994) claims that *condensation*-like forms are instances of vowel quality preservation, rather than the stress preservation seen in *imagination* et al. However, he does not provide a formal account of vowel quality preservation, and hence provides no reason why vowel quality preservation should be variable, and stress preservation consistent.

Word-initially, though, we find some well-known lexical exceptions (e.g. *ràcóon*) as well as some usually unrecognized instances of stem stress preservation (e.g. *fàscístic*). I refer the reader to the Appendix A for a discussion of the somewhat complex theoretical challenges these "exceptional exceptions" present.

In §1.3.3, the lack of pretonic stress on words like *banána,* and *Tàtamagóuchi,* was attributed to the ranking of FTBIN above PARSE-σ. The parallel blocking of lexical and stem based stress preservation described here can likewise be ascribed to the high ranking of FTBIN, so long as it dominates STRESSIDENT. Since the general version of STRESSIDENT is dominated by STRESSWELL, which itself is several rungs lower in ranking than FTBIN, the tendency for monomoraic syllables to be destressed is already built into the hierarchy. However, that they are always destressed establishes a new ranking: FTBIN dominates the lexically specific STRESSIDENT-γ. With STRESSIDENT-γ intervening between FTBIN and STRESSWELL, lexically based pretonic stress preservation is possible for words like *condensation* and *chimpanzee,* but impossible for words like *phonetician* and *Montebello,* or *mathematician* and *Tatamagouchi,* as well as *majestic* and *banana.* The following tableau compares *condensation* and *phonetician*; the other word-types would be treated just like *phonetician*:

(52) FTBIN » STRESSIDENT-γ

Input: *condensation* *phonetician*	FTBIN	STRESS IDENT-γ	STRESS WELL
(còndn)(sá)tion)		*!	
(còn)(dèn)(sá)tion ✓			*
(phòne)(tícian) ✓		*	
(phò)(nè)(tícian)	*!		*

Because words like *còndènsátion* incur no violation of FTBIN, stress preservation is possible. However, in a word like *phonetician,* stress preservation creates a violation of FTBIN. As STRESSIDENT-γ is ranked beneath FTBIN, stress preservation is impossible in this context.

Since this analysis also applies to the distinction between possible exceptional monomorphemic words like *chìmpànzée,* and impossible ones like **Mòntèbéllo,* a useful comparison can be made to the discussion of such cases in Kager 1989: 140. Kager also posits lexical stress on the pretonic syllable of *chìmpànzée.* This lexical stress blocks the rule of 'Closed Syllable Adjunction', which would ordinarily form a foot by adjoining the medial syllable with a preceding one. However, to express the absence of words like **Mòntèbéllo,* Kager is forced to invoke a bald restriction against lexical stress on light syllables, presumably because there is no principled reason why lexical stress should block 'Closed Syllable Adjunction', but not 'Open Syllable Adjunction'. When preservation of underlying stress is formalized as an Optimality Theoretic constraint, however, the extent to which lexical stress can override the usual stress phonotactics of the language can be neatly expressed. This

comparison serves to again highlight the difficulties nonuniformity poses for a theory based on full satisfaction, and the ease with which it is dealt with under minimal violation.

3.1.3 Unfaithfulness III: ALIGN-HEAD » STRESSIDENT-γ

The approach taken to ruling out stress preservation when it conflicts with FTBIN carries over to an account of a couple of central facts left undiscussed until now. The instances of stress preservation discussed here are what is referred to in the literature as *weak preservation*: the primary stress of the stem corresponds to a secondary stress in the derivative. Weak preservation is not complete faithfulness – the segment bearing stress in the stem is the head of the Prosodic Word, and its correspondent is but the head of a foot. A separate, but obviously related observation, is that preservation of the stem stress does not interfere with main stress placement – stress is preserved not at all, instead of forcing the displacement of main stress. Similarly, lexical stress does not force main stress placement to the left.

I will start with the second observation. An example of how stress preservation might interfere with main stress placement can be found in the cases we have just looked at. If FTBIN » STRESSIDENT-γ disallows **gràmmárian*, then what rules out **grámmarian*? This would satisfy both FTBIN and STRESSIDENT. The problem with **grámmarian*, of course, is that main stress is too far to the left. Assuming that these, and other stress placing suffixes, are incorporated into the Prosodic Word (see Lamontagne and Sherer 1993), a ranking of ALIGN-HEAD » STRESSIDENT-γ will ensure that main stress placement is unresponsive to the demands of stress preservation:

(53) ALIGN-HEAD » STRESSIDENT-γ

Input: *grammarian*	ALIGN-HEAD	STRESS IDENT-γ
gram(mári)an ✓	**	*
(grámma)rian	***!	

As discussed in §2, the dominance of ALIGN-HEAD by FTBIN, and NONFINALITY, entails that the minimal number of ALIGN-HEAD violations is the two incurred by the optimal candidate. The third violation rules out **grámmarian*, due to the ranking of ALIGN-HEAD over STRESS-IDENT. Similar results obtain if one posits preantepenultimate lexical stress.

The same ranking can account for the subordination of the preserved stress to the primary stress. Let us assume that STRESSIDENT is a gradient constraint: it is satisfied if the correspondent of the head of the Prosodic Word is itself the head of the Prosodic Word (i.e. strong preservation), one violation is caused if the head of the Prosodic Word is in correspondence with only the head of a foot (weak preservation), while two violations result if the head of the Prosodic Word is in correspondence with a non-head (non-preservation). An attempt to better satisfy STRESSIDENT by making the preserved stress the head of the Prosodic Word, will automatically increase the number of violations of the higher ranked ALIGN-HEAD:

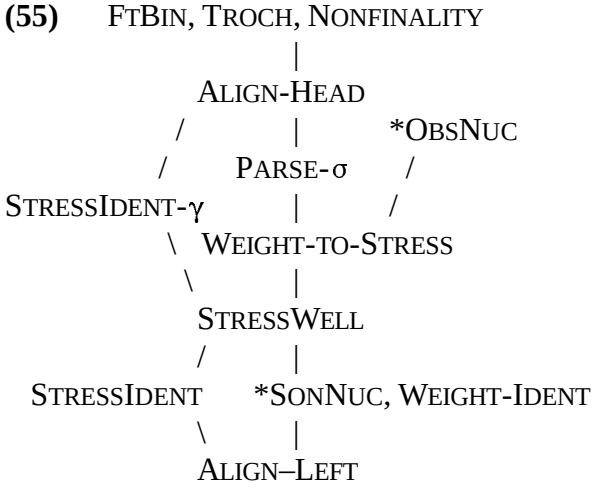
(54) ALIGN-HEAD » STRESSIDENT: Stress subordination

Input: *imagination*	ALIGN-HEAD	STRESS IDENT
i(màgi)(ná)tion✓	*	*
i(mági)(nà)tion	***!	

Here the minimal ALIGN-HEAD violation is but a single one, since the vowel is bimoraic, and FTBIN is obeyed. If the stem stress is preserved as a primary stress, the additional ALIGN-HEAD violations are fatal. I have omitted a candidate with two main stresses: this would be ruled out by an independent, probably universally undominated (or *Gen*-internal), constraint against joint headship.

To wind up the discussion of prosodic faithfulness, it is striking that the distribution of exceptional and stem based stress requires high ranking FTBIN and ALIGN-HEAD, a low ranking ALIGN-LEFT, and an intermediate STRESSWELL, all of which are provided by the analysis of regular stress. This provides strong support for the approach taken here of accounting for these special cases by interspersing STRESSIDENT constraints into the hierarchy of constraints established for the usual patterns. Moreover, the close parallels between the distribution of lexical and stem based stress fall out nicely from the use of a single mechanism of prosodic faithfulness for them both (though cf. Appendix B). And above all, we have accounted for a wide array of facts by simply adding one constraint, and its lexically specific instantiation, to the independently motivated hierarchy. The resulting hierarchy is as in (55):

(55)



In the following sub-section, we turn to some more exceptions to the generalizations of §1, which this time fall outside the domain of prosodic faithfulness, and so must be generated by the grammar. These cases serve to strongly motivate a grammatical account of exceptionality, in addition to a purely lexical one, as well as to highlight the differences between "productive exceptions", and the nonproductive ones discussed in this last section.

3.2 Lexical exceptionality as lexically specific ranking

As discussed in § 1.2.1, odd-parity pretonic strings contrast with bisyllabic ones in that the final pretonic syllable of those strings is usually stressed if it is heavy, as in *bàndána*, *Hàlicàrnássus*, and *àrgumèntátion*. This was explained by the ranking PARSE-σ » STRESSWELL, which creates a preference for parsing the lone syllable into a foot, over the stresslessness that STRESSWELL demands of a syllable adjacent to the main stress. This section examines the rather large set of exceptions to this pattern of heavy syllable stress. I will provide an account of these productive exceptions in terms of a lexically specific ranking of STRESSWELL » PARSE-σ, which creates, for these words, a preference for pretonic stresslessness over parsing.

The best-known exceptions to the usual pattern of initial pretonic heavy syllable stress are words that were historically formed with Latinate prefixes (see e.g. Chomsky and Halle 1968:121, Liberman and Prince 1977: 284, and H&V 1987: 239). The prefixes often surface as stressless when pretonic, whether they end in a sonorant (56a), an obstruent (56b), or have a long vowel in other (often related) words (56c). It was in their discussion of these words that Liberman and Prince pointed out the special markedness of stress adjacent to the main stress, as opposed to simple adjacency (cf. *prèsèntátion*, *pròlòngátion*, and *rèlàxátion*):

(56) a. condémn condénse embárrass embráce engáge engráve enjóy
b. absólve admíre advántage extréme extínguish obsérve obstrúct
c. precócious presént prolóng recúrrent refórm reláx

It is not the case, though, that these prefixes always reduce in the pretonic environment. Besides the fact that more semantically transparent cases of prefixation, especially with the very productive prefixes /pre-/, /re-/, /pro-/ and /de-/ , do not involve reduction (e.g. *recover* 'cover again' vs. *recover* 'get back'; *rebutter* 'butter again' vs. *rebutter* 'one who rebuts', *preconscious* vs. *precocious* – the consistent long vowels are likely due to a restriction that 'true' prefixes in English must be bimoraic; see McCarthy and Prince 1994b), there is a great deal of variation in whether words with opaque Latinate prefixation have stressed or stressless initial pretonic syllables. In general, more common words have stressless initials, while more learned words have stressed initials (Fidelholtz 1975). To give a sense of the sort of variation that occurs, the lists in (57) provide examples of words with historical Latinate prefixes that are transcribed by Kenyon and Knott (1953) as stressless, stressed, or with both stressed and stressless variants. I have indicated in brackets instances in which Webster's 1981 disagrees with Kenyon and Knott. A plus sign (+) means that Webster's transcribes the initial syllable of the word as stressed, a minus sign (–) stressless, and an equal sign (=) both stressed and stressless:

(57) a. Stressless:

administer, admire, absolve, admonitory, advance, advantage, adversity (+), advise, combat (v.), combust, companion, compassion, compose, compress, compulsion, companion, concur, concern, condemn, conduct, confection, confer, conflate, conflict (v.), congressional, controller, convenient, convention, embarrass, embody, embrace, endeavour, endow, engage, enjoin, enjoy, enlarge, enlighten, entice, entire, exact, example, exceed, except, excoriate, excrete, excursion, excuse, executive, exhume, expose, express, extend, extinguish, extravagance, extraneous (+), extreme, object (v.), obsequious (=), observe, obsess (=), obstetric, obstruct, obtain, obtrude, obtuse, obvert, proceed, produce, profess, profound, project, prolong, promote, propel, propose, protect, propose

b. Stressless or stressed:

abdominal, abduct (+), abhor (–), absorb (–), abstemious (+), abstract (v.), abstruse, absurd (–), abnormal (+), accelerate, accentuate, accept, accessible, accessory, acknowledge, adhere, admit (–), admixture (+), admonish (+), adverse (+), adverbial, concelebrate, concoct, concordance, eccentric, emphatic, exhale (+), obscene, obscure, obverse, pronomial (+)

c. Stressed:

abjure, abscise, abscissa, abscond, access (v.), admeasure, adsorb, advection, agnomen, concrete (v.), concretion (=), conglobate (=), concur (=), empiric (–), emporium (=), enteric, excreta, excursus, exogamy, expropriate, exsect, extrinsic, extrorse, obtest, obtund, progentior, proliferate (–), proscenium, prosector, protract (=), protrude

Since the more common words tend to be reduced, for this set of words, it would seem that pretonic stresslessness is productive. This is confirmed by the existence of a number of derived words in which pretonic stresslessness occurs on syllables that are stressed in the stems:[14]

(58) áccèss, accésible; ádverb, advérbial; cóncòrd, concórdance; cóngress, congréssional; émphasis, emphátic; éxecùte, exécutive, exécutor

The presence of full stressed vowels in the stems precludes an analysis of the pretonic stresslessness of these words in terms of faithfulness to any prosodic or segmental feature. These stressless heavy syllables must therefore be generated by the grammar. To capture the productivity of this pattern, we can posit a lexically specific version of STRESSWELL ('no stress/main stress adjacency'), which I will refer to as STRESSWELL-ζ, that dominates PARSE-σ. For a typical speaker, the set 'ζ' would include

[14] Liberman and Prince (1977: 285) note what might be another two cases of this type: "In the words *concave*, *convex*, the prefix retains stress; curiously, in the derivatives *concavity*, *convexity* it seems easily destressable." However, in Kenyon and Knott 1953, the stems and the derivatives are equally given with both stressed and stressless initial syllables, while in Webster's 1981, both *concave* and *concavity* have only stressed initials. Here, as well as for the rest of the special cases discussed in §3, careful study of the pronunciations of native speakers would be extremely informative (see in this regard the next footnote).

most of the words in (57a), some of the words in (57b), but few of those in (57c).[15] The result of this lexically specific ranking is illustrated in (59):

(59) STRESSWELL-ζ » PARSE-σ

Input: *advantage*	STRESSWELL-ζ	PARSE-σ
(àd)(ván)tage	* !	*
ad(ván)tage ✓		**

For words that are subject to STRESSWELL-ζ, pretonic stresslessness is preferred, even though this results in an extra PARSE-σ violation (that is, in addition to the one made necessary by the dominance of NONFINALITY). For words that are not targeted by STRESSWELL-ζ the extra PARSE-σ violation makes pretonic stresslessness ungrammatical, since as shown in §1.2, PARSE-σ dominates the general STRESSWELL constraint.

The effects of this ranking can also be seen outside of the domain of words based on Latinate prefixes. First of all, as one might expect, there are words with stressless initial heavy syllables that superficially resemble those in (57), but do not in fact contain Latinate prefixes:

(60) agnóstic, confétti, conquístador, obsídian

There are also some monomorphemic words that bear less of a resemblance to the words in (57), but yet can have stressless initial syllables. All of the words in (61) are given in either Kenyon and Knott 1953 or Webster's 1981 with at least a variant with a stressless initial:[16]

(61) ambássador, Atlánta, Atlántic, Kentúcky, Manháttan, Septémber, sincére

Outside of Latinate prefixation too, initial heavy syllable stresslessness appears to be productively generated. Initial reduction of such closed syllables is "restricted to words of considerable frequency" (Kager 1989: 142, citing Fidelholtz 1975). This would seem an odd restriction on an entirely extrasystemic pattern (which is how it has usually been treated). Furthermore, there are examples of destressing in derivation. Most of these cases involve long vowels (62a), but there is at least one

[15] I assume that variation in the pronunciation of individual words here and elsewhere in this section is due to interspeaker variation. That two competing productive patterns would produce a great deal of variation is to be expected. If closer study reveals that this variation occurs within individual speakers, then one might appeal to the "floating constraint" formalism proposed by Reynolds (1995), which is quite consistent with the approach to lexically based variation taken here.

[16] I exclude from this list words like Vermont, and Berlin, since as Liberman and Prince (1977: 284) note, *[vɛrmánt] and *[bɛrlÍn] are impossible in English. There must therefore be some independent constraint that forces coalescence between /ɛ/ and /r/ in this environment, making these in effect light syllables.

instance of each a sonorant-final (62b), and an obstruent-final syllable (62c) becoming destressed in a derived word. Again, variation runs rampant here.

(62) a. Pláto, platónic; phóne, phonólogy; vácàte, vacátion; schéma, schemátic; légal, legálity; démon, demónic; régal, regálity; fátal, fatálity; phótogràph, photógraphy
b. sénse, sensátion
c. spéctacle, spectácular

So far, we have looked only at initial syllables. However, the ranking STRESSWELL-ζ » PARSE-σ generalizes to medial environments as well. Recall that in the present account, the dominance of PARSE-σ over STRESSWELL also generates stress on the pretonic syllable of words like *Halicarnassus*. The productivity of stress in this environment was demonstrated by words like *argumentation*, in which a stressless syllable in the stem becomes stressed. There are, however, monomorphemic words that lack stress on such syllables:

(63) Kìlimanjáro Nèbuchadnézzar èlecampáne

We also find instances of productive destressing here. Liberman and Prince (1977:298) note that *sèntimentálity* optionally occurs, though *sèntiméntal* bears a stress on the corresponding syllable. To this example we can add those in (64a) and (64b). All of them appear in Webster's 1981; all have variants with pretonic stress.

(64) a. ìnstruméntal, ìnstrumentálity; rècomménd, rècommendátion; órièntˌ òrientátion; represent, rèpresentátion
b. rétrogràde, rètrogradátion; cívilìze, cìvilizátion; stándardìze, stàndardizátion; párasìte, pàrasitólogy

This too results from STRESSWELL-ζ » PARSE-σ:

(65) STRESSWELL-ζ » PARSE-σ

Input: *Kilimanjaro*	STRESSWELL-ζ	PARSE-σ
(Kìli)(màn)(járo)	* !	*
(Kìli)mn(járo) ✓		**

Finally, as Kager (1989:125) notes, there is one clear exception to the generalization that pretonic obstruent final syllables retain stress when preceded by a heavy syllable: *dìa**g**nósis*.[17] Since PARSE-σ

[17] Kager (1989: 125) also cites *indignation* as a counter-example, though his transcription provides a stress on the pretonic syllable. The stressed version is in agreement with Kenyon and Knott (1953), and Webster's (1981). This example highlights the difficulties in attributing stress or stresselessness to [I] - note that

dominates WEIGHT-TO-STRESS, by transitivity STRESSWELL-ζ also does. Therefore, this exceptionally unstressed heavy syllable, whose superficial resemblance to a Latinate prefix is perhaps not entirely a coincidence, can also be attributed to the lexically specific ranking of STRESSWELL.

In sum, in this section I have shown that stresslessness on lone heavy syllables is productive, at least for a lexically restricted group of words. In §1.2.1, it was demonstrated that for the bulk of the vocabulary, stress on such syllables is the norm and is productive. Stress in this context is produced by the ranking PARSE-σ » STRESSWELL, while stresslessness is induced by a lexically specific ranking of STRESSWELL-ζ » PARSE-σ. The difference between the unproductive exceptions like *chìmpànzée*, which were accounted for via faithfulness, and these productive exceptions, is well captured by a model in which unproductive exceptions are encoded with phonological structure in the lexicon, and an appropriate ranking of a faithfulness constraint, while productive exceptions are accounted for entirely in the grammar, through reranking (Inkelas, Orgun, and Zoll 1994, Inkelas to appear). Though there is some overlap between the empirical coverage of these formal mechnisms, and though criteria of productivity are notoriously contentious and difficult to define, it seems clear that lexically specific ranking, and exceptional lexical specification, have separate roles to fulfill, and that neither one can be eliminated from the theory.

3.3 Remarks on special secondary stress

The most important point about the analysis of special secondary stress presented here is that it does not overgenerate. This contrasts with the account of lexical variation in Halle and Kenstowicz 1991, which invokes lexically conditioned rules of weight-to-stress and Stress Copy. Instead of completely shutting down weight effects, as the lexically specific weight-to-stress rule does, the lexically specific ranking of STRESSWELL alters the relative strengths of some of the relevant constraints. Crucially, this reranking does not subordinate WEIGHT-TO-STRESS or *SONNUC to ALIGN-LEFT. Therefore, the grammar constructed here does not generate unattested forms such as **Mònongahéla*. Further, the lexically specific ranking of STRESSWELL does not favour **Tìconderóga* over the correct *Tìcònderóga*, since adjacent stresses are not militated against by STRESSWELL, only stress adjacent to the primary stress. If secondary stress weight effects can be turned off arbitrarily, as in Halle and Kenstowicz 1991, then there is no reason why these unattested forms should not be generated alongside the perfectly regular *Tàtamagóuchi*.

Halle and Kenstowicz's (1991) use of the lexically conditioned Accent Rule for *còndènsátion*-type words is in part motivated by the observation that stem stress is not consistently preserved in this environment, as demonstrated by words like *ìnformátion*. Instead of denying that stem stress plays any role, as that analysis implies, the lexically specific STRESSIDENT constraints allow faithfulness to stem stress to vary somewhat between words. Because faithfulness, rather than syllable weight, is called upon to motivate the pretonic stress in *còndènsátion*, pretonic stress in a word like *còncentrátion*, in which the stem lacks stress on the corresponding syllable, is ruled out. Also, since STRESSIDENT is ranked above ALIGN-LEFT, left alignment of words like *imàginátion* is impossible, though it is predicted to occur under the assumption either of a lexically conditioned rule

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[ϵ] and [i$^{\gamma}$] often reduce to something like [I], rather that schwa. The present study follows previous studies of English stress in abstracting from the difficulties of accounting for various realizations of the reduced vowel.

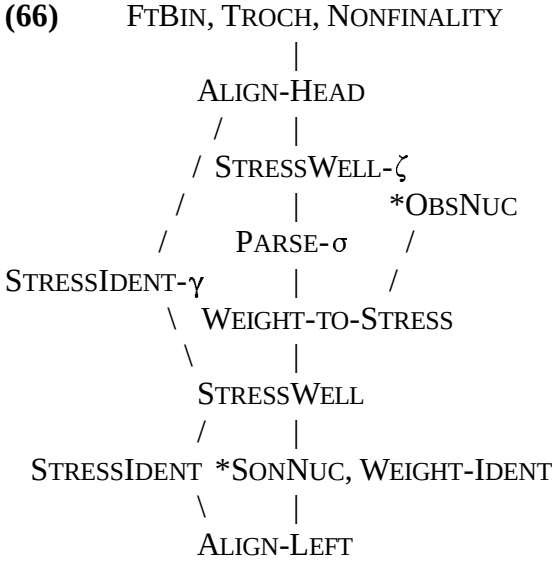
of Stress Copy (Halle and Vergnaud 1987; Halle and Kenstowicz 1991; cf. Burzio 1994: 192), or of morphological reanalysis (Chomsky and Halle 1968; Halle and Vergnaud 1987).

It appears that here too, it is the *all or nothing* characteristic of full satisfaction that is at the root of the empirical shortcomings of these prior analyses. The precision of the present account of the lexical influences on the weight-to-secondary stress relationship is not bought at the cost of generality. As we have seen, the lexically specific ranking of STRESSWELL provides a unified account of a number of exceptional patterns of heavy syllable stresslessness. And by placing the faithfulness constraint STRESSIDENT and its lexically specific counterpart into the hierarchy established for regular stress, the same principles that determine regular prosodification are used to control the extent to which stem and underlying stress can alter the usual pattern of secondary stress.

4. Final Hierarchy and Conclusions

The hierarchy now stands as in (66). Underneath the hierarchy are examples from the sets of words targeted by the lexically specific constraints.

(66)



Where ζ = {admire, companion, entire, expose, present**,** Atlanta, Manhattan, Kilimanjaro, representation...}
And γ = {chimpanzee, condensation, creativity, contestation...}

At the outset of the paper, it was pointed out that weight-to-stress, and stem stress preservation unequivocally determine the placement of secondary stress in certain phonologically determined environments, while in others the activity of these principles is subject to the vagaries of the lexicon. In §3.1, we also saw that in yet other environments, the preservation of stem stress, as well as of underlying stress, is unable to exert any influence at all. Throughout the paper, the difficulties this nonuniformity creates for analyses based on full satisfaction have been pointed out, and have been overcome through the adoption of minimal violation and constraint ranking. There is little novel in

the constraints themselves; the main innovation here consists of the ways in which they are made to interact.

A crucial aspect of this analysis is that the relative rankings of the constraints are validated across the various domains investigated. For instance, the low rank of ALIGN-LEFT that is motivated by the non-aligned leftmost stress in words like *Monòngahéla* is also required to explain the preference for rightmost main stress (e.g. *América*), and for stress preservation (e.g. *imàgination*), over left-alignment. A dominant FTBIN is an essential ingredient in the analysis of the lack of heavy syllable stress in words like *Alexánder*; as well as in the absence of initial light syllable stress in *banána*; its high rank is supported in primary stress by the violation of ALIGN-HEAD that it compels in words with light penults (e.g. *Cánada*), and in lexical and stem based stress by the non-preservation of stress in instances in which this would create a monomoraic foot (e.g. **Mòntèbéllo* and **phònètícian*). This sort of coherence provides added reason to believe that this approach to nonuniform weight-to-stress and stress preservation effects is on the right track.

Appendix A: Initial monomoraic stress preservation

The analysis in the text succeeds in fully accounting for the distribution of regular and exceptional stress on pretonic heavy syllables. There is, however, a residue of exceptionally stressed light syllables that remain to some extent intractable to it. Examples of lexical stress are in (67):

(67) ràcóon bàbóon èfface vàmóose sùttée sèttée èfféte bàssóon
càfféine Èsséne èrráta Còlléen fèllátio ìllúsion Hìppócrates

And of stem-based stress in (68):

(68) fáscist, fàscístic; léprosy, lèprótic; ánarchy, ànárchic; gémma, gèmmátion
hérald, hèráldic; módern, mòdérnity; Áaron, Àarónic; ácid, àcídic; Ítaly, Ìtálian
rábbi, ràbbínical; éthic, èthícian; Héllène, Hèllénic; lípid, lìpídic; clínic, clìnícian
mámmal, màmmálian; métric, mètrícian; sùm, sùmmátion

It should be noted that many of the words in both (67) and (68) have alternate pronunciations with unstressed initial syllables. This is not unlike the situation for words like *condensation* and *condemnation*, both of which appear in Webster's 1981 with both full and reduced pretonic vowels (Kenyon and Knott 1953 give *condensation* with only a full pretonic vowel, and the rest of the words like it with full and reduced variants). The present pattern is also similar to the *condensation/chimpanzee* one in that monomorphemic words with stress in this position are grossly outnumbered by ones without, and that derived words productively destress, but do not stress, these syllables. All of these facts serve as diagnostics of the unproductive nature of this pattern, which as we have seen, is well captured by an analysis based on faithfulness to underlying or stem stress.

Another benefit of an analysis based on faithfulness is that the restriction of exceptionally stressed monomoraic syllables to initial position can be derived from principles active in the grammars of other languages. Work by Selkirk (1994) and Beckman (1995) (see also Steriade 1993; Flemming 1994) shows that faithfulness constraints are sensitive to the morphological or prosodic position of the targeted element. For example, in Shona, contrastive vowel height occurs only in the first syllable of a root. Beckman (1995) attributes this to a position-sensitive faithfulness constraint demanding identity in height values between correspondent segments in root-initial syllables, which is ranked higher than the general vowel height faithfulness constraint. Given the formal equivalence between featural faithfulness and prosodic faithfulness constraints, it is natural that prosodic faithfulness should also be position-sensitive. In the present case, by ranking a positional STRESSIDENT constraint above FTBIN, the restricted distribution of monomoraic feet can be generated.

While such analysis explains why monomoraic feet occur only initially, there are a couple of remaining problems. McCarthy and Prince (1986) ascribe the ill-formedness of words like */bæ/, */tϵ/, and */pI/ to their consisting of monomoraic feet, which violate Foot Binarity. If, however, initial monomoraic syllables can exceptionally be parsed, as the data in (67) and (68) taken at face value do imply, then there is no reason why a lone monomoraic syllable should not be exceptionally parsed, as it is of course initial. The bimoraic word minimum, however, is exceptionless. Note that one could

not simply reinterpret word minimality as a restriction on the size of the head of a prosodic word, as exceptional monomoraic primary stresses also occur (e.g. *Sémìte*, and *éssày*).[18]

The tension between the existence of these exceptional monomoraic feet and the absoluteness of the bimoraic word minimum is a generally unresolved problem. One way of avoiding it is to deny that these initial syllables are parsed into feet, and treat them instead as accented but unfooted, or more radically, as unfooted and unaccented, but unreduced (cf. Kager 1989: 142, Burzio 1994). To make this consistent with the rest of the text account, we would need to introduce a violable constraint that demands that an accented syllable be the head of a foot, or for the more radical view, that a full vowel be stressed, so that in the usual cases discussed in the text, full vowels, accent, and headship are correlated. Initial accent preservation would then be generated by ranking positional stress (or vowel quality) faithfulness[19] above the head/accent correlation constraint (✓*rà(cóon)*), but below FTBIN (**(rà)(cóon)*). The latter ranking would enable these facts to be brought in line with the aforementioned analysis of word minimality, since it requires FTBIN to dominate positional faithfulness.

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[18] One way of generating these exceptional monomoraic main stresses is to have a lexically specific version of NONFINALITY that outranks FTBIN. Like the lexically specific STRESSWELL, this constraint would apply primarily, but not exclusively, to words containing bound affixes – in this case the suffixes *-ite*, *-oid*, and *-ode* (e.g. *Semite*, *cathode*, *lithoid* – see Liberman and Prince 1977: 305). This would not interfere with a FTBIN-based analysis of word minimality, since when the input is monosyllabic, NONFINALITY is rendered inactive by the dominance of LEX≈PR, that is, by the requirement that lexical words be prosodified (Prince and Smolensky 1993). An interesting related observation is that words of this shape (i.e. **LH**) are regularly end-stressed (Oehrle 1971; Liberman and Prince 1977: 299). This suggests that the regular pattern is for FTBIN to dominate NONFINALITY, and that these constraints are actively competing.

[19] One consequence of the stress-based version of this analysis, though, is that it would require an extension of the theory of prosodic faithfulness in McCarthy (1995) to handle direct preservation of prominence. In McCarthy (1995), prominence is only preserved indirectly, through faithfulness to the prosodic role of segments. Insofar as the patterns of 'stress preservation' discussed in this paper are idiosyncratic to English, which can only be established through further research, it may be in fact preferable to treat them as vowel quality preservation instead, and leave the theory of prosodic faithfulness alone. The prediction this would make is that English-like stress preservation should only occur in languages with vowel reduction.

Appendix B: Differences between lexical and stem based stress

In the text, I emphasize the parallels between lexical and stem based stress, in order to motivate a unified analysis of them. There are, however, a series of fairly subtle differences between the distribution of these two types of special stress. Interestingly, the gaps are always in the area of lexical stress: in all of these cases, we find examples of stem stress preservation, but no parallel ones of lexical exceptionality.

First, there is a group of words which preserve stem stress on a pretonic syllable, and leave the preceding initial syllable unstressed. Here are two of the more robust examples (Kager 1989: 171):[20]

(69) apártment, apàrtménta<u>l</u>; seléctive, selèctívity

In these examples, faithfulness to stem stress causes a violation of PARSE-σ (or perhaps TROCH), as well as of the lower ranked STRESSWELL. There are no instances of similar PARSE-σ violations in underived words.

Second, as noted in §1.3.2, monomorphemic words with a medial stressed pretonic long vowel, parallel to *cìvi<u>lì</u>zátion*, do not seem to exist. Similarly, there is a rather long list of derived words with binary pretonic strings in which the second syllable retains a stressed long vowel:

(70) còmmùnálity, cònglòbátion, crèàtivity, dènòtátion, èxcìtátion, èxclùsívity, èxhùmátion, èxùdátion, ìmmòbílity, òsmòlárity, trìlòbátion

There are no attested underived words with long vowels in this position.

The final difference between lexical and stem based stress of which I am aware involves pretonic *-Vs-* clusters. These often preserve stem stress:

(71) còntèstátion, dètèstátion, dòmèstícity, èlàstícity, ìncrùstátion, ìnfèstátion, mòlèstátion, òbtèstátion, pròtèstátion

Again, there are no reported monomorphemic words with stress on a medial *-Vs-* cluster (Kager 1993: 124).

There are two possible reactions to these disparities between the two types of exceptional stress, and as the choice seems rather arbitrary, I leave it open. One alternative is to treat the absence of monomorphemic words in each case as an accidental gap, which is especially reasonable given that these patterns are subject to regularization – stress tends to disappear on these pretonic syllables as words become more frequent – and that English is generally a poor source of underived words with multisyllabic pretonic strings (note the prevalence of North American place names and Biblical names in example lists). If, on the other hand, these distributional differences between lexical and stem based

[20] A full account of words like those in (69) will also have to deal with the complications induced by the instances of apparent monomoraic feet (***à**còustícian*) and vowel lengthening (***dò**mèstícity*) that seem to occur as alternatives to PARSE-σ violations (see Kager 1989: 171 for further examples).

stress are thought to merit a grammatical account, one could specify STRESSIDENT as applying to either lexical-surface correspondent pairs (STRESSIDENT-LS), or to stem-stem pairs (STRESSIDENT-SS), a move that is consistent with McCarthy's (1995) well-motivated use of separate lexical-surface, and stem-stem faithfulness constraints in his analysis of Rotuman. Under this account, a lexically specific STRESSIDENT-SS would outrank PARSE-σ (for the forms in (69)), as well as whatever constraints rule out words like those in (70) and (71). STRESSIDENT-LS, on the other hand, would be dominated by these constraints.

Appendix C: The Luxipalilla problem

As an account of regular pretonic secondary stress assignmnent, this analysis remains incomplete in only one respect. For words containing the pretonic string **HLL-**, like *Lùxipalílla*, it incorrectly predicts *(Lùx)(ìpa)(lílla), since this parsing respects all of PARSE-σ, FTBIN, and STRESSWELL. However, it appears that some relatively unorthodox representational assumptions are needed to deal properly with words of this type. In the text, I have employed more standard representations that allow attention to be focused squarely on the issues surrounding nonuniformity, because the evidence that motivates the unorthodox representations is somewhat orthogonal to the discussion of weight-to-stress and stress preservation.

The important, and often neglected fact about pretonic dactyls is that the onset of the final syllable is aspirated, and unflapped (in the case of [t]) (Withgott 1982: 146, Gussenhoven 1986: 133, Jensen 1993: 106). This contrasts with consonants that are onsets to a word-final syllable, even though the immediate environment is identical; in both cases, the consonants are flanked by reduced vowels (compare *Mèditerránean, Mánitowòc* and *Nàvratilóva* with *cápital* and *autómata*). In this respect, these consonants are behaving as if they are foot-initial (*potáto*), or Prosodic Word-initial (*tomáto*). Thus, while either violating PARSE-σ, as in (Lùxi)pa(lílla), or FTBIN, as in (Lùxipa)(lílla) would yield the correct distribution of stress, neither parsing is consistent with the consonantal allophony.

The simplest way to make these syllables foot-initial would be to posit an iambic foot. However, if iambicity is permitted here, then it is difficult to see how one would give an account of the usual pattern of antepenultimate noun stress. Furthermore, this would make the main stress non-initial in its foot, counter to the evidence from aspiration. Thus, it seems necessary to either set up another level of foot structure, as in the 'superfoot' of early metrical phonology, so that these syllables are incorporated as foot-initial (Prince 1980; cf. Itô and Mester 1992), or to posit recursive Prosodic Word structure (Kager to appear; cf. McCarthy and Prince's 1993a assumption of recursive morphological stems), so that they are PrWd-initial.

Whatever the proper analysis of these initial dactyls turns out to be, there are two related facts that must be accounted for. First, weight related constraints, and stem stress preservation both consistently override the stresslessness of the second syllable in the HσL- sequence (e.g. *Tìcònderóga* and *ìcònoclástic*). Second, flapping is preserved from the stem in this environment (e.g. *càpitalístic* vs. *militaristic*; Withgott 1982). As flapping is allophonic in English, this last fact may provide motivation for the Stem-to-Stem correspondence account of morphological relatedness assumed here (see Benua 1995, and McCarthy 1995), though it could also be that the flapping is derivable from prosodic differences between the words, which may or may not ultimately require Stem-to-Stem correspondence to explain (cf. Cohn and McCarthy 1994).

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