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English stress, vowel length and modularity*

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1. Introduction

The evolution of phonological theory over the past fifteen years or so mirrors in important respects that of syntactic theory. The common evolutionary characteristic is the emergence of modularity. As is frequently noted following Chomsky (1986: ch. 3), in syntax, rich systems of rules have been supplanted by a relatively small number of discrete sub-theories, such as the theories of thematic relations, Case, Binding, Government, and the theory of empty categories. Characteristically, each sub-theory regulates one specific aspect of syntactic structure, at one or more levels of representation, for example the distribution of overt noun phrases at S-structure. The emergence of the sub-theories reflects a natural shift in investigative focus. Just as studying the facts of language from a systematic and formal perspective led to the discovery of generalizations of fact, originally expressed as 'rules', so the study of the rules themselves led to the discovery of higher-order generalizations, expressed by the various conditions or principles that make up the contemporary sub-theories. Although Chomsky (1986: 70ff.) lists several important contributors to the development of the new perspective, in the mind of most syntacticians, a watershed event in this evolution was Chomsky's own 'Conditions on transformations' (1973). To the extent that this development of syntactic theory is a natural one towards deeper understanding, a comparable one is expected in phonological theory. Although the 'modularity' of phonology is less frequently noted and identification of a single watershed event is perhaps more difficult, there are clearly several 'modules' or sub-theories that have emerged in post-*SPE* history – three in particular. One is a certain theory of the segment known as 'feature geometry', which defines a network of interdependencies among

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distinctive features (Goldsmith, 1979, 1990; Clements, 1985; Sagey, 1986; and other work cited in McCarthy, 1988). The role of this theory is to reduce the range of observed interactions among segments to a small number of theoretical primitives, exactly three in the programmatic analysis of McCarthy, 1988: spreading (= assimilation); delinking (= neutralization); and effects of the 'Obligatory Contour Principle' (= dissimilation).

A second, rather perspicuous module within phonological theory is the theory of the syllable (Kahn, 1976; Steriade, 1982; Clements & Keyser, 1983; and much other work). By defining a narrow range of possibilities for arranging consonants around a vocalic nucleus, syllable theory has succeeded in subsuming a large number of formerly rule-specific statements under few simple theoretical formulas. (For an illustrative example, see Clements & Keyser, 1983; 58–61.) Syllable theory has also identified the prosodic sub-units upon which stress appears to be computed.

The third module is the theory of stress, or 'metrical theory', which defines the possible arrangements of syllables into larger prosodic units, feet and words, and the prominence relations within and among them (Liberman & Prince, 1977; Kiparsky, 1979; Hayes, 1982, 1985; Prince, 1983; Halle & Vergnaud, 1987a). Our goal in this article is to show that metrical theory as an independent module plays a central role in English vowel-length alternations, and that the rule-based apparatus formerly employed to account for those alternations can be largely dispensed with – the typical achievement of modularity. We will also argue for a 'representational' rather than 'derivational' approach to metrical structure, based on well-formedness conditions or principles rather than on rules, thereby further highlighting the analogy with contemporary syntax.[1]

2. Well-known alternations

An important attempt to unify descriptively different cases of vowel-length alternations was made in Myers (1985, 1987), who considered the cases in (1a, b, c).

(1) (a) divíne ⇒ divínity
(b) rÈcÍte ⇒ rècitÁtion
(c) oblíge ⇒ oblígatòry

[1] It is not obvious what interdependence, if any, exists between the two distinctions we are drawing: modular versus 'undifferentiated' structure of the theory, and representational versus derivational organization. Our sense is that there is substantial interdependence. Thus, in an undifferentiated theory, derivational properties such as rule ordering are crucial in defining the empirical content of the theory, while in a modular one it is the parcelling into modules that does, rendering reliance on derivational properties less crucial. However, in principle, modules could still have a derivational organization, for example, as in a theory of the syllable that postulated ordered rules of syllabification (Steriade, 1982). McCarthy (1988: 84) lends support to the interdependence, by noting that modularization in phonology HAS been accompanied by a shift from rules to representations.

Myers's proposal, subsequently integrated into the more general analysis of English stress of Halle & Vergnaud (1987a) (henceforth 'HV'), was that vowels shorten in syllables that head binary feet. We may state this as in (2).[2]

(2) *Myers's/ HV's shortening in binary feet (adapted)*
Shortening affects σ_1 in $(\sigma_1\ \sigma_2)$

On this account, the forms on the right-hand side of (1) will undergo shortening because they satisfy the structural description of (2), as shown in (3).

(3) (a) di(ví*n*i)ty
(b) (rè*c*i)tÁtion
(c) o(bl*í*ga)tòry

The feet indicated in (3b, c) are binary factually, whereas the one in (3a) is binary under the common view that the final syllable here is extrametrical. That view seems thereby supported, as it enables (3a) to fall within the same structural generalization as (3b, c). In contrast, the italicized vowels on the LEFT side of (1) remain unaffected by (2), because they are in MONOsyllabic feet, as in *di*(*vIne*), (*rE*)*cIte*, *o*(*blIge*).

In what follows, we will argue that Myers's solution was to a certain extent correct, but not general enough. To see this, we consider that there are several other alternations that it does not account for. One of these is the shortening in unstressed position illustrated in (4).[3]

(4) (a) def*Á*me ⇒ dèf*a*mátion
(b) comp*Ó*nent ⇒ còmp*o*nénti*a*l
(c) volc*Á*no ⇒ vòlc*a*nólogy

Myers's study does not deal with this case, but HV, who adopt Myers's system, do, postulating a further rule, which we give in (5), along with HV's definition of 'stress well'.

(5) *HV's shortening in a stress well*
(a) $V: \Rightarrow V\ /\ \sigma\_\_\_\sigma$
condition: V dominates a stress well
(b) Stress well $=_{def}$ a syllable whose level of stress is lower than that of an adjacent syllable.

[2] We will not be concerned here with Myers's further attempt to justify the shortening of (2) in terms of resyllabification of *V.CV* into *VC.V*. The independent motivation for such a move seems lacking, as argued by HV (p. 253). In contrast, Myers's resyllabification account of alternations like *keep/kept*, which we briefly consider in section 11 below, seems well motivated.

[3] Another instance of (4) is also *rec*[*I*]*te/rec*[*i*]*tation* in (1b).

The italicized vowels of the right-hand forms in (4) shorten under (5) because, at the relevant point in the derivation, their stress (while possibly non-null, see HV for details) is weaker than that of an adjacent syllable, namely the one that bears the primary stress. What is relevant to our discussion at this point is not so much how (5) works, exactly, but the fact that it is unrelated to (2).

When one considers the full range of vowel-length alternations in English, one notes two major classes. One, of alternations which are relatively systematic (although none is completely exceptionless, see fn. 41), and one of alternations which are unsystematic. The alternations in (1a, b, c) and (4) belong to the former class. The ones in (6) and the next few cases we consider belong to the latter class.

(6) (a) blasph*É*me ⇒ bláspheмous
(b) des*Í*re ⇒ des*Í*rous

In (6), shortening occurs in (a), but not in (b), despite the identical environment. This phenomenon appears to be rather general among Latinate affixes, as shown by the cases in (7), whose italicized vowels are long in the corresponding stems.[4]

(7) áspirant, résident, chástizement, ádmirable, váginal, éxcretòry, órator, gángrenous, sátirist, sémitism, lénitive

Myers (1985: 281; 1987: 504) addresses these cases (not examined in HV) and attempts to derive them in the manner of *répertòry* and the like, traditionally treated in terms of destressing of the medial syllable (see discussions of 'sonorant destressing' in Kiparsky (1979: 428), Hayes (1985: 174), HV (p. 257), and section 8 below). While Myers does not go on to discuss the shortening here, one may presume it would follow from some version of (5), applying to the destressed vowel. This account is not quite adequate, however, since the phenomenon of (6a) and (7) is NOT limited to post-initial syllables like that of *réPERtòry* (contrasting with non 'de-stressing' *eleMÉNtary*). This is shown by (8) below, where the italicized shorten and yet stress is *non*-initial.[5]

(8) concúbınage, coíncident, clarífıcant, signífıcant, advértisement, amórtizement, exécutor, submáriner, carnívorous, monótonous, teléphony, micróscopy, appétitive, constítutive, exécutive

[4] The case *éxcretòry* in (7) is an instance of (6) rather than (4) because heavy syllables before *ory* pattern as in *refé*ctory. See section 8 below for some discussion.

[5] It also does NOT affect syllables closed by sonorants, as shown by (i).
(i) consúltant, repéntant, dispérsant

For better descriptive adequacy, we must go back to the original account of these cases in Kiparsky (1979: 431), which we give in (9).

(9) *Kiparsky's ('morphological') shortening*

'a lexically conditioned vowel shortening rule which applies to the presuffixal vowel in certain words prior to the assignment of stress'.

While eminently descriptive, (9) is still not completely accurate, since morphological shortening is not limited to suffixes, but occurs with *pre*fixes as well, as shown by (10).

(10) ímp*i*ous, ínf*a*mous, ínf*i*n*i*te, omnípotent, unív*a*lent, bíc*y*cle, súbsequent, antíth*e*sis

Thus, none of the past formulations of morphological shortening is fully adequate empirically, but more relevant to our goals is the fact that none relates morphological shortening to any of the other instances of shortening.

A further case which, like morphological shortening, falls into the 'unsystematic' category, is the '*ative*' shortening, illustrated in (11).

(11) (a) gén*er*Á*t*e ⇒ gén*er*a*t*ive
(b) ínnov*A*te ⇒ ínnov*A*tive

Here again, the alternation obtains in (a) but not in (b), despite the identical environments. As Myers does not address this case, we turn again to HV, who, following in part earlier work by D. Nanni, propose the rule in (12) (HV, p. 262).

(12) *HV's 'ative' rule*

'a special rule that renders *-at-* non stress bearing... [applying] to specifically marked words.'

Within this account, cases like (11a) are presumed to be first stressed in the manner of (11b), and then destressed by (12). The actual shortening follows in HV's account from (an extension of) (5) above,[6] but again of relevance to us is the fact that these cases require the special rule in (12) and in this sense they too fail to reduce to some more general account.

The next and last case we review here is the shortening in the sequence *atory*, which we place in the unsystematic class, despite the fact that American English exhibits no variation. The variation occurs in British English, where we find the two dialectal variants in (13) (Fudge, 1984: 63).

(13) (a) artícul*A*te ⇒ artícul*a*t-ry
(b) artícul*A*te ⇒ artìcul*A*tory

[6] In HV's analysis these cases satisfy the structural description of (5) on the assumption – which we do not share – that there is a stress on *ive*.

In American English, the results are consistently as in (14).

(14) artícul*Á*te⇒ artícul*a*tòry

We know of no specific analysis of the British cases. The American case is analysed in HV. In their framework, a challenge is posed by the systematic ternary feet in these cases, like the one of *ar*(*tícula*)*tòry*. The reason is that their system, like that of Hayes (1982, 1985) on which it is based, has no direct way of constructing ternary feet over tetrasyllabic sequences, and normally assigns two binaries instead, correctly for cases like (*àpa*)(*làchi*)*cóla*. HV (p. 256) thus propose that the sequence *atory* is a 'stress domain', which essentially means that it is stressed as if it were an independent word, like *aróma*. An associated stem, like *articul* is also supposed to be stressed independently and, omitting details, like *inhábit*. The final stress pattern then results from integrating the two partially metrified substrings.[7] Shortening of the italicized vowel in (14) will then be just another instance of (5), but – once again – a unique device, namely the two independent 'stress domains', stands in the way of unification with any of the other cases.[8]

The battery of independent devices that one collects from past analyses is thus as in (15).

(15) (a) Myers's shortening: (i) div*i*nity
(ii) r*è*citátion
(iii) obl*í*gatory
(b) Shortening in unstressed position: èxcl*a*mátion
(c) Morphological shortening: blásph*e*mous
(d) *ative* rule: géner*a*tive
(e) *atory* as a stress domain (Amer.): artícul*a*tòry
(e′) ?? (Brit.): artícul*a*t-ry

3. Towards unification

We will now claim that the phenomena in (15) are all manifestations of a single principle that requires that vowels shorten in word formation. We will argue that the descriptively different categories result from the interaction of that single principle with metrical theory, which stands as an independent module. In particular, we will show that shortening is systematic in certain cases and unsystematic in others because metrical theory includes a principle requiring that stress be preserved in word formation. This principle will

[7] Myers's shortening must then apply after the concatenation has occurred, given *obl*[*i*]*gatory*.

[8] In Hayes's analysis, the trisyllabic foot of items in *atory* is dealt with by supposing that the full sequence *atory* becomes extrametrical (Hayes, 1985: 196), after receiving stress on *ory*. Computation of primary stress will then start at its left edge.

sometimes not interfere with shortening, hence guaranteeing its systematic success, but sometimes it will, resulting in the unsystematic pattern. Thus consider, for example, the 'trisyllabic' shortening of (15ai) above, as given in (16).

(16)		*Shortening*	*Stress preservation*
divÍne	⇒ divínity	yes	yes

Here, the affixed item *divinity* in which shortening occurs, maintains the stress of its stem *divíne*. As we will see, stress preservation is not always possible, but in this case it is because the metrical structure of *divínity* is well formed, requiring no restressing. This well-formedness can be established on theory-neutral grounds. For the structure of *divínity* and of all such 'trisyllabic' cases, is just like that of *américa*, with a light antepenultimate, a light penultimate, and antepenultimate stress – a normal case in English. Analogous considerations hold for the cases in (15aii, iii) (*rèci*)*tátion*/ *o*(*blíga*)*tòry*. These have a (non-rightmost) binary foot headed by a light syllable, which we know must be well formed, since it is just like the one of (*àri*)*zóna*, *ac*(*cèle*)*ráte*, and many other cases. Thus, there is again no obstacle to preserving the stress on the shortened vowel.

Putting aside (15b) for the time being, let us now turn to the 'unsystematic' cases, like (15c), given in (17).

(17)		*Shortening*	*Stress preservation*
blaspÉme	⇒ blásphemous	yes	yes

Here, while shortening occurs, stress preservation does not. The reason is that it CANnot, as stress on a light (non-initial) penultimate is not possible. Again, factual generalizations suffice to make the point. For we know that nouns and suffixed adjectives exclude the pattern **blasphémous* (with a short *e*), whence **américa*, **barbárous*, **cantankérous*, **agámous*, **extravágant*, **gallívant*, **relévant*, and many others. It is true that there are a few apparent exceptions, like *vanílla*, but we may suppose that, whatever provision permits them, it is not available to stress preservation. Specifically, we will suppose (with *SPE*, pp. 82ff., 148ff.) that such items as *vanilla* have geminate consonants, which make the penultimate syllable heavy. Then, we exclude **blasphémous* by supposing that there is no gemination process available (at least for purposes of stress preservation). Thus, if stress preservation is a principle of metrical theory, it is violated in (17), evidently overridden by the combination of vowel shortening and general constraints on metrification. However, if it is real, it ought to manifest itself sometimes, as in fact in (18).

(18)		*Shortening*	*Stress preservation*
desÍre	⇒ desÍrous	no	yes

What we are thus claiming is that the contrast between (17) and (18) results from the tension between two principles of word formation: shortening and

stress preservation, only one of which can be satisfied in this kind of structure. The reason is again that the conjunction of both shortening and preservation, as in **desírous* (with a short *i*) is excluded, just as it was in **blasphémous* (with a short *e*). For present purposes, we will regard the choice of which contending principle is satisfied in each case as idiosyncratic, although further study may turn up additional principles.

Just like (18) are the stress-preserving cases in (19), which thus contrast with the shortening cases in (7).

(19) exc*I*tant, poll*U*tant, caj*O*lement, persev*E*rance, opp*O*sable, res-t*O*rable, homic*I*dal, anecd*O*tal, locom*O*tory, div*I*sor, extr*E*mist, esc*A*pism, div*I*sive

We will see later on that the other 'unsystematic' cases, *ative* and *atory* are simply subcases of morphological shortening, following from the same considerations, and requiring no special stipulation.

In essence, we are thus postulating a single rule of shortening which subsumes both Myers's and Kiparsky's. Myers's rule happened to capture the shortening of stress-preserving environments, while Kiparsky's captured that of restressing ones. Our claim is that the difference between the two rules simply describes the workings of stress preservation, which is an independent principle of metrical theory. Hence there is only one rule.

That shortening in English is a general contingency of word formation is shown by the fact that none of the subcases of shortening reviewed above extends to 'underived' items. In the case of 'morphological' shortening this is obviously true by definition, as is in the *ative* and *atory* cases.[9] For the shortening described by Myers's rule, this is also true, although not expressed in Myers's original formulation. For it is well known that the 'trisyllabic' shortening of (15ai) does not affect unaffixed items, like *Ivory*, *Apricot*, *dYnamo* (Kiparsky (1982: 35), Halle & Mohanan (1985: 95; HV, p. 80). This immunity extends – as predicted by Myers's/HV's unification – to the bisyllabic medial feet of (15aii, iii), as shown, for example, by (*clYtem*)*nestra*, (*pOla*)*roid*, (*nIghtin*)*gAle*, (*boome*)*rang*, (*trIlo*)*bIte*, (*Abel*)*mosk*, (*Abra*)*ham*, (*nOvo*)*cain*, (*rhOdo*)*dendron*, (*Oca*)*rina*, (*wIsen*)*heimer*, (*Edel*)*weiss*, given by Myers (1987: 516) as 'exceptions'. Affixation appears to be required also for the shortening in unstressed position. For (as we argue in more detail in Burzio, 1994), there is reason to suppose that the long vowels in final syllables such as those of *rábbI*, *sémIte*, *sátIre* and many others do *not* bear stress, *contra* traditional views. This assumption is supported by various considerations which we can only mention briefly. One is that it trivially

[9] Note that items such a *prerog-ative* and *labor-atory*, must count as derived despite their bound stems, given the shortening of the *a* in both suffixes. This will follow from our formulation in (20), as the shortening of the vowel in *at* occurs in the context of another affix, namely *ive*, *ory*, respectively.

explains the initial primary of these items in contrast to the final primary of cases like *rèpórt*. Another is that it reduces noun/verb alternations like *éxcise/excíse* to the standard one of *áccent/accént*. Further considerations will be presented later on. If this is correct, it means that shortening in unstressed position fails to extend to underived items, just like the other cases of shortening, providing further motivation for a unified account.

Before turning to the details of our proposal, it is worth noting that the earlier argument for extrametricality of the final syllable in *di(vini)ty*, etc., based on the resulting parallelism with *(reci)tation*, *o(bliga)tory*, has now disappeared. The reason is that we are no longer associating (systematic) shortening with bisyllabic feet. Rather, we are associating it with *well-formed* feet, of any kind. Thus, *divinity* is well formed because *américa* is. Shortening will follow even if it turned out that *divinity*, *america* have final *ternary* feet, with no extrametricality. Correspondingly, the lack of shortening in *divIne* is now unrelated to non-binarity, but is rather due to the unaffixed status of this item – an assumption required even within Myers's framework (given the noted *dYnamo*, etc.).[10]

4. Generalized shortening and metrical theory

The two major components of our proposal are thus the shortening rule or principle, which we refer to as 'Generalized Shortening', and metrical theory, stated as in (20a, b), respectively.

(20) (a) *Generalized Shortening*

Vowels shorten in the environment: [... __ ...] affix (linear order irrelevant)

(b) *Metrical theory*

This proposal is minimal, in the sense that any analysis will need metrical theory (to account for stress), and no analysis can do with metrical theory alone, since **div[I]nity* would be metrically well-formed, like *d[Y]namo*, hence requiring at least one additional device. It is also minimal in the sense that (20a) imposes exactly one condition: affixation. The only way to reduce the analysis even further would then be to attempt to subsume (20a) under some broader principle or generalization. While essentially leaving this question open at this point, we will none the less suggest speculatively that in fact (20a) is part of the more general phenomenon identified in Kiparsky (1973)

[10] One might present a different argument for extrametricality in *di(vini)ty*, based on parsimony of foot types, as *di(vini)ty* employs the same foot needed for *o(bliga)tory*. But this argument is illusory too since, under syllable extrametricality, there is no unification of word-final feet with word-internal ones. In particular, the presumed unary of *a(gén)da* has no counterpart word-internally, witness **in(fòr)mátion*, etc. It is rather a non-extrametricality-based *a(genda)* that would have a perfect internal counterpart, like *mo(nonga)hela*.

whereby lexically exceptional features are filtered out in word formation, as in 'still lifes/*lives', 'Toronto Maple Leafs/*leaves', and other cases. Exceptional markings for stress seem to undergo a similar fate as well. Thus, *órchestra* is exceptional (compared with *asbéstos*), but *orchéstral* is normal, shifting stress despite the fact that *al* adds no syllables here. Analogously, *cátholic* is exceptional (for the *ic* class, compared with *orgánic*), but in *cathólicism* the normal pattern is restored, despite the fact that *ism* is generally stress neutral (as in *orgánicism*). We are thus suggesting that, in English, lexical marking for vowel length is an exceptional feature, to be lost in word formation, like others.

Note that the structural description of (20a), which will correctly distinguish between derived *div[i]nity*, and underived *d[Y]namo*, has in fact a different effect than the notion of 'strict cyclicity' which has been generally invoked in the past (Kiparsky, 1982; Halle & Mohanan, 1985; HV) to make such distinction, via a convention that cyclic rules may not apply to underived environments. The reason for the difference is that in (20a), the affix itself is *not* in the environment of shortening. In contrast, a strict-cyclicity approach would place it *within* that environment. Yet affixes do not THEMSELVES undergo shortening, unless there are FURTHER affixes. Thus, while shortening occurs in *sat[i]rIze*, *Ize* itself only shortens non-peripherally, as in *advert[i]sement*, despite the fact that some peripheral cases of *ize*, like *anthropomórphIze*, are most likely unstressed (Burzio, 1994). Analogously, in items in *atory* in American English, shortening affects *at*, but not peripheral *ory*, which thus attracts stress (although *o*, like other vowels, surfaces lax before *r* (Rubach, 1984: 51)). The latter suffix *ory* shortens again as predicted when non-peripheral, as in *álleg[o]rIze*, whence its lack of stress despite the general stress neutrality of *Ize*, and so forth. Thus, in general, it is the narrower condition of being internal to an affix that appears relevant to shortening, not the broader condition of being part of a derived word, as implied by 'strict cyclicity'.

Turning now to metrical theory, we presume it consists of two components. The first is a set of well-formedness conditions on metrical structure, applying to derived representations. By postulating these, we take a 'representational' approach to stress, in terms of stress 'checking', for which we will find good reasons below, and not a derivational one, in terms of stress 'assignment' by rule, which is the more traditional way. The second component we postulate is a principle of stress preservation, which requires that stress (but in fact, more generally, metrical structure) be preserved in word formation. We list these in (21).

(21) *Metrical theory*

(a) Well-formedness conditions on metrical structures

(b) *Stress preservation:*
Stress is preserved in word-formation

As we will see, the conditions of (21a) have overriding power over the principle in (21b), so that the empirical effect of the latter is that of preserving stress only to the extent possible, namely IF WELL-FORMED METRICAL STRUCTURES RESULT. There is ample evidence for a principle like (21b), to which we turn in the next section. Here, we consider the structure of (21a).

A central part of the set of well-formedness conditions on metrical structures is of course the definition of well-formed feet. In (22) below, we list what we take to be the well-formed feet of English, along with relevant examples (H/L: heavy/light syllable, respectively).[11]

(22)	*Foot typology*	*Non-rightmost*	*Rightmost*	
	(a) mo (non ga) hela	(H σ)	(H σ)	a (gen da)
	(b) (win ne pes) saukee	(σ L σ)	(σ L σ)	a (me ri ca)
	(c) ac(cele)rate	(L σ)	#(L σ)	(ho nes)t

As (22) shows, we are essentially postulating binary/ternary feet applying uniformly across the word, except for one residual asymmetry: a binary foot headed by a light syllable is possible word-finally only by default, that is if there are no more syllables, as in *honest* of (22c). In contrast, in non-final position, this kind of foot is possible more generally, as in *accelerate* of (22c), though still under somewhat specific conditions, which we put aside for now. In this system, we thus pursue a different path from the influential one initiated by Hayes (1981, 1982), and attempt to dispense with the notion of 'syllable extrametricality' that his work has made so familiar. We return shortly below to cases like *prevént*, *inhábit*, *robúst*, etc., which do not seem to fall within (22).

As we argue in Burzio (1990), we see the spectrum of possibilities in (22) as resulting from a certain notion of foot 'weight', with a higher and a lower limit. If we suppose that the required weight is partly linked to word prosody, we will predict larger feet at the right edge of the word, normally associated with greater prominence. This seems to cast light on the asymmetry in (22c), with the smallest foot size (*LL*) becoming freer as we move to the left. We will briefly return to the notion of foot weight in section 10 below, in connection with finer distinctions than we need at this point. While the notion of foot weight can thus be argued to underlie the range of possibilities in (22), for most of our discussion it will be sufficient to take (22) as a given, comparable to the fixed range of foot structures postulated in other theories.[12]

In addition to the range of metrical structures defined by (22), English

[11] The reasons why the final *t* of *honest* in (22c) are outside the final foot will become clear below (see (26)).

[12] Other theories also postulate a three-member taxonomy. Specifically, in Hayes's or HV's framework, final feet are $(H)/(\sigma L)$, while non-final ones are $(\sigma\sigma)$.

appears to have a class of 'weak' syllables, which may, but need not, be metrified, in the manner illustrated by (23).

(23) (a) a ris (tó cra cy) / (ác cu ra) cy
(b) ob (jéc tive) / (ád jec) tive
(c) ad (vén ture) / (á per) ture, (tém pe ra) ture
(d) a (pós tle) / (pár ti ci) ple
(e) de (cém ber) / (chá rac) ter

The analyses in (23) presuppose a form of extrametricality, but one which is quite distinct from Hayes's, as we show in a moment. The class of weak syllable, which are allowed to be extrametrical, thus comprises syllables with the vowel that orthographic *y* generally stands for, the sequences *ive* and *ure*, and syllables with sonorant nuclei. We speculate that weak syllables are weak concretely, namely acoustically. This conclusion seems to hold transparently for the cases in (d, e) with consonantal nuclei, and is to some extent supported for the other cases in (a, b, c) as well, all involving high vowels. It is in fact well known, for example from Lehiste (1970: 120f.) that high vowels have a lower acoustic output. From this point of view, feet which are structurally minimal, namely binary, and incorporate a weak syllable, will be particularly 'weak', in the same (acoustic) sense of 'weak' syllables. This now provides a very natural account of the 'retraction' of primary stress in cases like (24).

(24) (a) (órtho)(dòksy)
(b) (ínno)(vÀtive)
(c) (árchi)(tècture)
(d) (táber)(nàcle)
(e) (álli)(gÀtor)

That is, primary stress can now simply be presumed to shun 'weak' feet in the above sense, falling on the rightmost non-weak one. We have thus established two independent criteria for identifying weak syllables, namely extrametricality, as in (23), and stress-retraction, as in (24). The two criteria yield identical results, supporting our account.

It is now easy to see that our 'weak syllable' extrametricality is unrelated to Hayes's. The reason is that the latter aims to account for the 'longer' penult/antepenult pattern of nouns, such as *agén⟨da⟩*, *améri⟨ca⟩*, reducing it to the 'shorter' final/penultimate one of verbs, such as *prevén⟨t⟩*, *inhábi⟨t⟩*, in which extrametricality affects only the final consonant. This means that the 'extra-long' pre-antepenult/penult pattern of (23, right) will be left out, requiring some additional mechanism. That mechanism is bound to be some version of our 'weak-syllable' extrametricality. Thus, in Hayes's approach two notions of extrametricality are needed, both applying to cases like *(accu)⟨ra⟩[cy*, while only one applies to other cases, like *aris(t-*

ocra)⟨*cy*⟩.[13] In contrast, our approach will employ only one notion – that of *weak*-syllable extrametricality.

Turning now to the 'shorter' stress pattern typical of verbs, we integrate it into our framework by postulating that metrification, and in fact syllabification, can parse phonetically null structure, in the manner illustrated in (25).[14]

(25) (a) pre (vén tØ), ro (bús tØ)
(b) de (vé lo pØ), or (gá ni cØ)

This hypothesis is a (non-derivational) variant of the '*e*-elision' of earlier work, in particular *SPE* (pp. 147, 229), Ross (1972: 170f.). It is, however, more closely related in general scope to the 'zero syllable' hypothesis of Giegerich (1981, 1985) and related work, like Iverson (1990). Thus analysed, the cases in (25) will now fall within the usual foot typology of (22). We motivate the presence of null vowels in (25) by postulating that English words must all end in a vowel, a requirement minimally weaker than that of other languages, like Italian, in which *overt* vowels are required (see Burzio, 1987, 1994).[15] This requirement is now apparently too strong, however, since cases like *hónest*, *ásterisk*, *féderal*, will have a final null vowel, and yet do not have the stress pattern of verbs. But the discrepancy is promptly removed by weak-syllable extrametricality, in the manner of (26).[16]

(26) (hó nes) tØ, (ás te ris) kØ, (fé de ra) lØ

For it is most natural to suppose that syllables with null vowels are weak syllables, as they trivially meet the proposed 'acoustic' criterion. This analysis further predicts that syllables with null vowels should give rise to weak feet, like other weak syllables. This is correct, as shown by the cases in (27) and many others, parallel to those in (24) above.

(27) (bérnar)(dÈne), ac(céle)(rÀte)

This approach has a number of advantages over previous ones, as we argue in more detail in Burzio (1994). One is that it succeeds in accounting for final 'superheavy' syllables, like those of *pre.VENT*, *ro.BUST*, *ho.NEST*,

[13] Some instances of our weak syllable extrametricality have traditionally been analysed as involving 'late syllabification'. See Burzio (1994) for arguments against this particular formulation, which fails to generalize to all cases.

[14] Oxytones like *permit* require the further assumption that consonants sometimes function like geminates, as in *permittØ*, the same assumption required by exceptional paroxytones like *vanilla*. See also section 10 below.

[15] A few other languages in which words must end in a vowel are Malayalam (Mohanan, 1989: 591), Kannada (Aronoff & Sridhar, 1983: 12), Diyari (Prince, 1991).

[16] This view implies that sequences like *ive*, *ure*, which are sometimes extrametrical, are in fact bisyllabic. This is of no particular consequence, other than indicating that extrametricality, while confined to *weak* syllables, is not confined to *single* syllables.

as.te.RISK, etc. Superheavies are now simply heavy penultimates, the extra C being in the final syllable, as in *pre.VEN.TØ*, etc. (See also Giegerich, 1985; Iverson, 1990.) Another advantage is that a single notion of extrametricality is employed – the one relative to weak syllables – while two are required otherwise, as noted. A third advantage is the substantial unification of final and non-final feet, all falling within the same three possibilities in (22), not achievable under the alternative, which scales down final feet by one syllable (see fn. 10). We put aside the initial stress of cases like *bàndánna*, for the moment, which obviously requires further comment (see section 10).[17]

The apparatus we have thus far introduced is distributed over three different levels of language specificity. The overall structure of the metrical theory in (21) may be presumed to be quite general, perhaps universal. The foot typology in (22) is somewhat language-specific, but still common to many languages, including Arabic, Latin and Italian. As for weak syllables, they are not in themselves unique to English. Thus, if null vowels are the correct solution to superheavy syllables, then Latin *a.mant* and Arabic *da.rabt* must have final null vowels, hence weak syllables.[18] What is peculiar to English is the metrical ambiguity of weak syllables, in contrast to their systematic behaviour in other languages – consistently extrametrical in Latin, as in *(á.man)tØ*, and consistently metrified in Arabic, as in *da(ráb.tØ)*.

In sum, while we subscribe to Hayes's general programme of unifying apparently different stress patterns both across languages and within English by postulating that word edges are metrically ambiguous, allowing for different 'starting points' we differ in attributing the ambiguity not to final syllables in general (there is no reason why normal syllables should be

[17] One reviewer suggests verifying the interaction of the null vowel hypothesis and suffixation. By making null vowels word internal, suffixes ought to give apparently different stress patterns with stems that bear them. In general, null vowels are NOT detectable in this manner, but for principled reasons. The distribution of 'superheavy' syllables, normal finally, but very rare internally, indicates independently that null vowels are an 'edge' phenomenon, presumably because primarily licensed by the inherent prosodic weakness of word edges. This predicts that they will be generally suppressed under suffixation, a fate that befalls many overt stem-final vowels as well. Certain exceptions to the peripherality of null vowels are, however, entailed by the presumed integrity of syllabification principles. One set of cases concerns the regular past-tense morpheme *-d*, plural/third-person *-s*, as well as ordinal *-th*. Null vowels must be allowed to occur internally to these, as in *peepØd*, *peepØs*, *nInØth*. Another exception is that of occasional cases like *departØment*. The stress facts here are quite consistent with these analyses. In the first set of cases, the null vowel represents a weak syllable (as does the overt vowel of *seed[i]d*), whence the neutrality of these suffixes (see text below). In the second set of cases, the null vowel accounts for the apparently adjacent stresses of *depàrtØméntal*, otherwise excluded. A third type of exception to peripherality provides the supporting evidence the reviewer refers to, though it is an isolated case. It concerns the sequence *ageous*. Each of the individual suffixes in this sequence metrifies as a single syllable, as in *(béverag)e*, *(márvelou)s*. However, when combined, the two do NOT metrify as two syllables, witness **ad(vántageou)s*, but rather as three, as in *advan(tágeou)s*. This only follows if *age* has a final null vowel, which is computed when *ous* follows. This argument is adapted from *SPE* (p. 48).

[18] We are unaware of weak syllables with other than null vowels in these languages, however.

ambiguous), but only to 'weak' syllables, in particular to the ones with null vowels.

5. Weak preservation

As indicated in (21) above, an important component of our proposed metrical theory is a general principle imposing preservation of stem stresses in word formation. The existence of such a principle can be deduced from the two well-known phenomena of (28).

(28) (a) *Weak preservation*
napóleon ⇒ napòleónic
(b) *Strong preservation*
pròpagánda ⇒ pròpagándist

The 'weaker' preservation of (28a), in which the primary of the stem is preserved as a secondary in the derived word, is the one traditionally attributed to the 'cyclic' character of the stress rules, which supposedly apply first to the inner, unaffixed portion, and then to progressively larger ones respecting existing stresses (*SPE*; Kiparsky, 1979; Hayes, 1982, 1985).[19] The 'stronger' preservation of (28b), in which the full metrical structure of the stem, including its primary stress, is preserved, and often referred to as 'stress neutrality', has consistently been characterized in the past as some form of stress 'evasion' or immunity on the part of certain affixes. Thus, *SPE* postulated a word boundary '#' between stem and affix, inhibiting (further) application of stress rules. The 'Lexical Phonology' of Kiparsky (1982), relying on the 'Level Ordering' hypothesis of Siegel (1974), Allen (1978), postulated that stress-neutral affixes are attached at 'level 2', a derivational level beyond the scope of the stress rules, which apply at 'level 1'. Halle & Vergnaud (1987a, 1987b) proposed a modified version of that general approach, maintaining that the lexical diacritic distinguishing restressing from neutral affixes is not 'level 1' versus 'level 2', but rather 'cyclic' versus 'non-cyclic', namely a marker determining whether or not the stress rules, at least those of the 'cyclic' subset, are being triggered.[20]

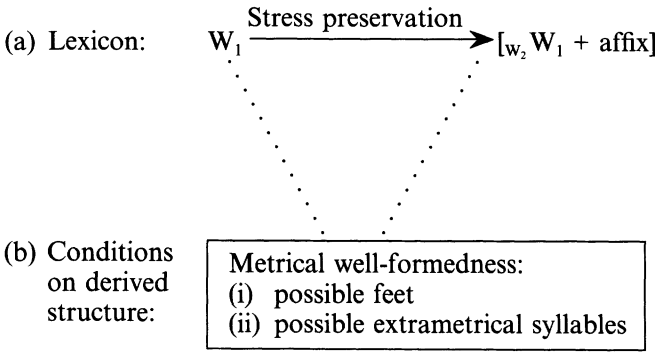
Our approach will be rather different. We will maintain that in fact metrical theory makes no provision for stress evasion or immunity, and that all affixes are metrified under the usual canons. We will show that both weak

[19] On the other hand, HV (p. 245), deny the existence of a systematic effect of this sort. See also fn. 22.

[20] The motivation behind Halle & Vergnaud's departure from the Lexical Phonology model is to avoid the so called 'bracketing paradoxes', both of the *un-grammatical-ity* type (Pesetsky, 1985) and of the *capital-ist-ic* type (Aronoff & Sridhar, 1983), both featuring a neutral suffix more deeply embedded than a non-neutral one. Halle & Vergnaud's system avoids the paradoxes because, unlike Lexical Phonology, it makes no connection between stress neutrality and level of morphological embedding.

and strong preservation follow from the same general principle of stress preservation, the different effects being predictable from the syllabic structure of the affixes.

Turning now to the specifics of our formulation, we take metrical structure to be part of lexical representation, subject to 'stress checking' by well-formedness conditions, as mentioned above. These include the specification of possible feet given in (22), and the specification of possible extrametrical syllables, designating as such those of (23) and (25). Furthermore, we take stress preservation to hold as a general principle of word formation. This model can be represented as in (29).



In this system, the relation between two words, W_1, W_2, in which W_2 is derived from W_1 via affixation, falls under two simple constraints. One is that both words, like *all* words, meet the conditions in (29b). The other is that W_2 preserve the stresses of W_1. As stated earlier, we take the conditions in (29b) to have overriding force, overruling stress preservation if necessary.

We consider now that, given precisely the overriding character of the output conditions in (29b), there need not be any stress-preservation effect despite the existence of a stress-preservation principle. The reason is that, if the output conditions imposed a fully deterministic relation between syllables and stresses, then, given any sequence of syllables, a unique arrangement of stresses should result, regardless of derived versus underived status of the word. To state it differently, we predict that stress preservation should be observable only in those cases in which the general conditions in (29b) permit more than one choice, stress preservation then being able to make that choice. In what follows, we will argue that the two preservation phenomena of (28) in fact result precisely from the two major indeterminacies of metrical structure in English. One, yielding the 'weak' preservation effect of (28a), is the double option for sequences $\sigma L \sigma$ in non-rightmost feet. As we saw in (22), such sequences admit of the two different metrifications shown again in (30).

(30) *Non-rightmost feet*

(a) ... σ (L σ) (... e.g. ac(céle)ràte
(b) ... (σ L σ) (... e.g. (wìnnepes)saúkee

The second indeterminacy, yielding the 'strong' preservation of (28b) is that of final weak syllables, which may or may not be metrified, as shown in (31).

(31) *Weak syllables*

(a) ... W) e.g. a(cádemy); ro(bústØ)
(b) ...) W e.g. (éffica)cy; (hónes)tØ

Note that, in the absence of stress preservation, the indeterminacy of both (30) and (31) is typically resolved by other principles. Thus, final weak feet (bearing only secondary stress) in general impose the choice of (30a), as in the example given. In the absence of a final weak foot, the choice made is the one that yields exhaustive parsing, as in *(winnepes)saukeee* versus *(apa)(lachi)cola.* As for the metrification of weak syllables, there are also some general predictors, like the difference between nouns and verbs. We will see, however, that stress preservation in fact overcomes these additional mechanisms, systematically exploiting both double options of (30) and (31) to its advantage. We must therefore consider the conditions of (29b) to consist of two sets: the ones given there, which are inviolable, and some others, such as the ones just mentioned, which are weaker, and generally superseded by stress preservation.

In the remainder of this section, we consider (30) and the weak-preservation effect, leaving strong preservation for the next section. We thus consider that all the cases in (32) preserve the stress of the italicized vowel by means of the binary option ($L\sigma$) of (30a).

(32) (a) divísible ⇒ di(vìsi)(bílity)
(b) medícinal ⇒ me(dìci)(nálity)
(c) famíliar ⇒ fa(mìli)(árity)
(d) supérior ⇒ su(pèri)(órity)
(e) relígious ⇒ re(lìgi)(ósity)
(f) antágonist ⇒ an(tàgo)(nísticØ)
(g) enthúsiast ⇒ en(thùsi)(ásticØ)
(h) napóleon ⇒ na(pòle)(ónicØ)
(i) expédient ⇒ ex(pèdi)(éntia)l
(j) coíncident ⇒ co(ìnci)(dénta)l
(k) phenómenon ⇒ phe(nòme)(nólogy)
(l) accéleràte ⇒ ac(cèle)(rátio)n
(m) heréditàry ⇒ he(rèdi)(tária)n

These cases all contrast with comparable underived items like (*win-*

nepes)saukee, where a ternary ($\sigma L\sigma$) obtains instead, satisfying exhaustive parsing.[21] Further examples of this kind are listed in (33).[22]

(33) (a) collègiálity, compàtibílity, condìtionálity, convìviálity, corpòreálity, dedùcibílity, grammàticálity, impètuósity, infèriórity, insòlubílity, invìsibílity, litìgiósity, metìculósity, orbìculárity, partìculárity, pecùliárity, postèriórity, recìprocálity, theàtricálity, volùminósity

(b) anòmalístic, apòcalyptic, icònoclástic, monòpolístic, mysòginístic, recìdivístic

(c) expèriéntial, expèriméntal

(d) bactèriólogy

(e) accùmulátion, affìliátion, apprèciátion, appròpriátion, artìculátion, assàssinátion, assìmilátion, capìtulátion, collàborátion, commèmorátion, commìserátion, commùnicátion, concìliátion, confèderátion, conglòmerátion, consólidátion, contàminátion, corròborátion, debìlitátion, defòliátion, degènerátion, delàpidátion, delìberátion, deprèciátion, discrìminátion, dissìmilátion, dissòciátion, elàborátion, elìminátion, elùcidátion, equìvocátion, eràdicátion, extràpolátion, facìlitátion, gestìculátion, hallùcinátion, humìliátion, incrìminátion, insìnuátion, intìmidátion, manìpulátion, partìcipátion, precìpitátion, prolìferátion, refrìgerátion, regènerátion, remùnerátion, repàtriátion, retàliátion, vitùperátion

In contrast to the above cases, those in (34) preserve stem stress by means of the ternary option ($\sigma L\sigma$) of (30b).

(34) (a) phenòmenólogy ⇒ phe(nòmeno)(lógic)

(b) artículàte ⇒ ar(tícula)(tòry)

(c) persónify ⇒ per(sònifi)(cátion)

(d) assímilable ⇒ as(sìmila)(bílity)

[21] In contrast to the cases in (32l), the ones in (i) predictably preserve the initial stress of their *ate* stems.
(i) (òxyge)(nátio)n, (pèregri)(nátio)n, (tèrgiver)(sátio)n
In analogous contrast to the cases in (32m), those in (ii) preserve the initial stress of their *ary* stems.
(ii) (dìscipli)(nárian), (vèteri)(nárian)

[22] HV (p. 245, fn. 12), claim, based on Kenyon & Knott (1944), that examples like those in (32), (33) in fact have two possible variants, for example *articulátion/àrticulátion*. Note that, if this were correct, our text discussion would still stand, so long as derived cases differ from underived ones, which seem to lack the first of these two alternatives. The vacillation would be due to the conflict between stress preservation and exhaustive parsing. We believe, however, that the HV classification is only partially correct, in that the second type of variant is not excluded very sharply. We maintain that, in general, the stress-preserving variant is noticeably preferred, although this may vary somewhat across the overall spectrum of cases. In this respect we thus agree with Kiparsky (1979), Hayes (1985) and Fudge (1984), who only report the first type of variant, as do most dictionaries.

These cases all differ from underived ones like (*apa*)(*lachí*)*cola*, where two binaries are constructed instead, satisfying exhaustive parsing. Further examples are given in (35).

(35) (a) bactèriológic, epidèmiológic, epìstemológic
(b) adjúdicatòry, alléviatòry, antícipatòry, capítulatòry, concíliatòry, congrátulatòry, corróboratòry, depréciatòry, discríminatòry, ejáculatòry, elíminatòry, hallúcinatòry, incríminatòry, inítiatòry, intermédiatòry, intímidatòry, invéstigatòry, manípulatòry, negótiatòry, partícipatòry, propítiatòry, recíprocatòry, reconcíliatòry, recríminatòry, remúneratòry, retáliatòry
(c) acìdificátion, cemèntificátion, elèctrificátion, exèmplificátion, humìdificátion, idèntificátion, indèmnificátion, intènsificátion, sacchàrificátion, solìdificátion, syllàbificátion
(d) commènsurabílity, commùnicabílity, decìpherabílity, delìverabílity, demòlishabílity, depòsitabílity, detèrminabílity, devèlopabílity, disrèpubabílity, distìnguishabílity, incòrrigibílity, recòverabílity, solìcitabílity

It is important to note that, as predicted by our analysis, there is never any stress preservation corresponding to other than these two possible feet. In particular, there is no preservation corresponding to unary feet, as shown by (36).

(36) (a) catástrophe ⇒ (càt*a*s) (tróphic∅)
(b) intérnal ⇒ (ìnt*er*) (nálity)
(c) compónent ⇒ (còmp*o*) (néntia)l
(d) infórm ⇒ (ìnf*or*) (mátio)n

If monosyllabic feet were an option, stress preservation in **catàstróphic*, etc. should be possible on a par with that of (32)–(35). The cases in (37) are of the same kind.

(37) (a) còmm*u*nality, èxt*er*nality, ùniv*er*sality
(b) àd*a*ptation, àff*i*rmation, cònf*i*rmation, cònserv*a*tion, cònsultation, cònv*er*sation, cèmentation, fràgmentation, làmentation, prèserv*a*tion, trànsp*or*tation, ùs*ur*pation

Note that, in all the cases in (36) and (37), the italicized vowel is reduced, so that the absence of stress is beyond question. In contrast, in the otherwise analogous cases in (38) below, that vowel is or may be unreduced. This, however, only reflects the fact that reduction is unsystematic in closed syllables, and provides no reason for supposing there is any stress.[23]

[23] We interpret the famed *SPE* (p. 39) *còmp*[ə]*nsátion/còmd*[*e*]*nsátion* pair as a preservation of SEGMENTAL properties, only indirectly related to stress. Specifically, we suppose the latter item preserves the unreduced vowel of *cond*[*é*]*nse*, while the former reflects the reduced one of *còmp*[ə]*nsáte*. This move enables us to see stress preservation as an eminently regular

(38) (a) ìmmortálity, informálity, ìnstrumentálity, sèntimentálity
(b) àcceptátion, àffectátion, àttestátion, còndemnátion, èxpectátion
(c) èxisténtial, ìnspectórial
(d) pròpagandístic

Note further that contrasts like the one in (39) also follow from our analysis.

(39) a(dúmbra)te ⇒ (àdum)(brátio)n

The verb in *ate* in (39) is one of a handful in which the syllable with the null vowel is extrametrical, so that stress does not fall on *ate* (despite the long vowel, recall discussion of *rabbI*, *satIre* above), but rather on a heavy penultimate. Since items in *ation* generally preserve the structure of their *ate* counterparts, as shown by (32l), (33e) above, **adùmbrátion* would be expected if monosyllabic feet were possible. Analogous cases are *defálcate/dèfalcátion*, *incúlcate/ìnculcátion*, *imprégnate/ìmpregnátion*, *delécate/dèlectátion*.[24]

There are also no preservation effects corresponding to feet larger than ternary, as shown by (40).

(40) pàrasitólogy ⇒ (pàra)(sìto)(lógic∅)

That is, the quaternary pattern **pàrasitológic* is not possible here. The cases in (41) are of the same kind.[25]

(41) èndocrìnológic, pàleòntológic

Furthermore, there are no preservation effects corresponding to ternary feet with a heavy medial syllable ($\sigma H\sigma$), as shown by (42), and the additional cases in (43).

(42) (a) ínfant ⇒ in(fánti)(cìde)
(b) cómpensàte ⇒ com(pénsa)(tòry)
(c) làryngólogy ⇒ la(rỳngo)(lógic∅)

(43) (a) rodénticìde
(b) confíscatòry, excúlpatòry, incúlpatòry, obfúscatòry
(c) ophthálmològic

Stress preservation thus occurs to the exact extent that it corresponds to well-formed feet. Remetrification occurs otherwise.[26] The above facts confirm

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phenomenon, placing the burden of accounting for *cònd[e]nsátion* versus *ìnf[ə]rmátion* on an appropriate theory of vowel reduction, which, however, is beyond the scope of this article.

[24] An apparent exception to this is *elóngate/elòngátion*. See discussion in section 10 below.

[25] Both *mèteòrológic*, and *mèteorológic* are attested. The former is like (40), while the latter has monosyllabic parsing of the bivocalic sequence, available in other cases, like those in (98) below.

[26] Note that there is no derivational sense to our use of the term 'remetrification'. In our system, metrical structure simply *is*, subject to checking by the noted conditions.

both the organization in (29) in general, and the range of postulated feet in particular, including the existence of ternaries and the non-existence of unaries.

As mentioned earlier, the 'weak' preservation effect just described has traditionally been accounted for in terms of the notion of the cycle. In certain respects, our system is analogous to the cycle. Like the cycle, it ensures that the product of each affixation is re-adjusted as needed to constitute a well-formed word. It differs from the traditional cycle in that it employs well-formedness conditions rather than rules to accomplish this. This approach accounts for the fact that the same range of feet obtain under all derivational circumstances, that is both in derived and underived words. Within the more traditional rule-based system, there is no particular reason for this. For it is perfectly conceivable that a cyclic rule which assigns new stresses while respecting previously assigned ones, would do so by creating adjacent stresses, as in **catàstróphic*, or tetrasyllabic sequences, as in **phènomenológic*. The exact conditions for integration of new metrical structure with old one have to be specified in the rule.[27] The condition that a stress-assigning rule respect pre-existing structure must itself be stipulated, since a rule that would not respect it, and re-assigned all stresses anew is just as well statable. In addition, the traditional cyclic apparatus straightforwardly allows for postcyclic application of rules. Thus, there is no reason why stress rules could not simply be postcyclic, hence always stressing derived words like underived ones. In short, a rule system organized around the traditional notion of the cycle can express the correct facts, but it is too rich, allowing for unattested options (see also fn. 54 below).

One might point out that our system too includes stipulations, since a model like (29) without stress preservation seems equally conceivable. This is not the case, however, for we understand the general organization in (29) to reflect the structure of the lexicon in general, rather than just metrical structure. What we mean, specifically, is that preservation of structure is a GENERAL property of word formation. Thus, in the adjective *napoleonic*,

[27] The claim that integration of new metrical structure with old one creates unique patterns is in fact explicitly made in some of the literature. For example, Steriade (1988) argues that, in Latin, certain kinds of encliticization yield stressed light penultimates, such as *liminá-que* – a pattern otherwise unattested. In contrast to this exceptionally 'short' pattern, Hayes (1985: 164ff.) notes the exceptionally 'long' one of sòlemnizátion. We will not attempt to provide specific analyses of these cases here, although we analyse the *ization* cases in Burzio (1994). We will note, however, that the text slightly overstates the case. In acuality, stress preservation in English does appear to expand the range of possible feet, but only in a rather minimal way, quite compatible with the proposed conception. For example, in allowing syllables closed by sonorants to function as light, as in *párentage* – a phenomenon also attested in underived items, such as *wáshington*, but more rarely. It also allows monosyllabic parsing of bivocalic sequences, as in *nátional*, otherwise parsed BISYLLABICALLY (see section 9 below). The *ization* cases fall into this general category, but are slightly more complex. For a study of patterns of stress preservation along different lines from ours see also Halle & Kenstowicz (1991).

segmental and semantic properties of the noun *napoleon* are preserved. From the point of view we adopt, it is thus the null hypothesis that stress should be preserved, behaving like everything else. Specific stipulation would be required to exempt it.[28] We have noted that stress is preserved only partially and under specific circumstances, but this is not fundamentally different from what occurs with other aspects of lexical representation, which also undergo various re-adjustments in word formation. We may thus consider that not only the 'preservation' aspect of (29), namely (29a), generalizes to other aspects of lexical representation, but the overall schema, including the well-formedness conditions of (29b). The conditions we described, specific to metrical structure, would thus be part of a larger set which we may collectively call general phonotactics of the language. Thus, although it is beyond our goals here to extend the discussion to non-metrical aspects of the representation, we none the less take lexical organization in general to consist of a tension between maximal re-use of existing structure ('preservation'), and the requirement that the output of word formation be maximally like other words, as expressed by (29).

In sum, no special apparatus is needed to account for weak preservation, since a principle of preservation is part of lexical organization, and since the conditions under which preservation occurs are the ones needed for underived words.

6. Strong preservation

In this section, we will show that strong preservation, alias stress neutrality, follows from the same organization in (29) above, in particular stress preservation, and results from the second of our metrical indeterminacies, namely the ambiguity of word-final weak syllables of (30b) above. Thus, for example, we take the two instances of stress neutrality in (44) to have the analyses given.

(44) (a) (pròpa)(gánda) ⇒ (pròpa)(gándis)tØ
(b) a(mérica)nØ ⇒ a(mérica)(nìstØ)

It is independently quite clear that sequences like *ist* are metrically ambiguous in English. Thus, the comparable sequence in *robúst* stands as a full foot, bearing stress, while the one in *hónest* acts like a single unstressed syllable. The simple thesis that stress preservation can exploit that ambiguity will account for the neutrality of *ist* in (44). For, if *ist* stands as a single syllable in (44a), it will just replace the final *a* of the stem, requiring no changes in the metrical structure. On the other hand, if it is metrified as a foot in (44b), in our analysis that foot will have the structure (*HW*), and hence will be a

[28] We are in fact essentially stipulating that vowel length is exempted from preservation.

'weak' foot attracting only secondary stress, and thus allowing the stem to maintain its full metrical structure and the primary. The claim that *ist* bears secondary stress in (44) seems to us compatible with the perceptual facts, and we will assume it is correct, although the latter facts alone would not seem to establish it.[29] No case arises in which the stem stress could not be maintained by resorting to one of the options in (44), as we will see below.

We are thus postulating that stress-neutral suffixes are integrated with the pre-existing metrical structure of the stem. Integration exploits the ambiguity of a final weak syllable and is thereby always achieved.[30] In contrast, restressing suffixes appear to have a fixed mode of metrification, so that in a sense it is here the metrical structure of the stem that must be adapted, in the ways we saw in the last section. We may think of the distinction as a diacritic mark, in terms of a setting of the rightmost foot boundary for restressing affixes, as in (45a), in contrast to no such setting with neutral affixes, as in (45b).

(45) (a) Restressing: a)l∅, ity), ic∅)
(b) Neutral: ist∅

Use of a diacritic mark seems to make our theory similar to others. There is a fundamental difference, however, in that our analysis will predict the diacritic mark from syllable structure.

Let us then consider what syllabic structure a suffix must have in order to result in systematic preservation of the stem stress in the manner of (44a, b). We begin by defining the range of possible syllabic structures that English suffixes may have. The observations in (46) are useful in this connection.

(46) (a) Most English suffixes end in a weak syllable (i.e. ∅, *y*, *ive*, *ure*, or a syllabic sonorant).
(b) Most English suffixes are monosyllabic or bisyllabic.

Let us abstract away for the moment from the – relatively few – suffixes that do not meet either of (46a, b). The range of logical possibilities will then be as in (47).[31]

[29] Perceptual facts are rather generally a weak basis for determining presence of secondary stress on heavy syllables with unreduced vowels.

[30] See Gussenhoven (1988), Giegerich (1985: 104ff.) for partially similar ideas.

[31] Essentially, the only exception to (46a) is *efy/ify*, ending in a long vowel, which behaves as predicted. For, if the null vowel is motivated by a final consonant, this suffix will have no null vowel and hence no weak syllable, so that it will have to metrify unambiguously. Since it is bisyllabic with a light penultimate, stress ought to fall on the preceding syllable, as in fact it does, as in *persónify*, *humídify*, *solídify*, and quite generally. Note that non-preservation from the corresponding *pérson*, *húmid*, *sólid* shows that *fy* does not bear stress despite the long vowel (recall discussion of *rabbI*, *semIte*, etc.). This follows from the noted absence of a final null vowel and our general framework, namely the non-existence of a foot (*H*). If *fy* did bear stress, then *pérsonify*, etc. should be possible, on a par with *óxygenàte* and similar cases.

(47) (a) W e.g. -ly, -ive, -ure
(b) H W e.g. -istϕ, -Ize, -mentϕ
(c) L W e.g. -icϕ, -alϕ, -ity, -able

The further observation in (48) is now also relevant.

(48) English suffixes are either concatenated with the metrical domain of the stem, as in (a), or overlapped with that domain by one syllable, as in (b).

(a) a (mé ri ca) nϕ
└—ist (→ americanist)

(b) propa (gán da)
└—ist (→ propagandist)

Note that (48) refers to metrical and not segmental structure. Presuming that the case in (48a) has a final null vowel, there is overlap in that case too, but not with the metrical structure, as the null vowel is here external to the final foot. The observation of (48) will now give rise to two logical possibilities for each of (47), which we now examine in turn.

Corresponding to (47a), we find (49a, b), where ')' is the rightmost foot boundary of the stem.

(49) (a) Concatenation: ...) W
(b) Overlap: ... W)

Note that both of (49a, b) are well formed, since we know that weak syllables may or may not be metrified. This means that the rightmost foot boundary of the stem will never need to be moved with this kind of suffix, and in turn that none of the metrical structure that precedes it will need to be changed, thus resulting in stress neutrality. The prediction is thus that all suffixes that have the structure 'W' should be stress neutral. This seems correct. The suffixes in (50) instantiate this structure.

(50)	*Suffix*	*Examples*	
(a)	-ly	(hónes)t	⇒ (hónes)tly
(b)	-er	(ínter) (vièwϕ)	⇒ (ínter) (vièwer)
(c)	-or	(ági) (tÀte)	⇒ (ági) (tÀtor)
(d)	-y	(hónes)t	⇒ (hónes)ty
(e)	-ive	pro(híbitϕ)	⇒ pro(híbiti)ve
(f)	-ure	de(pártϕ)	⇒ (depártu)re

Consider now the two possibilities for (47b), given in (51).

(51) (a) Concatenation: ...) H W
(b) Overlap: ... H) W

The two structures in (51) are also well-formed. The one in (51b) in the same way as (49a), and the one in (51a) because the sequence (*HW*) is a well-formed foot in its own right, though a weak one, hence only bearing secondary stress, as we saw for (44b). We thus predict that all suffixes with the structure *HW* should also be neutral, not affecting primary stress. Again, this seems correct, as shown by (52).

(52)	*Suffix*	*Examples*	
(a)	-ist	a(mérica)n	⇒ a(mérican) (istØ)
(b)	-ism	(còsmo) (pólita)n	⇒ (còsmo) (pólita) (nìsmØ)
(c)	-ant	in(hábitØ)	⇒ in(hábitan)t
(d)	-ent	de(péndØ)	⇒ de(pénden)t
(e)	-ance	in(héritØ)	⇒ in(héritan)ce
(f)	-ence	de(péndØ)	⇒ de(pénden)ce
(g)	-ment	de(vélopØ)	⇒ de(vélopmen)t
(h)	-Ize	(èuro) (pÉa)n	⇒ (èuro) (pÉa) (nÌze)
(i)	-Ite	su(búrba)n	⇒ su(búrba) (nÌte)

Finally, we consider the structure *LW* of (47c), yielding (53a, b).

(53) (a) Concatenation: *...) L W
(b) Overlap: ... L) W

In this case, only the structure in (53b) is well formed. The one in (53a), obtained by 'concatenation' is not. The reason is that, unlike *HW*, the structure *LW* is not a well-formed (final, non-initial) foot in (22). Some remetrification of the stem will therefore be predicted for (53a), while stress neutrality is predicted for (53b). This prediction too is correct. Thus, the neutral suffixes of (54) instantiate (53b), while the non-neutral ones in (55) instantiate (53a).

(54)	*Suffix*	*Examples*	
(a)	-able	pre(véntØ)	⇒ pre(vénta)ble
		in(hábitØ)	⇒ in(hábita)ble
(b)	-age	per(céntØ)	⇒ per(cénta)ge
		(cóverØ)	⇒ (cóvera)ge

(55)	*Suffix*	*Examples*	
(a)	-icØ	(ícelan)d	⇒ ice(lándicØ)
(b)	-ity	(génera)l	⇒ gene(rálity)
(c)	-alØ	(ácciden)t	⇒ acci(dénta)l
(d)	-ousØ	(gélati)n	⇒ ge(látinou)s

In essence, the suffixes in (54) are neutral because they attach to stems that metrify a final null vowel – mostly verbs. The first syllable of the suffix will then replace the latter null vowel in the same metrical structure, while the

second syllable, being weak, will remain extrametrical. The suffixes in (55), on the other hand, attach primarily to nouns and adjectives, and while their first syllable may replace a final null vowel, they typically remain external to the metrical structure of the stem. For this reason they cannot achieve stress neutrality, and will thus only permit the 'weak' preservation of the previous section.

Note now that, while preservation of the rightmost foot boundary of the stem will entail stress preservation, the opposite is not true. That is, there exists a class of cases in which resetting of the rightmost boundary would still result in stress preservation. These cases have the structure illustrated in (56).

(56) $\ldots(\acute{H}\ L)+L\ W \Rightarrow \ldots(\acute{H}\ L\ L)\ W$

In other words, what we seemingly predict is that suffixes with the structure *LW* which concatenate with the last foot of the stem, while not neutral in general, should still be neutral with stems whose final feet have the specific structure (*HL*), since the latter is 'expandable' by one syllable. This, however, is not the case, as shown by (57).

(57) (a) (tÍta)n ⇒ *(tÍtani)cØ
(b) (nórma)l ⇒ *(nórmali)ty

The idea that stress preservation exploits the ambiguity of final weak syllables is thus insufficient to yield the full distinction between neutral and non-neutral suffixes. On the other hand, the diacritic marking of (45) above *is* sufficient, imposing the correct metrifications *tI*(*tanicØ*), *nor*(*mality*). The question then is how to go from stress preservation, which only approximates the facts, leaving out (57), to the diacritic, which provides a full account.

In some of the above, we suggested that stress preservation is part of a more general phenomenon of preservation of structure, requiring that morphemes maintain a consistent form. We may refer to this as 'anti-allomorphy'. Consider now that, while lexical organization is clearly in some respects algorithmic, as many words are formed by productive processes, we must suppose that it is at the same time also fundamentally taxonomic. Thus, a word like *divinity* is algorithmically derived from *divine*, but it must also be listed autonomously in the lexicon, since many of its algorithmic peers, like **supremity*, from *supreme*, do not exist. Anti-allomorphy, avoiding different forms of the same morpheme, can then be understood as a constraint on the taxonomic aspects of lexical representation – a form of economy of lexical space. On this view, just as there is metrical consistency of stems – our stress preservation, now a form of anti-allomorphy – there should also be metrical consistency of suffixes. This is correct, as non-neutral suffixes are indeed metrically consistent, as in *napole*(*ónicØ*), *aca*(*démicØ*), versus *ab*(*dómina*)*lØ*, *me*(*dícina*)*lØ*. The cases in (57) now indicate that there is no 'mixing' of stem consistency and suffix consistency, the choice between (58a, b) below being set for each individual suffix.

(58) (a) Suffix consistency: recompute the stem as needed
(b) Stem consistency: recompute the suffix as needed

We suggest that this fact now follows from the 'algorithmic' aspects of lexical representation. In simple terms, we suppose that, by holding disjunctively for each suffix, (58a, b) make stress easily predictable, as they constitute maximally simple algorithms. For, in contrast, an algorithm based on 'consistency of stem stress whenever possible' would be as in (59).

(59) *Stem consistency over suffix consistency*

Preserve the stem stress if possible, recomputing the suffix;
Otherwise, assign the prevalent metrification to the suffix, recomputing the stem.

It seems plausible to suppose that (58a, b) are preferable to (59). The diacritic markings of (45) above will then determine the choice between (58a) and (58b). Recall that such markings, as in *ic*$\emptyset$), *ity*) are independently needed to express the metrical consistency of non-neutral suffixes. They can also distinguish neutral from non-neutral ones. Once thus interpreted, the markings will be predictable from our earlier discussion of syllabic structure. Thus, suffixes which cannot be neutral for structural reasons will obviously have to follow (58a), and will be marked for suffix consistency, as in (45a). Conversely, suffixes which *can* be neutral will be *allowed* to follow (58b). However, in fact those suffixes seem to be REQUIRED to do so, as we find no suffixes which could be neutral (structurally), but are not. In other words, stem consistency is the preferred choice in (58). To find some reason for this fact, we focus on the taxonomic aspects of lexical representation again (as, algorithmically, the choice between (58a, b) seems to be neutral). Consider that, for each individual suffix, suffix inconsistency will produce only a minor increase in the number of metrical structures lexically represented, exactly one. The reason is that suffixes have (at least one and) at most two metrical allomorphs – one including and one excluding the final weak syllable, for instance, *is*)*t*$\emptyset$; *ist*$\emptyset$). In contrast, for each suffix, stem inconsistency will produce a major increase in the number of metrical structures, equivalent to all the stems that need to be remetrified, for instance **ame*(*rícanis*)*t*, **ca*(*pítalis*)*t*, **cri*(*mínalis*)*t*, etc. There is thus a sense in which consistency/anti-allomorphy is violated more severely when stems are remetrified, accounting for the preference for (58b). If the latter is the preferred choice, then no marking is required to induce it, precisely as in (45b) above.[32]

In sum, while the simple notion of preservation of stress stem would seem to make the wrong predictions for cases like (57), we noted that the metrical

[32] Note that (58a, b) are not necessarily incompatible. For example, *able* and *age* of (54), and in general suffixes σW that attach only by concatenation, are both stem and suffix consistent.

consistency of non-neutral suffixes makes an independent call for further refinements.[33] We have then suggested that at work is an interplay of a more general notion of preservation/consistency ('anti-allomorphy') extending to suffixes, and a notion of predictability of stress, which reflect, respectively, the taxonomic and the algorithmic bases of lexical representation. While somewhat speculative, the latter elaborations seem plausible, so that the distinction between stress-neutral and non-stress-neutral suffixes may be seen to follow not only in part but in full from the noted differences in syllabic structure.

7. Alternatives

While the above account seems successful in relating stress neutrality to syllabic structure, one might challenge our particular assignment of syllabic structure to the various suffixes. Thus, in (50) above, neutral *er*, *or* have been assumed to constitute weak syllables, but the superficially comparable sequence *ar* must not be, since this suffix is not neutral. Analogously, the final syllable of *able* has been analysed as weak, but comparable syllables incorporating *al* must not be, since this suffix too is not neutral. Furthermore (as one reviewer correctly notes) *able* has been analysed as a sequence *LW*, while *ism* is treated as *HW*, despite their clear phonetic parallelism (abəl/izəm). One may thus wonder whether syllabic structure was not just assigned *ad hoc* in these cases. The answer is negative. While some of the postulated distinctions cannot be made on the basis of phonetic evidence, they can none the less be made independently, by the behaviour of those suffixes when they occur with bound stems. Thus, adjectival *able* is metrically monosyllabic in the cases in (60), whose stems are 'bound', namely not independent words.

(60) (ámica)ble, (équita)ble, (fórmida)ble, im(práctica)ble, incom(mén-sura)ble, inde(fátiga)ble, in(dómita)ble, in(dúbita)ble, in(évita)ble, in(éxora)ble, in(númera)ble, in(súpera)ble, (mísera)ble, un(cónscion-a)ble, (vérita)ble, (vúlnera)ble

Here there is obviously no issue of stress preservation. To account for the position of the stress, *able* must then be metrified as indicated, with the syllable *ble* extrametrical, just like the final one of (*partici*)*ple* or (*vegeta*)*ble*. On the other hand, despite the relatively reduced character of its vowel, which brings it phonetically rather close to the *əl* of [*bəl*], the adjectival suffix

[33] We regard the choice of metrification by non-neutral suffixes as partly idiosyncratic, noting, however, that there are some predictors in this area as well. In particular, the difference *ic*Ø)/*a*)*l*Ø seems to follow from the fact that precisely these two metrifications would yield consistency of stress in *ic*/*ical* alternations, for instance *aca*(*démic*Ø)/*aca*(*démical*Ø) – a fairly substantial class. This is, of course, reminiscent of *SPE*'s (p. 58) derivation of *ic* from *ical* by deletion of the final syllable after stress assignment.

al is not extrametrical, as shown by the cases in (61), which again have bound stems.[34]

(61) a(býsma)l, con(génita)l, e(phémera)l, epi(dérma)l, e(quívoca)l, e(térna)l, ex(térna)l, fra(térna)l, in(férna)l, infini(tésima)l, in(térna)l, ma(térna)l, mu(nícipa)l, noc(túrna)l, pa(térna)l, re(cíproca)l, vi-(gésima)l

Hence, phonetic similarity notwithstanding, there is a metrical difference between *ble* of *able* and *al*.

Similarly, the agentive suffix *er*, *or* (though occurring rather rarely with bound stems), is arguably extrametrical in the cases in (62a), and occurs as a weak syllable in a weak foot in (62b).

(62) (a) (bárris)ter, (chóris)ter, (méssen)ger, (pássen)ger, (ánces)tor
(b) (nécro) (màncer), (béne) (fàctor), (préde) (cèssor)

In contrast, the adjectival suffix *ar* (an allomorph of *al*) never behaves as a weak syllable, but rather as shown in (63).[35]

(63) par(tícula)r, pe(cúlia)r, perpen(dícula)r

The difference between (62) and (63), like the one between (60) and (61) must be expressed in any theory, independent of the account of stress neutrality. Our analysis thus adds nothing to minimal assumptions.

As for the postulated metrical difference between *able* and *ism*, that too can be established independently. Thus, it is clear from the cases in (64), which again have bound stems, that *ism* can function as a foot.

(64) écumenìsm, málapropìsm, sólipsìsm

The alternative assumption would place primary stress one syllable further to the right (obligatorily). The sequence *ism* must obviously also function as a foot in such cases as *schism*, *prism*. In contrast, *able* never functions as a foot, as there are no sequences $(\sigma\sigma\sigma)Cable/(\sigma H)Cable$, only $(\sigma\sigma Ca)ble/(HCa)ble$, as in *(amica)ble/(lia)ble*. There are also no words in *áble* with a short *a* parallel to *schísm*, *prísm* – only words like *able*, *enable*, *cable*, *gable*, *sable*, *table*, with a long *a*. Thus, the *a* of *able* must be in an open syllable, while the *i* of *ism* must be in a closed one, just as we assumed in (50)–(55), phonetic parallelism notwithstanding.

In sum, while we have attributed distinct syllabic structures to a few pairs of suffixes which are relatively non-distinct phonetically, those distinctions

[34] The non-suffixal *al* of *ínterval* and *pédestal*, could perhaps be extrametrical, although treating the medial syllables as honorarily light, like those of *álternate*, *órchestra* discussed in section 8 below, provides an alternative. Adjectival *al* would seem to be extrametrical only in the variant *(díscipli)nal*.

[35] When it is not an adjectival suffix, *ar* does function like a weak syllable, as in *(cálend)ar* (arguably), and *(cáter)(pìllar)*.

can be established independently of the issue of stress neutrality, and are therefore not introduced *ad hoc*.

While the above considerations dispel possible doubts about our account of stress neutrality, others confirm its correctness. One of these is that stress neutral suffixes are never 'too large'. Thus, while in (46b) we noted that most suffixes do not exceed two syllables, there are in fact some that do, such as *ation*, *ology*, *ometer*. None of these is stress neutral, however. If all suffixes are metrified as we claim, this follows directly, since these sequences exceed the structure of a weak foot (σW), and will thus necessarily cause a shift in primary stress. However, if suffixes can be marked for stress evasion, there is no reason why this kind should not be affected.

A further consideration is that certain suffixes which are rather generally neutral, are in fact not always so. For example, *able* and *ist* induce stress shifts as in (65).

(65) (a) (dócu)(mènt∅) ⇒ (dòcu)(ménta)ble
(b) (ánec)(dÒte) ⇒ (ànec)(dÓtis)t∅
(c) (fálsifY) ⇒ (fàlsi)(fÝa)ble

The facts in (65) follow from our analysis rather straightforwardly. In (65a, b) while the left-hand forms have final weak feet, the right-hand ones do not, since the first syllable of the suffix, which replaces the null vowel of the stem, is not a weak one. As a result, the final foot comes to attract primary stress. Analogously in *règognízable*, *mànifèstable*, and other comparable cases.[36] The case in (65c) is slightly different. Here, the left-hand form has a single foot (no secondary on *fy*, as we argued), while the right-hand one has two feet as its structure predicts, like its counterparts in (65a, b).

The cases in (66), involving the otherwise neutral *ly*, illustrate a similar phenomenon.[37]

(66) (a) (néces)(sàry) ⇒ (nèces)(sárily)
(b) (mánda)(tòry) ⇒ (mànda)(tórily)

The stress shifts of (66), quite general to the *ary/ory* class and other comparable structures in American English, follow on the rather simple assumption that *ly*, while possibly extrametrical, as indeed in (*hónes*)*tly*, is in fact preferably metrified so long as no reparsing of feet occurs, hence excluding **ho*(*néstly*). In (66) and similar cases, such as *législàtive* → *lègislátively*, primary stress is then as predicted since ternary feet are never weak. Thus, from our point of view, (65) follows automatically, and (66)

[36] Note also the correctly predicted stress shift of (*démon*)(*stràte*)/*de*(*mónstra*)*ble*, versus the neutral pattern of *com*(*múni*)(*càte*)/*com*(*múnica*)*ble*.

[37] Note also the stress shift of cases like *eleméntary/èlementárily*, which, however, would require a lengthier discussion than we can provide here. See Burzio (1994).

follows under rather minimal assumptions. In contrast, if *able*, *ist*, *ly* could remain unmetrified, there is no reason why precisely these cases should be exceptions.

If neutral suffixes are thus metrified, options for analysing them are few. For instance, no single metrification of *ist* could reduce both *ámericanist* and *propagándist* to independently existing stress patterns. One is thus forced to our proposed double metrification. This in fact yields further dividends. In particular, we will now understand why stress-neutral suffixes exist in a language like English, in which the edge of the word is metrically ambiguous, witness *hónest/robúst*, *cónvert/convért*, etc., but not in other languages, like Italian, in which the edge of the word is metrically unambiguous (no weak syllables), as *onésto*, *robústo*, etc. In contrast, if neutral suffixes could be marked to evade metrification, this should be possible in Italian just as well. Note that, unlike strong preservation, which is indeed quite specific to English, weak preservation is well attested in many languages, including Italian (Vogel & Scalise, 1982), Chamorro (Chung, 1983), Indonesian (Cohn, 1989). This follows from our view that the two 'indeterminacies' which underlie the two phenomena, namely (30) and (31) above, have the different degrees of language specificity noted.

Finally, if all suffixes undergo metrification, we understand why the *al* of *arríval* is neutral, while that of *parént*al is not. The reason is that a monosyllable can always be integrated into the metrical structure of verbs, which parses an empty slot, as in *ar(rIvØ)*, but not with that of nouns, which does not, as in *(paren)tØ*.[38] Under the alternative, there is no reason.

So far, we have considered the distinction between neutral and non-neutral suffixes, which we have sought to derive. There is, however, another important distinction. Certain suffixes, like *ful*, *ness*, *ly*, *hood*, and in general affixes of the 'Germanic' class (aside from *-t*, *-th* of *kept*, *width*, respectively), never induce any vowel shortening in their stems, such as *m[E]ning* → **m[e]ningful*, or in fact any segmental changes, quite generally. This is in contrast with Latinate affixes, both neutral and not, which do affect the structure of their stems, as we saw in (7)–(8), (10) above. In addition to this, Germanic affixes have two other properties: they are always stress neutral (though sometimes only in the manner of *ly* in (66)), and they never occur with bound stems. As we argue in Burzio (1994), the simplest way to capture this cluster of properties seems to be via a condition applying in derived structure, that not only the overall result of suffixation be a well-formed word, as already required by (29) above, but that in fact the stem itself be. This will obviously exclude bound stems (= non-words); it will block segmental re-adjustments, including those due to our generalized shortening; and will require word-like metrification of the stem (= stress

[38] This, however, does not shed light on the fact that nominalizing *al* is confined to oxytonic stems, witness **inhábital*, etc., the only exception being *búrial*.

neutrality). There is still reason to believe, however, that these suffixes too never fail to be metrified. The reason is that those with the structure *LW*, like *ful∅*, only occur with words whose final foot can expand to take them in, as in (*pléntifu*)*l∅*, versus **póvertiful∅* (see Burzio, 1994; Fabb, 1988: 528 and references).[39] If this is correct, then stress, formerly a crucial piece of motivation for the 'Level Ordering' hypothesis, in fact provides no such motivation. We see this as another indication that rule systems are too rich, permitting options which are not attested. In a model of the lexicon based essentially on rules, stress evasion is straightforwardly available, by appropriate ordering of the rules, as in the level-ordering hypothesis. Yet this does not occur, as the model in (29) predicts.[40]

The conclusions reached in the last three sections can then be summarized as in (67).

(67) (a) There is a general principle (or effect) of stress preservation, which results in both weak and strong preservation.

(b) Suffixes are diacritically marked for how they metrify their final weak syllable (= suffix consistency), unless lack of such marking results in stress neutrality (= stem consistency).

(c) The range of possible feet in English is as in (22) above, namely:

$(\sigma L\sigma)/(H\sigma)$ everywhere; $(L\sigma)$ non-finally, or initially.

(d) The class of weak (hence possibly extrametrical) syllables is:

$C_0\emptyset$, C_0y, C_0son, C_0ive, C_0ure

8. Vowel shortening

It is now a simple matter to see that the conjunction of (67), arrived at independently, will account for all of the alternations considered at the outset, when simply conjoined with Generalized Shortening (20a) above. We begin with the 'systematic' cases of shortening, given in (68).

[39] There is also good reason to believe that Germanic prefixes, like *un*, are metrified, as in (*ùnbe*)(*cóming*), affected by phrasal 'rhythm rule' as well, as in *únbecòming thóught*.

[40] One might wonder what evidence remains for level ordering if the text is correct, and especially if Fabb (1988) is also correct in arguing that there is also no correlation between level of affixation and linear order. Note that Fabb takes stress neutrality as the diagnostic for level membership, so that what his discussion in fact shows is that there is no correlation between stress neutrality and order of affixation. This seems quite true, as shown also in Aronoff & Sridhar (1983). Our text provides reasons for this – with Latinate affixes, neutrality should correlate only with syllabic structure and mode of integration (concatenation/overlap). However, once the confounding effects of neutrality are thus removed, a certain correlation re-emerges rather sharply: the affixes which do not induce segmental changes (Germanic class) are always morphologically peripheral, aside from prefix/suffix combinations of the UNGRAMMATICALITY type. For a novel account of this, that supersedes the one based on level ordering, see Burzio (1994, 10.4).

(68)			*GS*	*SP*
(a)	de(f*Á*me) →	(dèf*a*)(mÁtio)n	ok	*
	(Hσ)	(Lσ)(σ Lσ)		
(b)	di(v*Í*ne) →	di(v*ín* it y)	ok	ok
	(Hσ)	(σ L σ)		
(c)	o(bl*Í*ge) →	o(bl*íg* a)(tÒry)	ok	ok
	(Hσ)	(Lσ)(Hσ)		

It is clear that all the structures in (68) have well-formed feet under (67c), as the analyses indicate. In all three cases, Generalized Shortening (GS) is satisfied. In (68a), stress-preservation (SP) is not satisfied, and for reasons we are now familiar with. This kind of case is in fact analogous to the ones in (36)–(38) above, and – like those – shows that monosyllabic feet are not an option. Stress preservation is thus excluded independently of GS, and as a result there is no 'tension' between the two. GS is then allowed to succeed systematically in this kind of configuration. Other instances of this kind are given in (69).

(69) còmp*o*néntial, hòr*iz*óntal, psych*iá*tric, dèf*a*mátion, dèr*iv*átion, èxpl*a*nátion, rèc*i*tátion, vòlc*a*nólogy

In (68b, c) there is also no tension between GS and SP, but for a different reason. As we argued more informally in section 3 above, here both can be satisfied simultaneously, yielding well-formed feet. Thus, shortening succeeds systematically here as well. Like (68b, c) are the further examples in (70a, b), respectively (see also Myers, 1987: 499ff.).

(70) (a) n*á*tural, f*á*bulous, t*á*bular, der*í*vative, prov*ó*cative, comp*ó*sitor, t*ó*nic

(b) def*á*matòry, decl*á*ratòry, excl*á*matòry, expl*á*natòry, exp*ó*sitòry, obl*í*gatòry, cons*ó*latòry, prof*á*natòry, rev*é*latòry

Note that the reason why adjectives in *ic* such as *tonic* of (70a) trigger the 'trisyllabic shortening' of (68b) is plainly that this suffix metrifies the final null vowel, as we argued earlier and as established by the stress facts [*bar*(*báric*Ø), versus (*bárbarou*)*s*Ø]. The foot resulting from shortening is thus a ternary (*LL*σ), just like the one of *divinity*. Other suffixes, like *id* and *ish* require a similar analysis.[41] The shortening of *rEcite/recitation* in (15aii) above will also follow, but we consider that in section 10 below.

[41] Note that we are abstracting away here from the pattern of exceptions either to trisyllabic shortening or to any of the other shortenings in (15) above, like *o*(*bEsit*)*y*, (*psYchic*Ø), (*scEnic*Ø), *a*(*phAsic*Ø), (*mOti*)*vation*, *di*(*vIda*)*bility*, etc. Our account is like others in the extent to which it approximates the facts, leaving certain residues for further study. It is different only in not requiring individual rules. Note, however, that these 'exceptional' cases are not metrically ill-formed in our analysis. They only violate GS. The text distinction between the systematic and unsystematic classes of shortening will stand despite the noted exceptions to the 'systematic' pattern.

We now turn to the 'unsystematic' cases of shortening, beginning with (71).

(71)		*GS*	*SP*
(a)	blas(phÉme) ⇒ (blásphemou)s (H σ) (σ L σ)	ok	*
(b)	de(sÍre) ⇒ de(sÍrou)s (Hσ) (Hσ)	ok	*

As mentioned earlier, we attribute the variability here to the fact that GS and SP cannot be satisfied simultaneously. Thus in (71a) GS is satisfied, but then remetrification must occur, since a final (non-initial) foot ($L\sigma$) is ill formed (by (67c) above), and since non-neutral *ous* does not metrify a final weak syllable (by (67b) above). In contrast, in (71b) SP is satisfied, and GS must fail, for the same reasons. The *ative* cases in (72) will be rather similar.

(72)		*GS*	*SP*
(a)	(géne)(rÀte) ⇒ (génera)tive (L σ)(H σ) (σ L σ)	ok	*
(b)	(ínno)(vÀte) ⇒ (ínno)(vÀti)ve (L σ)(H σ) (L σ)(H σ)	*	ok

In (72a), GS obtains. For the usual reasons, SP must therefore fail. Hence the rightmost foot of (*gene*)(*rAte*) must be reparsed. The question, then, is whether SP is also doomed to fail in the other foot. The answer is no, since we know that *ive* is a weak syllable, witness its extrametricality in (*adjec*)*tive*, as well as the weak foot of (*súbsti*)(*tùti*)*ve*. We thus expect that its metrification would be subordinated to stress preservation, as happens to suffixes with the structure '*W*' in general (see discussion of (49) above). By keeping *ive* extrametrical, the leftmost stress in (72a) is thus preserved, since the resulting foot is a well-formed ternary. In contrast to (72a), (72b) maintains even the rightmost stress, which requires that GS fail as usual.[42] Note that this predicts that the structure of **ge*(*nérati*)*ve*, with a non-extrametrical *ive* should be possible where stress preservation is NOT involved, which is correct, as shown by *pre*(*rógati*)*ve*, *pe*(*jórati*)*ve*. There is thus no need for a special '*ative*' rule, which fails to relate (72) to (73).

(73)		*GS*	*SP*
(a)	le(nÍte) ⇒ (léniti)ve	ok	*
(b)	di(vÍde) ⇒ di(vÍsi)ve	*	ok

[42] Note that here we must postulate that the metrification *tive*), which includes the null vowel, is not available, in contrast to the other two possible metrifications)*tive*, *ti*)*ve*, which are. While it is not clear how to express this fact formally, it is none the less established independently, as that metrification never occurs (except perhaps for the single idiolectal variant *divísive*, with a short *i*).

What the cases in (73) show is that there is nothing special about *ative*, as shortening occurs with *ive* more generally.[43] In turn we have been showing that there is nothing special about *ive* either, since other Latinate suffixes behave analogously, for example as in (71).

An account based on the '*ative*' rule has other inadequacies as well. One concerns the class of cases whose stems are oxytonic, non-*ate*, verbs. These cases, listed in (74), only surface in the unstressed variant *ətive*.

(74) (a) confírmative, consérvative, exhórtative, explórative, infórmative, presérvative, prevéntative, refórmative, represéntative, transfórmative
(b) compárative, declárative, derívative, evócative, exclámative, provócative, repárative, restórative
(c) cáusative, cúrative, fórmative, óptative, púrgative, tálkative

HV's (p. 261) analysis accounts for the stress pattern of these cases by postulating that the sequence *ative* and its stems constitute independent 'stress domains' (as they propose for *atory*). Their stress algorithm, which builds feet $(H)/(\sigma L)$, will then correctly stress the stem-final heavy syllables of (74). However, destressing of *ative* by the *ative*-rule will incorrectly predict the same *ətive/Ative* alternation here as in (72).[44] A related inadequacy concerns cases derived from *ate*-verbs with a heavy presuffixal syllable, such as those in (75a, b).

(75) (a) demónstrative, altérnative
(b) législàtive, désignàtive

The cases in (75a) are parallel to the ones in (74) in bearing stress on the syllable preceding *ative*, and in surfacing only with unstressed *ətive*. Hence, they raise the same questions as (74). In contrast, the cases in (75b), while structurally parallel, have a different stress pattern and only a stressed *Ative*. On HV's (multiple stress domains) analysis, primary stress should fall on the presuffixal heavy syllable here too, incorrectly. Furthermore, *ative* should

[43] The extrametricality of *ive* in (72a) is also not unique, as we noted (see discussion of (49) above).

[44] Within HV's framework, a more promising approach (which they do not attempt) would be to attribute the destressing of *at* to shortening/destressing in a 'stress well', that is HV's (37)/(33), (the former given in (5) above), rather than to the *ative* rule, hence accounting for the systematic destressing. *Ative* would be in a 'stress well' (defined as in (5b) above) here, because of the adjacent primary stress. Within this analysis, it would not be obvious, however, how the primary stress could be correctly assigned. For the mechanism responsible for primaries on a non-rightmost foot is the 'Rhythm rule' (HV's (21)). But the latter requires that the stress to be demoted be word final, correctly for many cases, like *désignàte*, etc., but incorrectly for words in *ative*. Note also that primary stress here would have to shift onto a monosyllabic foot to yield *confírmàtive*. This, however, does not normally happen, witness *rèpórt*, not **répòrt*.

again oscillate between the two variants, just as it does in (72).[45] In contrast to the above difficulties, all cases are correctly predicted by our system based on SP and GS, as shown in (76) and (77).

(76)		*GS*	*SP*
(a)	con(fírm∅) ⇒ con(fírm*a*ti)ve	ok	ok
(b)	con(fírm∅) ⇒ *(cónfir)(mÀti)ve	*	*

(77)		*GS*	*SP*
(a)	(démon)(strÀte) ⇒ de(mónstrati)ve	ok	*
(b)	(légis)(lÀte) ⇒ (légis)(lÀti)ve	*	ok

In (76)–(77), SP refers to stem stress. If we put aside the stress of *Ative* (which we presume lexically given) for a moment, the facts are as expected. For the vacillation of (77) is the usual one, given that satisfaction of both GS and (stem) SP, as in **(démonstra)tive*, is excluded by the ill-formedness of *($\sigma H\sigma$). As for (76), (a) is the only option, because the alternative violates both GS and SP. Considering now the stress of *Ative*, the latter is not preserved in (76a) because it would require that the stem stress not be preserved (no monosyllabic feet). If only one of two stresses *can* be preserved, then satisfaction of GS will determine which, hence (76a) continues to be the only option. The choices in (77) also continue to follow, provided that we assume that GS can overcome SP of both stem and affix as in (77a), which is consistent with the rest of our assumptions. In sum, our system dispenses with the *ative*-rule, as well as the need to postulate multiple 'stress domains', and in fact achieves better empirical adequacy than the conjunction of the latter.[46]

We now turn to the *atory* class. In essence, our account, for both British and American English, will follow from the assumptions needed for the *ory* class as a whole, requiring no special provision. We begin with the British cases in (78).

(78) *British*:		*GS*	*SP*
(a)	ar(tícu)(lÁte) ⇒ ar(tícul*a*t-)ry (Lσ)(H σ) (σL σ -)	ok	*
(b)	ar(tícu)(lÀte) ⇒ ar(tìcu)(lÁto)ry (Lσ)(H σ) (Lσ)(H σ)	*	ok

[45] The cases in (i) are attested in both of the patterns in (75).
(i) administrative, adumbrative, compensative, concentrative, contemplative, illustrative, maturative

[46] Given the parallel ('weak syllable') analyses of both *ive* and *ure* ((23) above), we predict that the sequence *ature* should behave quite analogously to *ative*. This is correct, although the smaller *ature* class does not provide the full range of cases discussed for *ative*. We may note *(judica)ture/(judi)(cAtu)re*, parallel to (72a, b) and in fact just like *(judica)tive/(judi)(cAti)ve*; *(signa)ture*, parallel to *con(firma)tive* etc. of (74); and *(legis)(lAtu)re*, parallel to *(legis)(lAti)ve*, and the other cases of (75b).

The final syllable *ry* is a weak syllable under our definitions ((67d) above). In British English, it is in fact systematically extrametrical – a condition that we may state as in (79).

(79) *British*:
... V)ry e.g. (mílita)ry, (cémete)ry, (lávato)ry

If (79) holds, then the variation in (78) is just like that of the *ative* cases in (72).[47] GS obtains and therefore the final foot cannot satisfy SP, as **(lato)ry*, with a short *a* is not well-formed. The otherwise well-formed (*latory*) is excluded precisely by (79). In other words, in British English, *o)ry*, is like *ou)sØ*, of (71) above. The question in (78a) is again whether the stress of the non-rightmost foot could be preserved. The answer is again yes, but only on condition that the resulting tetrasyllabic sequence be reduced to ternary. This in fact accounts for the syncope of *tory → try*. The resulting structure *ar(ticula)try* is then well formed, comparably to the one of (*accura)cy* and other cases. In contrast, in (78b), SP prevails, maintaining the rightmost foot, and thus excluding GS.[48] Just as for the *ative* class, we predict that, with stems ending in a heavy syllable, the variation between stressed and unstressed *atory* should affect the position of the primary stress. This is correct, as we find *com(pensato)ry*, parallel to (77a) above, and (*com-pen)(sAto)ry*, parallel to (77b), but not **cómpens[ə]tory* or **compénsAtory*. Likewise with *confiscatory*, *exculpatory*, *inculpatory*.

We now consider the American metrification, which is as in (80), exhibiting no comparable variation.

(80) *American*	*GS*	*SP*
ar(tícu)(lÀte) ⇒ ar(tícula)(tÒry)	ok	*
(Lσ)(H σ) (σL σ)(H σ)		

In contrast to British English, the prevalent American metrification of *Vry* is as in (81).

(81) *American*
... Vry) e.g. (míli)(tÀry), (céme)(tÈry), (láva)(tÒry)

In order for the rightmost feet in (80), (81) to be well formed, the vowel preceding *ry* must be metrically long as indicated, despite its phonetic

[47] The variation is here for the same lexical item across different dialects/idiolects, in contrast to some of the other variations considered, which were within the same structural class, but involved different lexical items (e.g. (71)). The British *atory* class is not unique in this respect. The same kind of variation occurs rather extensively in the *ative* class as well, with many items oscillating between (72a, b), or (75a, b), as noted in fn. 45.

[48] There is in fact a third variant *ar(ticu)(lAtə)ry*, in which the rightmost foot only bears secondary stress (Fudge, 1984: 63). This follows from supposing that the syllable containing the reduced vowel in that foot can function as a weak one, resulting in a weak foot (*ry* remaining extrametrical). An analogous situation obtains for the final syllable of cases like *rùtabága/rútabàga*, attested in both variants.

shortness. As noted earlier, this phonetic characteristic seems attributable to the following *r*, which induces 'laxing' rather generally (Rubach, 1984: 51; Liberman & Prince, 1977: 292), but apparently without altering the more 'abstract' and metrically relevant length. Given this, and (81), shortening in (80) will be a case of 'shortening in unstressed position', like (68a) above. That is, stress on *at* is excluded by the adjacent stress on *ory* (via non-existence of monosyllabic feet). Thus again GS will find no obstacle and hence obtain systematically. Note that the destressing of *at* versus the non-destressing of *ory* in (80) is not arbitrary, but rather follows from the formulation of GS (20a) above, which makes *at*, but not peripheral *ory*, a target for shortening, as we noted earlier. Thus, the *o* will remain (metrically) long, necessarily attracting stress.[49]

Turning to the non-rightmost stress in (80), it will be straightforwardly preserved in the manner discussed in connection with (35b) above. Specifically, because the resulting ternary foot ($\sigma L \sigma$) is well formed. Note again that, should the syllable preceding *ate* be heavy, remetrification will occur as predicted, as in *cómpensàte* → *compénsatòry* and the other cases in (42) and (43) above. There is therefore no need for any special device, such as HV's double 'stress domains' (or Hayes's extrametricality of the full sequence *atory*: fn. 8), which would in any event fail to extend to the cases in (82) and the many others listed in (35) above.

(82) (a) phenòmenólogy ⇒ phe(nòmeno)(lógic)
(b) persónify ⇒ per(sònifi)(cátion)
(c) assímilable ⇒ as(sìmila)(bílity)

Again, there seems to be nothing special about the *atory* class, only ternary feet ($\sigma L \sigma$) obtaining regularly under certain conditions, one of which is stress preservation as in (82), another exhaustiveness, as in (*wìnnepes*)*sáukee* and the like.[50]

A few words seem now in order about the two dialect-specific conditions in (79) and (81) from which the correct results have been derived. In section 6 above, we argued that if a suffix can be neutral by virtue of its structural characteristics, then it is not constrained by suffix consistency, its metrification being subordinated to that of the stem. This may seem contradicted by the claim that *ory* in both British and American English

[49] None the less, phonetically short *o* behaves like other short vowels with respect to vowel reduction, since it reduces when unstressed, as in the British cases, or American *contradictory* and the like, discussed in the text below, in contrast to long vowels, which remain long when unstressed, for instance *adúmbrAte*. This implies that vowel reduction and metrical theory refer to different aspects of the representation.

[50] There is, however, a residual problem concerning the handful of items in *ficatory*, derived from verbs in *ify*. Our analysis would incorrectly predict the metrification of **(clàs-si)(fíca)(tòry)*. We need to stipulate that the syllable *fi* in these cases cannot bear stress, resulting in the correct pattern *clas(sífica)(tòry)*.

maintains a fixed metrification, respectively as in (79) and (81). For, our analysis of this suffix implies it has the structure *HW* (*o* being long), which ought to make it a candidate for neutrality (recall discussion of (51) above). There is, however, no contradiction. Recall (fn. 32) that suffix consistency is not always incompatible with stress neutrality. Specifically, in the class of suffixes σW attached to the stem by overlap (as in (51a) or (53a) above), both stem and suffix consistency are always satisfied. This situation is schematically represented in (83a), and illustrated in (83b) with *able*.

(83) (a) ... σ)
-σ) W $\Rightarrow$ ...-σ) W
(b) in(habit$\emptyset$)
a) ble $\Rightarrow$ in(habita)ble

It so happens that *ory* attaches to a considerable number of stems by syllable overlap. The British metrification, which parallels that of *able* in (83b), is then precisely what is required to achieve stress neutrality, in the manner illustrated in (84a, b). both parallel to (83b).[51]

(84) (a) in(híbit$\emptyset$) $\Rightarrow$ in(híbito)ry
(b) còntra(díct$\emptyset$) $\Rightarrow$ còntra(dícto)ry

But, if the British metrification *o)ry* is consistent with neutrality, then of course the American metrification *ory*) should not be. In particular, the latter metrification should be stress preserving with stems ending in $L\sigma$), as in *in*(*híbi*)(*tòry*), but not with stems ending in $H\sigma$), as in **con*(*trádic*)(*tòry*). However, here in fact American English resorts to the British metrification of (84b). That is to say, while the prevalent American metrification is indeed as in (81), there is one systematic class of exceptions – cases in which the suffix is preceded by a heavy syllable. Thus, (81) needs to be revised as in (85).

(85) *American*
(a) ... $L(C_0Vry)$ e.g. in(híbi)(tòry)
(b) ... $(HC_0V)ry$ e.g. còntra(dícto)ry

Introduction of (85b) thus brings the behaviour of *ory* into compliance with stress preservation. Yet (85b) is not merely a reflex of the latter, since it obtains more generally, as in *refé*ctory. Here, we will not attempt to provide a full account of the heterogeneous nature of (85) as opposed to the consistent behaviour of the suffix in British English. Various hypotheses are possible, but it seems that a certain amount of idiosyncrasy or historical accident has to be factored in.[52] The question arises, however, why the *Ate*

[51] With other stems, preservation obtains for other reasons, partly fortuitous, that we cannot fully address here.

[52] Past analyses, going back to *SPE* (p. 134), have maintained the following kind of derivation: a first stress iteration stresses *ory*; a second stress iteration parses either *H* or

in *atory* does not behave as a heavy syllable in (85b), thus yielding the same facts in American as in British English. The answer must be that, in American English, (85b) is a special condition, overriding the normal pattern, whereas in British English that metrification is rather the norm. In this connection, consider (86).

(86) (a) *British*: sa(lĺva) ⇒ sa(lĺva)ry
(b) *American*: sa(lĺva) ⇒ (sáli)(vàry)

Here, the British case is stress preserving and non-shortening, just like the one in (78a). While the variant *(sáliva)ry*, parallel to (78b) seems also attested in British English, American admits only the shortening and non-preserving (86b). Although relevant examples are not very numerous and individual words vary somewhat, the contrast seems to be rather general, as in British *ex(créto)ry*, *se(créto)ry*, *an(tíqua)ry*, versus American *(éxcre)(tòry)*, *(sécre)(tòry)*, *(ánti)(quàry)*. This systematic difference follows from presuming that in British English there is a relatively even tension between GS and SP, with the latter in fact prevailing in (86a). In contrast, in American English, that balance is evidently upset by the preferential status of (85a) over (85b) (a 'suffix consistency' effect). This concurs with GS in excluding SP in the presuffixal syllable, as in (86b) and *atory* cases like (80). At the same time, (85b) is not violated, since the syllable affected by GS becomes light. In conclusion, even though the behaviour of the suffix *ory* is more complex than we initially assumed, our account of the *atory* class still holds given independently needed assumptions.

At this point, our analysis has thus succeeded in eliminating the five different provisions in (15) above, replacing them with the single requirement that vowels shorten within affixed stems. This reduction was made possible by relying maximally on metrical theory. It is important to note here that our formulation of metrical theory in terms of stress checking rather than stress assignment by rule is essential to achieving the desired unification. An attempt to recast our analysis within a system of ordered rules would in fact fail, resulting in an ordering paradox. To see this, consider that, in a rule system, the morphological shortening of *aspIre/aspirant*, to which we have also reduced that of *ative* and *atory*, must plainly precede stress assignment (precisely as in Kiparsky's formulation in (9) above), for the simple reason that stress is here sensitive to the effects of shortening. On the other hand, the 'trisyllabic' shortening of *div[i]nity*, and the 'bisyllabic' one of *obl[i]gatory*, as well as the shortening in unstressed position of *excl[a]mation*, will all have to *follow* stress assignment (as indeed they have in past analyses). The reason is that metrical information is here crucial: for example, shortening applies

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σL; destressing occurs in 'post-stress' position, hence in *contradíctory*, but not in *inhíbitòry*. This analysis fails to exploit the fact that syllables like *ry* admit of two possible metrifications, whence *áccuracy* versus *aristócracy*, and as a result sheds no light on the unstressed *ory* of British *inhíbitory*.

in the ternary foot of (*natura*)*l*, but not in the binary one of *ar*(*chIva*)*l*.[53] Thus, we have the order 'stress, shortening' in this class of cases, but 'shortening, stress' in the other – a paradox, if unification is attempted. To put it differently, past formulations have precluded unification by the very fact that they were rule-based. In contrast, no difficulty arises in our system, because the shortening requirement (GS), and the metrical requirements (SP and stress checking) are well-formedness conditions, not rules. For this reason they do not require relative ordering, but can rather apply simultaneously, so that in a sense metrical structure can bear on shortening, while shortening also bears on metrical structure at the same time.[54]

There is another case in which a rule-based account would run into an ordering paradox. It concerns syllables closed by sonorants or *s*, which sometimes behave like light syllables, as in (87).

(87) (a) (órchestra), (pédesta)l, (álterna)te, (wáshingto)n
(b) (pátenta)ble, (cómforta)ble, (párenta)ge

While a full discussion of this phenomenon is beyond our goals, we note that, beside a certain amount of idiosyncrasy, two conditions in particular govern its general distribution. One is exhaustiveness, the other stress preservation. That is, syllables closed by sonorants or *s* are (more systematically) parsed as light ones if the parsing is either exhaustive, as in (87a), or stress-preserving, as in (87b) (and as noted in fn. 27), or both. Past literature has addressed this

[53] Note that our theory seems to predict incorrectly shortening in cases like *tOnal*, since it gives the foot structure #(*Lσ*) as well formed, as in (22c) above. We return to this case in section 10 below.

[54] The notion that stress is present underlyingly and only subject to 'checking' (essentially accepted in Hayes, 1985: 145), is strongly supported by other considerations as well. One is that, while stress principles are flexible to a certain degree, there is never any corresponding 'free' variation of stress. For instance, *órchestra* and *asbéstus* have parallel structures and yet different and fixed stresses (see discussion of (87) below). If stress is lexically present, the lack of variation follows. In contrast, assignment by rule would predict free choice between the two patterns.

Another consideration has to do with the pattern of morpheme deletion in Italian and Romance identified in DiFabio (1990), and exemplified in (i).

(i) (a) fin -*ísc* -o / fin -iámo 'I finish/we finish'
(b) *vád* -o / and -iámo 'I go/we go'
(c) vol -*é* -re / vol -ró (> vorró) 'to want/I will want'
(d) pérd -*e* -re / pèrd -e -ró 'to lose/I will lose'
(e) vol -*ú* -to / pérd -to (> perso) 'wanted/lost'

As DiFabio argues, the pattern in (i) follows from the notion of metrical consistency. Each of the italicized morphemes in (a, b, c, e) is suppressed in the environment of the right-hand form because its lexically given stress is excluded in the context of an adjacent stress. In contrast, the italicized morpheme in (d) will not be suppressed, because it is unstressed.

While we will still have to distinguish the cases in (i), in which metrical inconsistency is avoided by means of suppression, from the cases in which it is not avoided, as in *paréntal*, inconsistent with *párent*, none of the effects in (i) is expected from the point of view of stress being assigned to sequences of syllables by rule. In particular, unlike the better-known kinds of preservation/consistency, the kind that results in morpheme suppression does not seem to be reducible to the notion of the 'cycle', under any imaginable extension.

phenomenon mainly in conjunction with specific classes of items, such as those in *ary*, *ory*, noting for example (*rèper*)(*tóry*), versus *re*(*fècto*)*ry*. Here, the syllable closed by a sonorant behaves exceptionally with respect to our (85) above. Exhaustiveness plays a role, as *ele*(*ménta*)*ry* returns to the normal pattern, and SP is also involved, for instance in inhibiting the exceptionality in *dis*(*pénsa*)*ry* (← *dispénse*). A long-standing account of these cases, after Kiparsky (1979), postulates a rule of 'sonorant destressing', removing a stress on a syllable closed by a sonorant under appropriate conditions (see Hayes, 1985; 174, HV, p. 257). While the latter rule expresses an important generalization, like many other rules it has an ultimately arbitrary character, since a comparable rule of 'obstruent destressing' seems equally statable. To overcome that arbitrariness, we must link the noted behaviour of sonorants, apparently shared by *s*, to other properties of these segments. We find a plausible link with the fact, noted by Fudge (1984: 200ff.), that unstressed syllables closed by sonorants or *s* permit vowel reduction with some generality, in contrast to those closed by obstruents which rarely do. For example, reduction applies to all the cases in (87) and (88a), but not to those in (88b).

(88) (a) cont*e*mplation, ser*e*ndipity, conc*e*ntrate, aff*i*rmation, cons*e*rvation, cons*u*ltation, us*u*rpation, neur*a*sthenia
(b) architectonic, olf*a*ctometer, adj*e*ctival, cond*u*ctivity, coll*e*ctivity, exp*e*ctation

That is, it seems reasonable to suppose that syllables closed by sonorants and *s* behave as light when unstressed because vowel reduction entails a partial loss of quantity (reduction is in many ways intermediate between full vowel and syncope).[55] If conditions on metrical structures are stated as output conditions in the manner of (29) above, then the phenomenon will follow from a characterization of syllables with reduced vowels as (similar to) light syllables. In contrast, no correlation between (87) and (88) can be expressed within a rule-based system. The reason is that, in order to make certain syllables light for purposes of stress, reduction would have to precede stress. But, in general, it must follow it, since it does not occur in stressed syllables, thus yielding another ordering paradox.

In sum, we find a pervasive tendency of rule systems to be inadequate compared with systems of conditions. Specifically, we have seen that rule systems permit too many options, such as evasion of stress by designated suffixes, and modes of stress assignment that would exclude stress preservation. We have also seen that rule systems stand in the way of desirable unifications, such as the ones we have proposed for vowel-length alternations and the behaviour of syllables closed by sonorants and *s*. This

[55] This view is further supported by the fact, noted in Hyman (1985: 8, citing Swadesh) that in Chitimacha '-əC rimes do not make their syllable heavy, but other -VC rimes do'.

underscores the analogy with syntactic theory, where the inadequacy of rule systems is a familiar conclusion. For a discussion of apparent differences between the two subdomains, see Bromberger & Halle (1989).

9. Vowel lengthening

The scope of our account of vowel length can be broadened further by slightly modifying the formulation of GS (20a), as in (89).

(89) (a) Vowel length can be affected
(b) Vowels are short in '[...—...] affix'
(order irrelevant)

The formulation in (89) essentially separates the derivational and configurational aspects of the earlier formulation. The statement in (89b) is now the relevant well-formedness condition, constraining derived representation. We take the derivational option (89a) to be free, but available only if required. Specifically, we suppose that our 'consistency' or anti-allomorphy constraint blocks idle applications, while permitting those required by (89b). This system is exactly equivalent to the earlier one, except for the fact that, under appropriate conditions, lengthening as well as shortening will now be possible. This enables us to deal with the cases in (90) (where '†' indicates existence of other variants).

(90) (a) e(lízabe)th ⇒ (elìza)(bÉtha)n
(b) (ádjec)tive ⇒ (àdjec)(tÍva)l
(c) (díscipli)ne ⇒ †(dìsci)(plÍna)l
(d) (hércule)s ⇒ †(hèrcu)(lÉa)n

The long vowel in each of the right-hand forms in (90) is now just like the one of *de(sIrou)s* in (71b) above. Like the latter, it violates GS (89b). Furthermore, like the latter, it satisfies SP, though in a slightly different manner. It does so by preserving the stem stress in a non-rightmost foot, while a new foot is added to its right.[56] Failure to lengthen the vowel in (90) would not result in this kind of preservation, but rather, for example, in **(èli)(zábetha)n*. Simultaneous satisfaction of both GS and SP as in **e(lìza)(bétha)n* will be excluded just as it was in **de(sírou)s*. Further examples are listed in (91), where the preserved stress is that of the italicized vowel.

(91) (a) sùbstantÍval, àblatÍval
(b) antìpodÉan, àpogÉan, dàmoclÉan, òedipÉan, sòphoclÉan

Appeal to stress preservation will correctly predict here that, in contrast to the cases in (90d), (91b), those in (92), also preserving the stress of the

[56] This case is thus essentially the mirror image of the *(gene)(rAte)* → *(genera)tive* case, in which a stem stressed is preserved while a final foot is lost.

italicized vowel, will NOT bear stress on *ean*, (adjacent stresses being excluded).[57]

(92) àrchimédean, prométhean, guínean, prótean

This analysis will further predict that, in this ('lengthening') class, there should be cases in which a vowel is kept short at the expense of stress preservation, just as there were in the class of *de(sIrou)s*, such as *(blasphemou)s*. This seems correct too, as *césar → cesárean*, *hércules → †hercúlean*, *cáribbes → caríbbean* (and, modulo fn. 57, *euclid → euclídean*) are of this sort. No example exists which is both non-preserving and has a long vowel.[58]

In sum, the reformulation of (89) will indeed reduce the cases in (90) to the usual interaction between vowel length and stress preservation. This enables us to eliminate another former rule, which we give in (93).

(93) '*Special*' *lengthening*, after Halle & Mohanan (1985: 81)
'a special rule that lengthens the stressed vowels in a number of specially marked words'.

Beside the cases in (90)–(91), the rule in (93) was aimed at those in (94).[59]

(94) (a) various ⇒ var(Iety)
(b) maniac ⇒ man(Iaca)l
(c) simultaneous ⇒ simultan(Eity)

The elimination of (92) is welcome here as well. The reason is that this phenomenon is completely general to the English lexicon, and as such cannot be due to any special 'marking'. That is, in a sequence V_1V_2, if V_1 is stressed, it is ALWAYS long. For example, in contrast to hundreds of sequences [Cayə] (namely: consonant, long *i*, reduced vowel), like those of (94a, b) and (95a)

[57] Note that it is immaterial whether the *e* of *ean* in the above is part of the stem or part of a complex suffix *e* + *an*. So long as the *e* is internal to the suffix *an*, our system will correctly predict a short *e* except when a long one is required for stress preservation. Then *èuropÉan*, *pythàgorÉan* can be added to (91b), and *shàekespéarean* to (92).

[58] The apparent exception *dàtíval* does preserve the stress of *dátive* in the initial syllable, in the manner we discuss in the next section. However, it instantiates a double violation of (89) compared with the alternative **dátival*, which would be an instance of trisyllabic shortening. We may perhaps suppose that there is a 'consistency' effect on *Ival*, analogous to that of simple suffixes, blocking the alternative *ival*.

The variant *(disciplin)al*, noted in fn. 34 above and contrasting with (89c), would appear to be stress-preserving via extrametricality of *al*.

[59] Note that Halle & Mohanan (1985) in fact do NOT cite the cases in (91) in connection with their proposed rule in (93). Rather, they suppose it applies to cases like *pIous*, the underlyingly short *i* surfacing in *impious*. We take the liberty of supposing their rule is also intended at least for the cases in (90d)–(91b) given the parallel environment and given that no other mechanism is proposed to handle those cases, the latter consideration extending to the rest of (90)–(91) as well. (On our own account of *pIous/impious*, recall discussion of (10) above.)

below, the English lexicon contains no instances of [Ciə], with '*i*' stressed but short.[60] Other vowels seem to behave analogously, as shown by (94c), (95b).[61]

(95) (a) psor*Ia*sis, ammon*Ia*cal, genes*Ia*cal, paradis*Ia*cal, simon*Ia*cal, zod*Ia*cal, †embr*Yo*nal

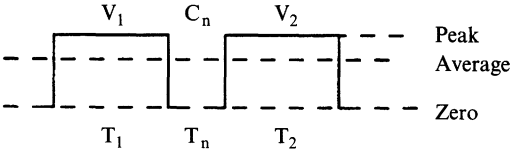
am*Ye*lous, b*Io*gen, cr*Yo*gen, d*Ia*dem, d*Ia*gram, d*Ia*lect, d*Io*cese, h*Ie*rarch, h*Ya*cinth, h*Ya*lin, *Io*din, lev*Ia*than, par*Ie*tal, pod*Ia*try, psych*Ia*try, th*Ia*min, var*Io*la, v*Io*lence, v*Io*let

agr*Io*pe, alcib*Ia*des, alc*Yo*ne, anch*Ia*le, ant*Io*chus, ant*Io*pe, arg*Io*pe, ast*Ya*nax, call*Io*pe, cass*Io*pe, cebr*Io*nes, chalc*Io*pe, herm*Io*ne, *Ia*cchus, laert*Ia*des, l*Ya*llpur, milt*Ia*des, p*Ie*lus

(b) algebr*Ai*c, alt*Ai*c, arch*Ai*c, choler*Ai*c, g*Ai*ety, mos*Ai*c, ph*Ae*ton beths*Ai*da, dan*Ai*des

When sequences V_1V_2 with a stress on V_1 are in binary feet, as in (*Ea*)*n* of (91b), the lengthening is predicted by (22) above – that is, when rightmost, binary feet must have the structure ($H\sigma$). However, when such sequences are in ternary feet, as in fact in (94), lengthening is not predicted by (22) as it stands. We must therefore appropriately amend it. The descriptive generalization here is that any foot with the structure ($L_1L_2\ldots$) is well formed only if L_2 has an onset. Presumably, this generalization must be expressed in any theory. Our perspective of section 4 above and the notion of foot 'weight' seems to provide a natural way to do so; for, consider that it seems plausible to suppose that a relevant notion of 'weight' is commensurate with some function of acoustic or articulatory energy. In addition, it seems clear that interruptions in the acoustic signal, such as an onset intervening between vowels, contribute to overall energy. To see this we consider (96), an idealized representation of acoustic intensity over time for two vowels V_1, V_2 separated by a consonant C_n.

(96)

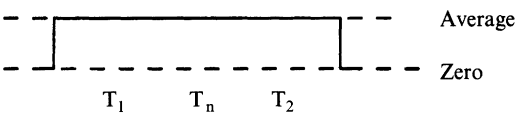


Over total time $T_1+T_n+T_2$, the signal in (96) can be analysed as the sum of a continuous signal (97a), and an alternating one (97b).

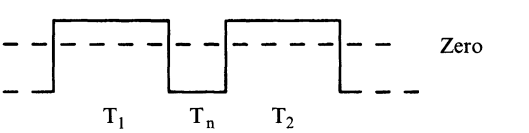
[60] This is true not only in rightmost feet, but more generally, witness (*dIa*)*betes*, (*hIero*)*glyphic*, (*sIa*)*mese*, (*scIen*)*tific* and many other cases.

[61] The only exceptions are independent diphthongs, as in *annoyance*, where the *o* is short (*[*ow*]), presumably because such is the structure of the diphthong *oy*.

(97) (a)



(b)



It is clear that (97a) is equivalent for energy to occurrence of the two vowels V_1 and V_2 by themselves, without C_n. The reason is that in (96) 'AVERAGE times $T_1+T_n+T_2$' equals 'PEAK times T_1+T_2' (by definition of AVERAGE). Example (97b) thus factors out the energy contribution of the onset. That contribution is obviously not null despite the null average of the signal, for the same reason that any alternating current does not fail to produce energy. Thus onsets MUST contribute to auditory (and presumably articulatory) energy, and, if foot weight is commensurate with energy, they must contribute to weight, yielding weight-deficient feet when they are absent, at least from foot-medial position. Vowel lengthening in such feet is then the naturally expected corrective for the weight deficiency.

While we are not in a position to define the exact contribution of onsets to make this hypothesis more concrete, we note that other cases have been cited in the literature which support the role of onsets in metrical structure. For instance, Halle & Kenstowicz (1991) report that in Manam, main stress is normally penultimate, but antepenultimate when the penultimate has no onset. From our point of view, this is not very different from the case of (94)–(95) above, and instantiates the same general fact that ternary feet with onsetless medial syllables are rather more akin to binaries. Another case in which onsets seem to play a role is that of Piraha, discussed in Everett & Everett (1984).

If ternaries with onsetless medials are more like binaries, then, beside occurrence of lengthening, one might also expect that larger feet could be constructed. This does obtain in English, though only in very specific cases, all involving stress preservation, like those in (98).[62]

(98) (a) (nAt*io*)n ⇒ (nat*io*na)l
(b) organiz(At*io*)n ⇒ organi(zAt*io*na)l
(c) ob(ject*io*)n ⇒ ob(ject*io*na)ble

[62] Partially similar to this is the fact that, while final weak feet generally induce preceding binaries, as in *ac(céle)ràte* (section 4 above), ternaries normally obtain instead when the rightmost syllable is onsetless, as in (i) (noted in Liberman & Prince (1977), Hayes, (1982)).

(i) (alie)nate, a(melio)rate, de(terio)rate, (etio)late, (vario)late, (varie)gate

The suffix *ion*, while metrically bisyllabic in general, as shown by the non-preservation of *abólish* → *abolítion*, seems to behave like a single syllable in the right-hand cases in (98). Yet these cases contrast with those in (94), or *abolition*, where stress preservation is not sufficient to induce monosyllabic parsing. We will make no attempt to deal with this variation here (see Burzio 1994), and will regard it as idiosyncratic. We will simply state that bivocalic sequences are normally parsed bisyllabically, and occasionally monosyllabically, under specific conditions such as stress preservation.[63] We propose that the bisyllabic parsing yields weight-deficient feet as discussed above, hence requiring lengthening of the stressed vowel.[64]

This kind of approach would seem to shed light on another lengthening phenomenon as well, illustrated in (99).

(99) (a) boston ⇒ bost(On*ia*)n
(b) canada ⇒ can(Ad*ia*)n

That is, if bivocalic sequences do not in general contribute to foot weight in the way that normal bisyllabic sequences do, then the feet in (99), like those in (94)–(95), will also be more similar to binaries than normal ternaries, and the lengthening may be expected. Our metrical account would thus seem to extend to the so-called 'CiV' lengthening, further exemplified in (100), and formerly also attributed to a specific rule, given in (101).

(100) hEl*ium*, phOb*ia*, croAt*ia*, pEr*io*d, artEr*ia*l, barOn*ia*l, collEg*ia*l, colOn*ia*l, arAb*ia*n, irAn*ia*n, comEd*ia*n, aristotEl*ia*n, remEd*ia*ble, sacrilEg*iou*s, advantAg*eou*s,

(101) *CiV*-lengthening, after Halle & Mohanan (1985: 78, simplified).
V → V: / ____ CiV

This last extension is admittedly more tentative, however, for various reasons. One is that *CiV*-lengthening is subject to a restriction of which we have no understanding at this time. As is well known, it fails to apply to *i*, as in *trívial*, *abyssínia*. In fact, *i* is in this context subject to normal 'trisyllabic' shortening, witness *palestIne* → *palestínian*, *vIce* → *vícious*. Another source of hesitancy is the fact that, while *CiV*-lengthening is clearly of a metrical nature since it does not affect unstressed vowels, witness *m*[ə]*níacal*,

[63] Our bisyllabic analysis of *iV* sequences concurs with *SPE* (p. 87). Hayes (1982: 265ff.) has proposed a monosyllabic analysis. However, his motivations are internal to his theoretical framework and foot typology, and do not carry over to ours. Note that a monosyllabic analysis requires some stipulation to ensure the correct stress results, given **bóstonian*, versus *américan*.

[64] Note that the required bisyllabic parsing will imply that syllable count and computation of weight are relatively independent of each other, so that a foot could be maximal with respect to the former, while being deficient with respect to the latter, thus requiring vowel lengthening.

not **mAníacal*, it none the less persists unexpectedly in non-rightmost bisyllabic feet such as the ones in (102), where we would predict shortening.[65]

(102) anes(thEsi)ology, (Asi)atic, bac(tEri)ology, col(lEgi)ality, de(fOli)-ation, ec(clEsi)astical, (gEni)ality, ne(gOti)ation, (pAtri)archate, (pEdi)atrics, (pEri)odical, (rAdi)ology, (sOci)ology, (spAti)ality

Furthermore, unlike the lengthening of (94)–(95), the one of (99) is limited to *iV*, and does not extend to other *VV* sequences, as shown by *gradual*, not **grAdual*. Finally, we also note that, while the stress pattern of (99)–(100) is straightforward if one takes the bivocalic sequences to undergo bisyllabic parsing, the latter cases none the less contrast with those in (90)–(91) in not being stress-preserving. Thus **cana(dIa)n *vari(Ety)*, do not obtain in contrast to *elizab(Etha)n*, *sopho(clEa)n*. Some residual stipulation would thus be required in this connection.

In this section we have argued that our metrical account of vowel length, initially devoted to shortening, in fact extends to three different categories of lengthening: that of *elizabEthan*, in which the stress reflects preservation and the lengthening is required to achieve a well-formed foot; and the lengthening of both *varIety* and *canAdian* in which the stress reflects normal trisyllabic feet, and the lengthening is required to make up the 'weight' deficiency resulting from the bivocalic sequence. Questions remain, especially in connection with the latter of those two alternations. Further study is required to identify precise criteria for defining the notion of 'foot weight', used rather loosely here, and determine how the various syllabic and sub-syllabic components enter into that notion. It is none the less clear that all three phenomena fall within the province of metrical theory, and are not due to specific rules.

10. Initial syllables

Initial syllables would seem to violate our proposed generalizations, in that they apparently permit monosyllabic feet, as shown by (103).

(103) bàndánna, bàctéria, thìrtéen, chrìstíne

This occurs only with heavy syllables, as initial light syllables generally exhibit vowel reduction, revealing that stress is absent, as in (104).

(104) b*a*nána, c*e*lébrity, *a*mérica, c*a*pítulàte

The existence of monosyllabic feet with the structure (H) in word-initial position can be verified by using our theory of vowel length as a diagnostic.

[65] The metrical nature of *CiV* lengthening is also underscored by its non-occurrence in the larger foot of *(nationa)l*, in contrast to the smaller one of *(nAtio)n*, although this does not generalize to the comparable foot of *organi(zAtiona)l* etc. for reasons which we must leave to further study.

Recall that, in word formation, the fate of stress and length of each vowel are intertwined in the manner of (105a, b, c).

(105) (a) *Well-formed foot regardless of vowel length*
Systematic stress preservation and shortening.
e.g. di(v*i*nity)

(b) *Well-formed foot only if vowel is long*
Vacillation between stress preservation and shortening.
e.g. de(s*I*rou)s/ (blasph*e*mou)s

(c) *Ill-formed foot regardless of vowel length*
Systematic non-preservation and shortening.
e.g. (def*a*)mation

If initial syllables can be metrified individually as (*H*) but not as (*L*), then they should exhibit the behaviour of (105b). This is correct, as shown by (106).

(106) (a) (tÍta)n ⇒ (tÌ)(tánicØ)
(b) (tÍta)n ⇒ tə(tánicØ)

We interpret (106a, b) as the usual tension between GS and SP. In (106a) SP succeeds, blocking GS, while in (106b) the opposite obtains.[66] This phenomenon is quite general, as the cases in (107a) are also attested in both variants, while those in (107a, b) appear to more firmly select one option (see fn. 66).

(107) (a) *long-V/ə*:
b*a*nálity, c*i*tátion, l*e*gálilty, l*o*cálity, l*o*gístic, m*i*nórity, m*o*nócracy, n*a*tívity, ph*o*nólogy, pl*a*tónic, ps*y*chíatry, sch*e*mátic, t*y*ránnical

(b) *long-V*:
gr*a*dátion, p*o*díatrist, r*o*dénticide, z*o*díacal

(c) *ə*:
l*a*bórious, m*a*níacal, pl*a*nárity

The asymmetry between monosyllabic initial feet, which must contain a heavy syllable, and plurisyllabic ones that need not, will now account for the

[66] The vacillation here concerns a single lexical item, while in other cases, such as *desIrous/blasphemous*, it concerns different ones, with parallel structures. We presume the difference reflects different degrees of lexicalization of the metrical structure, a higher degree resulting in higher consistency for each individual item. Among the factors that may play a role in this connection are perhaps word frequency, and primary versus secondary stress. Recall that vacillation within the same lexical item was also found in other cases, especially the *ative* class, and the British *atory* class (see fn. 47).

subcase of Myers's shortening of (15aii) above, which we have so far put aside. The latter is exemplified in (108).

(108) (r*È*)cíte ⇒ (rèci)tátion

In *recite*, the initial syllable is in a monosyllabic foot, which requires a heavy syllable and hence a long vowel. In *recitation*, however, that syllable is in a (non-rightmost) binary foot, which does NOT require a heavy syllable (see (22c) above), hence the shortening. Further examples of this type are given in (109).

(109) (r*E*)fúte/(*re*fu)tátion; (pr*O*)fáne/(pro*f*a)nátion; (pr*O*)póse/(pro-po)sítion; (pr*O*)vóke/(pro*v*o)cátion; (r*E*)pórt/(répor)torial; (p*O*)l-ítical/(p*o*li)tícian; (pr*O*)míscuous/(pro*m*is)cúity; (m*O*)nástical/(m*ó*nas)tery; (pr*O*)sérpina/(pr*ó*ser)pine

Note that our revision of the previous section, making our system symmetrical to allow for both shortening and lengthening, will now predict that, just as there is shortening when proceeding in the direction of (108) (monosyllabic to binary), there should be lengthening when proceeding in the opposite direction (binary to monosyllabic). This is correct, as shown by (110).

(110) (a) (próduc)t ⇒ (prÒ)dúction
(b) (prójec)t ⇒ (prÒ)jéction

In (110), the cases on the left are well formed because the structure ($L\sigma$) constitutes a possible foot even in rightmost position if word-initial, as stated in (22c) above. The cases on the right are stress-preserving, but this possibility requires lengthening. Non-stress-preserving, non-lengthening *prədúction*, *prəjéction* are also attested, instantiating the usual vacillation, like that of (106). The cases in (111) are all of this type, with the one in (111b) apparently lacking a destressing variant.

(111) (a) (pólitic)s/(p*O*)lítical; (sólidɸ)/(s*O*)lídify; (próces)s; (pr*O*)céssion; (prógres)s; (pr*O*)gréssion; (próphetɸ)/(pr*O*)phétic
(b) (prógeny)/(pr*O*)génitor

In sum, there is good reason to suppose that initial syllables can constitute monosyllabic feet if heavy, since this reduces their behaviour with respect to vowel length to independently established generalizations. The question, of course, is why should there be such an asymmetry between initial positions and medial ones, where monosyllabic feet are never possible, witness **ex*(*clàim*)*átion*, **sa*(*lÍ*)*vary* and many other cases noted. Search for an answer must consider that there is in fact another apparent exception to non-existence of monosyllabic feet: final syllables, like that of *prevént*, or *divíne*. Since we already have an answer for the latter case, it will be natural to attempt to extend it to the former. This involves taking the analysis of

bàndánna, *tìtánic*, and all such cases to be as in (*Øban*)*danna*, (*ØtI*)*tanic*, employing a null syllable much like *pre*(*ventØ*), *di*(*vIne*). This may at first seem problematic, since such initial feet would be iambic, bearing stress on its right-hand member, in contrast to the generally trochaic pattern of English. The difficulty is overcome, however, by independent evidence that iambicity can obtain by 'default', that is due to inherent inability to bear trochaic stress. In this connection, HV (pp. 63ff.) argue, following Rappaport (1984), that in Tiberian Hebrew, which has penultimate stress in general, syncope of the penultimate vowel results in apparent exceptions like *kaatbúu* (*uu* is a long vowel). Slightly adapting HV's discussion, we will suppose that the effect of syncope in Tiberian Hebrew is that of eliminating segmental material, leaving an empty position, and keeping the overall foot structure intact, as in *kaa*(*tabuu*) → *kaa*(*tØbuu*). Stress can then be seen as simply shifting to the only element fit to bear it in that foot. From this perspective, these cases are then only APPARENT exceptions to penultimate stress in Tiberian Hebrew, just HV argue. Analogously, cases like (*Øbàn*)*dánna* will now be only apparent exceptions to trochaic feet in English. Note that there are in fact sporadic cases in which iambicity obtains even with overt initial vowels, such as (*elòn*)*gátion*, (*elèc*)*trícity*, (*odòn*)*tólogy* (noted in *SPE*, p. 116), lending support to the proposed analysis. Such instances seem confined to light onsetless initials followed by a heavy syllable, but we will not attempt a more formal characterization here.

From the proposed general perspective, what is special about word edges is thus not that they allow monosyllabic feet, but rather that they are adjacent to empty structure, which can be metrified if needed (see also fn. 17). This predicts that, just as word-final empty structure is available not only to metrification, but to syllabification as well, witness 'superheavy' syllables, like that of *preVEN.T*, so should word-initial empty structure. This is correct, as *s* is known to occur 'extrasyllabically' word-initially, as in *S.trict*, etc. For us, there is no extrasyllabicity, or 'supersyllabicity' here any more than word-finally – just an extra syllable *Øs*, with a null vowel. Languages differ on whether such initial vowels needed for syllabification may be null, Spanish requiring a full one, as in *ES.tricto*. Analogously, languages differ on whether final vowels may be null, as we noted earlier.[67]

The plausibility of our analysis is underscored as well by the lack of alternatives. In particular, if we are correct in concluding that apparently

[67] This would seem to leave a residual asymmetry between the two edges, in that the null vowel of *pre*(*ventØ*), *in*(*habitØ*) is motivated independently of metrical structure by the requirement that words end in vowel, a reflex of a general principle of onset maximization, as suggested in Burzio (1987). In contrast, word-initially, a null vowel or syllable is motivated independently of metrical structure only in cases of 'extrasyllabic' *s*, but not in cases like (*Øban*)*danna*, etc. However, cases comparable to the latter exist word-finally as well. Within our framework, oxytones like *kangaroo*, must metrify a null syllable, which is obviously not motivated by the vowel-final requirement, but rather by metrical structure alone.

monosyllabic feet exist only at word edges, it is not easy to find alternative reasons why this should be the case. Note here that the conclusion that there is an asymmetry between the edges and the rest of the word is less than controversial, since it is essentially implied by HV's formulation of shortening given in (5) above and repeated in (112).

(112) *HV's shortening in a stress well*
(a) $V: \Rightarrow V / \sigma\_\_\_\sigma$
condition: V dominates a stress well
(b) Stress well $=_{def}$ a syllable whose level of stress is lower than that of an adjacent syllable.

In conjunction with (112), HV's also give a rule of 'destressing in a stress well' applying to light syllables and ordered after (112) (HV's (33)). This means that any target of (112) (resulting in a light syllable), will automatically also be the target of destressing. This system thus essentially ensures that, at least as far as open syllables are concerned, there will be no monosyllabic feet, except precisely at word edges, exempted by (112a).[68] With the basic facts thus not in dispute, the only question will be how to account for them. From the point of view of (112) there is no account – only a statement that edges are metrically exceptional. In particular, in contrast to our proposal, (112) establishes no relation between the metrical exceptionality of edges and the other noted exceptionality, the one relative to syllabification.

Note too that (112) is in any event not entirely accurate on the behaviour of either initial or final syllables. The former, because it predicts systematic immunity to shortening. As we have seen in (106)–(107), initial syllables actually *vary* between shortening and non-shortening. HV follow past literature here in taking lack of shortening in initial syllables to be systematic. Cases of shortening, like the ones we have cited, are occasionally noted, but regarded as 'exceptions' (Liberman & Prince, 1977: 284). The rule in (112)

[68] There are two cases in which the effects of HV's system would seem not to be quite as stated in the text. One is the configuration $\#\sigma_1\sigma_2\ldots$ with σ_2 bearing greater stress than σ_1. Here, σ_1 would be exempted from shortening because on the edge, and σ_2 because not in a 'stress well'. But if σ_2 has greater stress it must have primary, hence heading the rightmost foot, which – if monosyllabic – will make σ_2 final, thus abiding by the generalization that monosyllabic feet are only at the edges. The other case is the symmetrical counterpart $\ldots\sigma_1\sigma_2\#$, in which σ_1 bears greater stress than σ_2, thus presumably primary. This case is permitted by HV's analysis, at least the portion of it we are considering here, but to our knowledge it does not exist. A hypothetical case of this sort would be **salívàte* superficially similar to *adúmbrate*, which, however, does not have stress on *ate* in our analysis. Thus, by (112), there would/could be a small class of word-internal monosyllabic feet, but – to our knowledge – there are none.

As we discuss in greater detail in Burzio (1994), HV's system does allow more systematically for internal monosyllabic feet when CVC (rather than CV:) syllables are involved, such as *hàli(car)nássus*. We differ with this interpretation of the facts, however, seeing no such divergence between the two types of heavy syllables. We posit no stress on *car* in *halicarnassus*, only an unreduced *a*.

obviously also fails to account for lengthening as in (110)–(111). The systematic immunity to shortening of FINAL syllables predicted by (112) is also not completely true. In particular, it is not true in *infinite* (← *fInIte*), consistent with our formulation in (89) above, which makes AFFIXED STEMS the target of shortening. The reason why (112) appears nearly correct about final syllables is first that they are WITHIN an affixed stem (and still final) only when the affix is a PREfix, and second that within the cases of shortening triggered by prefixation, only the noted INFINITE happens to have a long vowel in the final syllable.

It now remains to determine why initial syllables give rise to well-formed feet only when they are heavy. In essence, we will argue that this continues to follow from the analogy with word-final position. For, in that position, we indeed find an asymmetry between the structure (*HW*), amply attested as in *pre*(*vent*Ø), *di*(*vIne*), and the structure *(*LW*), which is non-existent, witness **inha*(*bít*Ø), and other comparable cases. Apparent exceptions like *remít*, *confés*s require postulating a geminate closing the final syllable, analogous to the one closing the penultimate in *vanílla* and the like. This will account for the non-shifted stress in *remíttant*, due to the continued presence of the geminate, contrasting with the shifted one of *áspirant* (← *aspíre*), due to the non-continued presence of a long vowel.[69] The final geminate will also account for the absence of *CiV*-lengthening in (*confés*s →) *confés*sion and other similar cases (*SPE*, p. 149).[70] This type of analysis can be extended to all monosyllables with short vowels, like *shop*, *can*, *van*, *top*, etc., which we take to have the representations *shop*.*p*Ø, *can*.*n*Ø, etc. This extension of the analysis is indirectly supported by the phenomenon in (113).

(113) (sÍgnØ) ⇒ (sígnatu)re

Discussing this alternation, Halle & Mohanan (1985: 86) argue that it is best accounted for by supposing that the underlying representation of both items contains the cluster *gn*, which is then simplified in *sign*, presumably because unsyllabifiable in this context. The lengthening of the *i* they analyse as a case of 'compensatory' lengthening. While we agree with this interpretation, we find no reason for the lengthening, unless the structure with a short *i* was ill-formed. That it is ill-formed attests to the non-existence of feet (*LW*).[71] If feet

[69] There are, however, some sporadic cases in which degemination seems to occur, mirroring vowel shortening and resulting in comparable stress shifts, as in *refér*R/*réferent*, *búreaucràT*/*bureáucracy*, *télegràPH*/*telégraphist*, and a few others.

[70] Final geminates are also independently postulated by Myers (1987: 491) to reduce the alternation of *bIte*/*bit* to that of *keep*/*kept* (see section 11 below).

[71] This point stands despite the fact that some other option beside lengthening must be available for cases like *bomb*, *damn*, whose final clusters also simplify, but where lengthening does not occur. We may suppose that the phonetically simplified clusters remain structurally bipositional here, much like the presumed final geminates of *remit*, *shop*, etc.

(*LW*) do not exist, then *shop*, *can* must indeed have the structure *shop*.*pØ*, *can*.*nØ*.

Non-existence of (*LW*) is also implied by the contrasting cases in (114).

(114) (a) (pléase) ⇒ (pléasan)t
(b) (tÓne) ⇒ (tÓna)l

The shortening in (114a) suggests that the structure (*LH*) is a well-formed foot, at least word-initially, where lack of further syllables excludes a larger foot. Correspondingly, the failed shortening in (114b) suggests that the structure (*LL*) must not be comparably well formed. The number of cases which can verify the alternation of (114a) is actually small. Shortening occurs in *south/southern*, but *mIgrate/mIgrant*, *vIbrate/vIbrant*, *vAcate/vAcant*, fail to shorten. This may be the usual share of idiosyncrasy, or perhaps an indication that the structure (*LH*) is in fact only marginal as a rightmost foot. The former would seem more likely, since the structure (*LH*) is amply attested in non-derived items, like *honest*, *chemist*, *lizard*, *hazard*, *petard*, *wizard* (etym. ← *wIse*), *leopard*, *desert*, *gerund*, *second*, *brigand* and many others.[72] The pattern of (114b) has a few exceptions of its own, like *zeal/zealous/zealot*, *please/pleasure* (and, possibly *school/scholar* if relevantly related). These are significantly outnumbered by the regularities, however, some of which are listed in (115).

(115) Anal, bAsal, fEcal, fEtal, fOcal, lOcal, mOlal, nOdal, nOtal, sInal, tIdal, vIral, zOnal

lObar, plAnar, pOlar, vElar

fAmous, sErous, nOdous, fIbrous, nItrous, spInous

Furthermore, the shortening of (114b) partially extends to non-initial cases, where a larger foot could in fact be constructed, as in *appéar/appárent*, *adhére/adhérent* (possible with both short and long *e*), whereas the exceptional shortening of *zealous* is exclusively confined to the bisyllabic words noted (i.e. no case like *homicídal*, with a short *i*).[73] It would thus appear that in rightmost position the foot structure (*LL*) is essentially ill-formed, while (*LH*) is not. This asymmetry would follow from two assumptions. One is that there is an appropriate lower limit to foot weight, excluding (*LL*), the other is that non-head syllables also contribute to foot weight, hence placing (*LH*) in, while keeping (*LL*) out. Both assumptions are natural. If the notion of foot weight plays any role, it is clear that there will be some lower limit. It is also clear that non-head syllables contribute to

[72] A minimal contrast is *chémist/álchemist* (not **alchémist*), showing that indeed a light penultimate is only stressable if it is initial, unless stress preservation is involved, as in *appárent*, noted below.

[73] The contrast between *coherent*, possible with a short *e*, and *cohEsive*, attested only with a long *e* is significant in confirming the ill-formedness of (*LL*) or (*LW*) in contrast to (*LH*).

weight, since ($LL\sigma$) is well formed (cf. *américa*), while ($LH\sigma$) is not (cf. **ágenda*). If this is correct, then, since weak syllables surely contribute to weight less than non-weak ones (recall discussion of 'weak feet' in section 4 above), the structure (LW) will be excluded if (LL) is.

If final feet (LW) are thus excluded, then initial ones ($\emptyset L$) will be plausibly excluded on a par, since they are essentially just their iambic counterparts. This conclusion is consistent with the fact that the structure (LL), while excluded for rightmost feet as we just argued, is in fact permitted for non-rightmost ones, as in *ac(cele)rate*. Since (LW) instantiates a lower 'weight', we are free to suppose it remains excluded in non-rightmost position. The range of possibilities for binary feet headed by a light syllable can then be taken to be as in (116), which supersedes (22c) above.

(116)		*Non-rightmost*	*Rightmost*
(a)	(LH)	ok	ok
(b)	(LL)	ok	*
(c)	(LW)	*	*

As noted, we regard (116a) as free in rightmost position only when word initial (*pleasant*), and more marginal otherwise (*adherent/adhErent*). Initial feet ($\emptyset L$) are excluded as a subcase of (116c) as argued. Initial light syllables not incorporated into a larger foot will remain unmetrified – a necessary violation of the requirement that metrification be exhaustive.[74]

To sum up, the distribution of vowel length reveals that initial syllables can constitute separate feet if they are heavy, but not if they are light. We have proposed that apparent monosyllabicity is due to availability of empty structure word-initially, mirroring comparable availability word-finally, and that the exclusion of light syllables reduces to more general constraints on foot weight, which hold as in (116).

Recall now that at the beginning of this article, we noted an apparent argument for the notion of syllable extrametricality suggested by Myers's analysis of vowel length. It rested on the parallelism of *di(vini)⟨ty⟩* and *(reci)tation*, both shortening in binary feet. In the course of our discussion, we defused that argument, proposing an alternative interpretation of vowel length, which was at least as successful as Myers's, and in fact more general. We can now see that the facts of this section turn vowel length completely against syllable extrametricality and the foot typology it engenders. This can

[74] This is in fact a form of extrametricality applicable word-initially, not completely dissimilar from the one applicable word-finally. Note here that once the range of possibilities for right- and left-edge extrametricality is thus defined, along with the range of possible feet, the common notion that metrification is 'directional', proceeding right to left, or left to right, becomes quite irrelevant.

be seen by considering the alternations in (117) analysed in terms of syllable extrametricality.[75]

(117) (a) (pléa)se ⇒ (pléa)⟨sant⟩
(b) (pró)⟨duct⟩ ⇒ (prÒ)(dúct)⟨ion⟩

The final syllables of both *pleasant* and *product* must be extrametrical because this kind of framework postulates (*H*) and (σL) as the only possible feet (at the right edge). Non-application of extrametricality would give **pleasánt*, **prodúct* instead. But if extrametricality applies as in (117), then both *product* and *pleasant* violate the generalization that single light syllables cannot constitute a foot on their own. More importantly, the analyses in (117) make it impossible to provide any metrically based account of the differences in vowel length. For, in (117b) the syllable *plea* is in exactly the same kind of foot in both cases, as is the syllable *pro* in (117b). Note, too, that the alternations in (117) cannot have a purely (non-metrical) morphological source, since affixation results in shortening in (117a), but lengthening in (117b). Also, affixation fails to produce shortening in *tOne/tOnal*, morphologically parallel to (117a). The differences in vowel length in (117) thus require our proposed bisyllabic metrifications (*produc*)*t*, (*pleasan*)*t*, which are then consistent with the exclusion of feet with a single light syllable instantiated by **bànána*, and which imply that there is no syllable extrametricality.

We may also note here that the non-existence of the structure (*L*) or (σL) implies that cases like *sátIre*, *tábloid*, *sémIte* also have bisyllabic metrifications, further supporting our claim of section 3 above that long vowels in final syllables are NOT always stressed (*contra* long-standing assumptions going back to *SPE*, p. 72).

11. Conclusions

The goal of this article was to present an account of vowel length in English and to underscore the appropriateness of a modular conception of phonological theory in this domain. The module which we have taken to be at work is metrical theory, the theory independently needed to relate sequences of syllables to patterns of stress. We have argued that a single condition prescribing short vowels in affixed stems within the Latinate vocabulary, or 'Generalized Shortening' (GS), suffices to account for a wide array of phenomena when combined with metrical theory. The latter is understood as consisting of two major components of its own, one a general principle of stress preservation (SP), requiring that stem stresses be preserved in word formation, the other a characterization of well-formed feet. These

[75] The final consonant of *please* and similar cases is extrametrical in Hayes's (1982, 1985) original analysis. HV employ an equivalent provision.

three components GS, SP and the characterization of well-formed feet, have been seen to interact in the manner of (118a, b, c).

(118) In word formation (Latinate vocabulary)
- (a) *GS*: Stem vowels are short iff well-formed feet result.
- (b) *SP*: Stem stresses are preserved iff well-formed feet result.
- (c) *GS/SP*: If the conjunction of (a) and (b) cannot be satisfied, then either (a) or (b) is satisfied.

The cases in (119) have been shown to be instances of GS (118a) with respect to the italicized vowel.

(119)
- (a) di(v*i*nity)
- (b) (re*c*i)tation
- (c) o(bl*i*ga)tory
- (d) (ple*a*san)t
- (e) (excl*a*)mation
- (f) ar(ticul*a*)tory

Those in (119a–d) are simultaneously also instances of SP (118b) with respect to the same italicized vowel, while those in (119e–f) are not, as SP cannot be satisfied here. The cases in (120) have been shown to be instances of GS/SP (118c) with respect to each italicized vowel (lengthening and non-shortening being non-distinct for GS).

(120)	*GS*	*SP*
(a)	(blasph*e*mous)	de(s*I*rou)s
(b)	(gener*a*)tive	inno(v*A*ti)ve
(c)	ar(ticul*a*)t-ry	articu(l*A*to)ry
(d)	ce(sar*e*a)n	(s*o*pho)(clEa)n
(e)	t*i*(tanicØ)	(Ø*tI*)(tanicØ)
(f)	pr*o*(ductio)n	(Ø*prO*)(ductio)n

In addition, we have argued that the long vowels in (121) also result from metrical theory, the characterization of well-formed feet in particular.

(121)
- (a) va(rIety)
- (b) ca(nAdia)n
- (c) (sIgnØ)

To our knowledge, (119)–(121) are an exhaustive list of vowel-length phenomena in English, aside from the type of *keep/kept*, *wIde/width*, analysed in Myers (1985, 1987). Myers shows that these alternations follow from general constraints on syllable structure. In essence, he claims that the insertion of one additional consonant into a fixed syllable structure requires the loss of another unit elsewhere in the structure, whence the shortening. Adapting his analysis to some of our general assumptions, relevant derivations would be as in (122).

(122)
- (a) kee.pØ ⇒ kep.tØ
- (b) wI.de ⇒ wid.thØ

That is, we are suggesting that the distinction between the 'irregular' past morpheme of (122a) and the regular one of *peeped* is that the former attaches to the stem by removing its final null vowel, whereas the latter keeps it, as in *pee.pØ.dØ*, or *see.de.dØ*, in which the latter vowel becomes overt. The dichotomy generalizes to other cases, so that the regular plural or third-person morpheme *s* will be like the regular past, while nominalizer *-th* of (122b) and the other suffixes discussed by Myers are like the irregular past. In conjunction with Myers's analysis of cases like (122), which we have slightly adapted, our discussion thus advances the thesis that vowel length in English always reflects properties of some independent module: either metrical theory or syllable theory, and is never the result of some specific rule. Our generalized shortening is the only possible residue in this connection, hopefully to be reduced to more general principles too.

Our analysis has consequences for metrical theory, the definition of possible feet in particular. Having identified both SP and GS on the basis of some notion of metrical theory, we can as well reverse the pattern of deduction and employ GS and SP to identify the right metrical theory. In particular, we can ask what definition of well-formed foot would make (118a, b, c) above, which seem rather minimal and natural, hold true. When thus used as diagnostics, SP and GS give the answers in (123)–(128).

(123) $(\sigma L \sigma)$
- (a) SP: per(s*o*nifi)cation
- (b) GS: (gener*a*)tive

(124) $*(\sigma H \sigma)$
- (a) SP: *(l*a*ryngo)logic
- (b) GS: *(demonstr*a*)tive

(125) non-rightmost: $(L\sigma)$
- (a) SP: me(d*i*ci)nality
- (b) GS: (re*c*i)tation

(126) rightmost: $*(LL)$
- (a) SP: *blas(ph*e*mou)s
- (b) GS: *(t*o*na)l

(127) rightmost: $?(LH)$
- (a) SP: co(heren)t/*as(piran)t
- (b) GS: (pleasan)t

(128) medial: $*(\sigma)$
- (a) SP: *in(for)mation
- (b) GS: *ex(pla)nation/*ex(plA)nation

In short, if one abstracts away from the special behaviour of word edges, both patterns of stress preservation and of shortening reveal that, at least in English, foot structure has exactly the three options of (22) above repeated

in (129), the first two being available quite generally, while the third is distributed somewhat asymmetrically as in (22c)/(116) above.

(129) (a) (σ L σ)
(b) (H σ)
(c) (L σ)

While we have provided an analysis that integrates the behaviour of word edges with the typology in (129), the latter challenges certain prevalent assumptions on foot typology tied to the notion of syllable extrametricality, which exclude ternaries and include unaries.

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REFERENCES

Allen, M. (1978). Morphological investigations. Doctoral dissertation, University of Connecticut.

Aronoff, M. & Sridhar, S. N. (1983). Morphological levels in English and Kannada; or atarizing Reagan. In Richardson, J., Marks, M. & Chukerman, Amy (eds.) *Papers from the parasession on the interplay of phonology, morphology and syntax*. Chicago: Chicago Linguistic Society. 3–16.

Bromberger, S. & Halle, M. (1989). Why phonology is different. *Linguistic Inquiry* **20**. 51–70.

Burzio, L. (1987). English stress. In Bertinetto, P. M. & Loporcaro, M. (eds.) *Certamen phonologicum, papers from the 1987 Cortona Phonology Meeting*. Turin: Rosenberg & Sellier. 153–175.

Burzio, L. (1989). Prosodic reduction. In Kirschner, C. & Decesaris, J. (eds.) *Studies in Romance linguistics*. Amsterdam: John Benjamins. 51–68.

Burzio, L. (1990). English vowel length and foot structure. In Bertinetto, P. M., Kenstowicz, M. & Loporcaro, M. (eds.) *Certamen phonologicum II, Papers from the 1990 Cortona Phonology Meeting*. Turin: Rosenberg & Sellier. 121–145.

Burzio, L. (1991). On the metrical unity of latinate affixes. In Germán Westphal, Benjamin Ao, & Hee-Rahk Chae, eds. *Proceeding of the Eighth Eastern States Conference on Linguistics*, Department of Linguistics, Ohio State University. Reprinted in *Rivista di Grammatica Generativa* **16**, 1–27.

Burzio, L. (1992). Principles in phonology. In E. Fava, ed. *Proceedings of the XVII Meeting on Generative Grammar* (Trieste, February 22–24, 1991), 97–119. Turin: Rosenberg and Sellier.

Burzio, L. (1994). *Principles of English stress*. Cambridge: Cambridge University Press.

Burzio, L. (in press). Metrical consistency. In E. Ristad, ed. *Proceedings of the DIMACS Workshop on Human Language*, American Mathematical Society, Providence RI.

Burzio, L. & DiFabio, E. (in press). Accentual stability. In *Issues and Theory in Romance Linguistics* (*LSRL XXIII*), Georgetown University Press, Washington, D.C.

Chomsky, N. (1973). Conditions on transformations. In Anderson, S. & Kiparsky, P. (eds.) *A festschrift for Morris Halle*. New York: Holt, Rinehart & Winston. 232–286.

Chomsky, N. (1986). *Knowledge of language: its nature, origins and use*. New York: Praeger.

Chomsky, N. & Halle, M. (1968). *The sound pattern of English*. New York: Harper & Row.

Chung, S. (1983). Transderivational relationships in Chamorro phonology. *Lg* **59**. 35–66.

Clements, N. (1985). The geometry of phonological features. *Phonology Yearbook* **2**. 223–250.

Clements, N. & Keyser, S. J. (1983). *CV phonology: a generative theory of the syllable*, Cambridge, MA: MIT Press.

Cohn, A. (1989). Stress in Indonesian and bracketing paradoxes. *Natural Language and Linguistic Theory* **7**. 167–216.

DiFabio, E. (1990). The morphology of the verbal infix /-isk-/ in Italian and in Romance. Doctoral dissertation, Harvard.

Everett, D. & Everett, K. (1984). On the relevance of syllable onsets to stress placement. *LIn* **15**. 705–711.
Fabb, N. (1988). English suffixation is constrained only by selectional restrictions. *Natural Language and Linguistic Theory* **6**. 527–539.
Fudge, E. (1984). *English word-stress*. London: George Allen & Unwin.
Giegerich, H. (1981). Zero syllables in metrical theory. Dressler, W. U., Pfeiffer, O. E. & Rennison, J. R. (eds.) *Phonologica 1980: Akten der vierten internationalen Phonologietagung, Wien, 29 Juni – 2 Juli 1980*. Innsbruck: IBS. 153–159.
Giegerich, H. (1985). *Metrical phonology and phonological structure: German and English*. Cambridge: Cambridge University Press.
Goldsmith, J. (1979). Autosegmental phonology. Doctoral dissertation, MIT.
Goldsmith, J. (1990) *Autosegmental and Metrical Phonology*, Basil Blackwell, Oxford.
Gussenhoven, C. (1988). Lexical accent rules in English. Ms., Nijmegen University.
Halle, M. & Kenstowicz, M. (1991). The free element condition and cyclic versus noncyclic stress. *Linguistic Inquiry* 22.3, 457–501.
Halle, M. & Mohanan, K. P. (1985). Segmental phonology of modern English. *LIn* **16**. 57–116.
Halle, M. & Vergnaud, J. R. (1987a). *An essay on stress*. Cambridge, MA: MIT Press.
Halle, M. & Vergnaud, J. R. (1987b). Stress and the cycle. *Linguistic Inquiry* **18**, 45–84.
Hayes, B. (1981). A metrical theory of stress rules. Doctoral dissertation, MIT, published by Indiana University Linguistics Club, Bloomington.
Hayes, B. (1982). Extrametricality and English stress. *LIn* **13**. 227–276.
Hayes, B. (1985). *A metrical theory of stress rules*. New York: Garland. (Same as Hayes, 1981.)
Hyman, L. (1985). *A theory of phonological weight*, Dordrecht: Foris.
Iverson, G. (1990). Stipulated extraprosodicity in syllabic phonology. *Language Research* 26.3, 515–552. Seoul National University, South Korea.
Kahn, D. (1976). Syllable-based generalizations in English phonology. Doctoral dissertation, MIT.
Kenyon, J. & Knott, T. A. (1944). *A pronouncing dictionary of American English*. Springfield, G. C. Merriam.
Kiparsky, P. (1973). Elsewhere in phonology. In Anderson, S. R. & Kiparsky, P. (eds.) *A festschrift for Morris Halle*. New York: Holt, Rinehart & Winston. 93–106.
Kiparsky, P. (1979). Metrical structure assignment is cyclic. *LIn* **10**. 421–442.
Kiparsky, P. (1982). Lexical morphology and phonology. In *Linguistics in the morning calm*. Seoul: Hanshin. 3–91.
Lehiste, I. (1970). *Suprasegmentals*. Cambridge, MA: MIT Press.
Liberman, M. & Prince, A. (1977). On stress and linguistic rhythm. *LIn* **8**. 249–336.
McCarthy, J. (1988). Feature geometry and dependency: a review. *Phonetica* **43**. 84–108.
Mohanan, T. (1989). Syllable structure in Malayalam. *LIn* **20**. 589–625.
Myers, S. (1985). The long and the short of it: a metrical theory of vowel quantity. *Proceedings of the 21st regional meeting of the Chicago Linguistic Society*. Chicago, IL. 275–288.
Myers, S. (1987). Vowel shortening in English. *Natural Language and Linguistic Theory* **5**. 485–518.
Nanni, D. (1977). Stressing words in *-Ative*. *LIn* **8**. 752–763.
Pesetsky, D. (1985). Morphology and logical form. *LIn* **16**. 193–246.
Prince, A. (1983). Relating to the grid. *LIn* **14**. 19–100.
Prince, A. (1991). Aspects of prosodic minimality. Lecture, University of Maryland at College Park (2 Jan. 1991).
Rappaport, M. (1984). Issues in the phonology of Tiberian Hebrew. Doctoral dissertation, MIT.
Ross, J. R. (1972). A reanalysis of English word stress. In Brame, M. (ed.) *Contributions to generative phonology*. Austin and London: University of Texas Press. 229–323.
Rubach, J. (1984). Segmental rules of English and cyclic phonology. *LIn* **60**. 21–54.
Sagey, E. (1986). The representation of features and relations in nonlinear phonology. Doctoral dissertation, MIT.
Siegel, D. (1974). *Topics in English morphology*. New York: Garland.
Steriade, D. (1982). Greek prosodies and the nature of syllabification. Doctoral dissertation, MIT.
Steriade, D. (1988). Greek accent: a case for preserving structure. *LIn* **19**. 271–314.
Vogel, I. & Scalise, S. (1982). Secondary stress in Italian. *Lingua* **58**. 213–242.