

Modern Greek Accent and Faithfulness Constraints in OT*

Abstract

In Modern Greek nominals, the accent is sometimes faithful to the properties of stems, and sometimes to those of affixes. Several facts challenge solutions based on any simple ranking of faithfulness constraints in OT, however. These include the fact that accentual dominance of affixes correlates with their semantic markedness (marked Case; marked number); the fact that neighboring cells within a paradigm tend to be accentually uniform; and the fact that control of accent shifts from affix to stem when stems are followed by Class Markers. These facts are argued to motivate an approach in which faithfulness effects and their relative magnitudes are not primitive notions, but are rather derived in certain specific ways that take account of both the internal structure of representations and their overall distance in space.

1.	The Empirical Problems	1
2.	The Theoretical Framework	6
3.	Dominant versus Recessive Affixes	14
3.1	Nominals in -os	14
3.2	Entailments and Morphological Syncretism	17
3.3	Markedness and FAITH-AFFIX	25
4.	Oxytonic Stems	35
4.1	Multiple Correspondence	35
4.2	The Nature of Morphological Irregularity	39
5.	Augmented Stems	42
5.1	Class Markers and FAITH-STEM	42
5.2	Accentual and Segmental Syncretism	47
5.3	PU versus Epenthesis: Proparoxytonic Stems	50
6.	Stress variation in proparoxytones	57
7.	Entailments versus Head-dominance	61
8.	Conclusions	65
	References	66

* Acknowledgments

September 26, 2005

1. The Empirical Problems

The present article builds on the analysis of stress in Modern Greek (MG) nominals in Revithiadou (1998), (1999), but proposes crucial modifications in light of certain challenges. In MG, stress falls on one of the last three syllables in the word. Within that window, the stress of nouns is controlled by the properties of morphemes –stems or affixes, in the way partially illustrated in (1).

(1)	Affix	Stem	άνθρωπ- ‘man’	kubár- ‘godfather’
a.	Recessive: NOM.SG.	-os	άνθρωπ-os	kubár-os
b.	Dominant: GEN.PL.	ῶ-on	ανθρώπ-on	kubár-on

As Revithiadou shows, such morphological control is expressible within Optimality Theory (OT) in terms of the role of Faithfulness (FAITH) constraints. Consider first that, in a system in which no such morphological control existed, the phonological markedness (MARK) constraints that define the preferred stress pattern of the language would have to dominate FAITH, as in (2).

(2) **Phonologically determined stress:** MARK (stress) >> FAITH(stress)

By contrast, a system in which stress is determined lexically will feature just the opposite ranking.

However, in MG as in many languages, lexical/ morphological control is not absolute, but occurs only within a given window, hence requiring FAITH to dominate only some of the markedness constraints.

Schematically, this situation is describable as in (3a), and the case of MG as in (3b).

(3) **Morphologically determined stress within a phonologically given window:**

- a. Schema: MARK (window) >> FAITH >> MARK (default)
- b. MG: 3-σ# >> FAITH >> ANTEPEN

In (3b), the constraint ‘3-σ#’ encapsulates the effects of a set of constraints that compel the stress to be

on one of the last three syllables. Similarly, ANTEPEN encapsulates the effect of constraints that require the stress in MG to be on the antepenultimate syllable. It follows from the ranking in (3) that the metrical properties of morphemes, enforced via FAITH, will be able to force the stress away from the antepenultimate syllable as in some of (1), but never outside of the three-syllable window. The ability to characterize such hybrid systems is one of the virtues of Optimality Theory.

Several techniques are then available to produce the three-syllable window as well as the default antepenultimate pattern. One modeled after Burzio (1994) would work as illustrated in (4).

(4)	...σσσ#	* OTHER FOOT	FAITH-STRESS	* (σ ø)#	* (σσ)#	* (σσσ)#
a.	☞ ... (σσσ)#					*
b.	...σ(σσ)#				*	
c.	...σ(σø)#			*		

The hierarchy in (4) expresses the claim that the optimal foot in MG, at least at the right edge of the word, is trisyllabic, as represented by the bottom-ranked constraint. A less favored option in (4) is a bisyllabic foot, a degenerate version of which is a foot with a ‘catalectic’ syllable ø (Giegerich 1981; Burzio 1987, 1994; Kiparsky 1991) yielding oxytonic stress as in *ura(nósø)* ‘sky’. Such degenerate foot is presumable more strongly disfavored, as in the higher-ranked * (σ ø)#. All other conceivable foot options would be excluded by undominated constraints encapsulated in *OTHER FOOT in (4). A constraint ensuring that feet are trochaic: FOOT FORM: TROCHEE is also required. Further constraints would also be needed to exclude unparsed (extrametrical) syllables at the right edge, and to ensure that the rightmost foot receives primary stress. These goals can be achieved, respectively, by ALIGN FOOT RIGHT and END RULE RIGHT (the rightmost foot is the prosodic head), both utilized in Revithiadou (1999) and refs. Under the approach in (4), the three syllable window would arise from the

undominated character of the latter several constraints and *OTHER FOOT, while default antepenultimate stress as in candidate (4a) would arise from the bottom-ranked character of *($\sigma\sigma\sigma$)#. Candidates (4b, c) would each be optimal instead when expressing a stress present in the input. Note that FAITH-STRESS in (4) must be understood as penalizing only stress changes, not adding stress to a stressless input.

An alternative technique, closer to mainstream and in line with Revithiadou (1998), (1999) is illustrated in (5).

(5)	... $\sigma\sigma\sigma$ #	FAITH-STRESS	FOOT BINARITY	NON FINALITY
a.	☞ ...($\acute{\sigma}\sigma$) σ #			
b.	... σ ($\acute{\sigma}\sigma$)#			*
c.	... σ ($\acute{\sigma}$)#		*	

As before, other, undominated constraints would also be needed in addition to those shown in the tableau, including one prohibiting ternary and larger feet similar to *OTHER FOOT of (4). This would be needed in addition to FOOT BINARITY, since the latter is violable in (5), as both candidates (5b, c) could be optimal when favored by the input. Alternatively, however, one could take FOOT BINARITY to be undominated, and analyze oxytonic stress (5c) as involving a catalectic syllable as in (4c) above, a possibility Revithiadou (1999, 101) entertains in passing. As before, the three syllable window would be defined by undominated constraints, not explicitly given in (5), while multiple options within that window would follow from the ability of FAITH-STRESS to force violations of the other two constraints in (5). The exact characterization of both the three syllable window and of default stress will be largely immaterial to the ensuing discussion, and the possibilities in (4) and (5) are presented here only for concreteness. In fact, the claim that antepenultimate stress is the default pattern in MG is itself not

(7) **Problem I:** Dominant behavior of affixes correlates with their morphological markedness.

Affixes which, like the Nominative Singular *-os* of (1), express what is commonly viewed as a morphological default (unmarked Case, unmarked number) are metrically recessive, while affixes which are morphologically more contentful, like Genitive Plural *-on* (marked Case, marked number) are metrically dominant. There is no reason from the point of view of (6) or within the standard resources of OT why this correlation should hold.

(8) **Problem II:** Dominant affixes appear to behave recessively with oxytonic stems.

With such stems, the normally pre-stressing affixes *-u*, *-on*, *-us* receive final stress, as shown by the comparison in (9).

(9)	Affix \ Stem	άνθρωπ- ‘man’	υραν-ὐ ‘sky’
a.	Dominant: GEN.SG ὐ-u	ανθρώπ-u	υραν-ύ
b.	Dominant: GEN.PL. ὐ-on	ανθρώπ-on	υραν-όν
c.	Dominant: ACC.PL. ὐ-us	ανθρώπ-us	υραν-ús

This reversal of behavior is puzzling unless the antepenultimate stress of cases like *άνθρωπ-os* in (1) were taken to reflect just the default stress pattern rather than a lexical marking (unmarked stem, unmarked affix), the option just considered in passing. In that case, one could take FAITH-STEM to always dominate FAITH-AFFIX, contrary to (7). This line of analysis is in fact that of Revithiadou (1998), (1999). Again, we continue to put this possibility aside, returning to it in section 7 below, where we argue it is inadequate. The third and final problem is described in (10).

(10) **Problem III:** Dominant affixes behave recessively with augmented stems.

In certain cases, stem (or ‘root’) morphemes are followed by a class marker augment (CM) like the *-i-*

of (11).

	Affix	Stem	stratiót- ‘soldier’	manáv- ‘grocer’
a.	Recessive: NOM.SG.	-s	stratiót-i-s	manáv-i-s
b.	Dominant: GEN.PL.	-ón	stratiot- -ón	manáv-i-δ-on

When CMs precede a vowel initial suffix like GEN.PL. *-on*, the resulting hiatus is repaired either by deletion of the CM, as in *stratiot-ón*, or by epenthesis of [ð], as in *manáv-i-ð-on*. The point of relevance is that whenever the stem occurs augmented by the CM, otherwise dominant affixes recede, yielding to the metrical properties of stems, as shown by the shaded cell in (11) and ungrammatical counterpart **manav-i-δ-ón*. Stressed *-ón* of (11b) is an independently listed allomorph of the pre-stressing *ón* of (9b), a point to which we will return. However, like the latter, it is a dominant affix.

The reversal of behavior in (11) is then again unexpected under the simple approach of (6).

The rest of the paper will now proceed as follows. In the next section we lay out our theoretical premises. In sections 3-5 we address problems I-III above, respectively. Section 6 refines the analysis in light of certain cases of variation. Section 7 compares our analyses with Revithiadou’s Head-dominance theory. Section 8 concludes.

2. The Theoretical Framework

The present work will offer solutions to Problems I-III above based on the framework of Burzio (2002a, b), (2005a, b). The latter is an extension of both Prince and Smolensky (1993) and certain aspects of Burzio (1994). Its main characteristics are described in (12)-(16) below.

- (12) **General Architecture (Burzio 2002a, b), (2005a, b):** There is no ‘Underlying Representation’ (UR). Surface forms are evaluated in parallel by three sets of constraints:
- a. **Markedness** (As in Standard OT)
 - b. **Input-Output FAITH** (Essentially as in Standard OT, but see below)
 - c. **Output-Output FAITH** (As in other OT work, but as part of the ‘Morphology’)

Within this approach, morphological relations are subsumed under Output-Output Faithfulness (OO-F) relations as indicated in (12c). That is, it is not the case that there is a Morphology module that gives rise to certain word-to-word similarities (e.g. *prevent/prevent-able* featuring the same morpheme */prevent/*) and -in addition- a set of Output-Output Faithfulness constraints that also enforce word-to-word similarities. Instead, this approach maintains the obviously desirable unification of resources under a parallel architecture: Output-Output Faithfulness constraints *are* Morphology. For instance, the English suffix *-able*, of *prevent-able* requires its stem to be faithful (surface-to-surface) to a verb that independently occurs in the lexicon, like *prevent*. This can be expressed by a constraint of the form in (13a) below. Similarly, in an inflectional paradigm or paradigm fragment, like the Greek pair *ánthrop-os/ anθróp-on* of (1) above, either affix requires its stem to be faithful to a structure *X* such that *X* also occurs followed by the other affix, as expressed in (13b).

(13) **Morphology as Output-Output Faithfulness Constraints:**

- | | |
|-----------------------------|---|
| a. prevent/
prevent-able | -al ⇒ / X __ ; X = V (Base Identity)
‘-able occurs in the context of an X, where X occurs as a verb in the lexicon’ |
| b. ánθrop-os/
anθrop-ón | -on ⇒ / X __ ; X = / __ -os (Paradigm Uniformity)
‘-on occurs in the context of an X, where X also occurs in the context of -os’ |

Hence, the constraints in (13) are simultaneously both types of subcategorization frames for the relevant affixes expressing morphological relations, and types of Faithfulness constraints in OT. The constraint in

(13b) is violated by the stress difference in the two examples. As indicated, the effect characterized in (13a) is one that is sometimes referred to in the literature as ‘Base Identity’, while the one characterized in (13b) is referred to as ‘Paradigm Uniformity’(PU).

The notion of Output-Output Faithfulness has come to be widely adopted in OT work. See Benua (1995), (1997), Kenstowicz (1995), (1996) (1997), Steriade (2000), McCarthy (2000), and several of the contributions to Downing, Hall, and Raffelsiefen (2005). The framework of (12) above goes further than other work, however, in taking OO-F to constitute a type of parallel morphological system as just described, thus dispensing with the traditional notion of Underlying Representation. That is, once allomorphs are related to one-another via OO-F, there seems no reason to also relate them via a common input –the UR. In the revised perspective, surface allomorphs can then be freely associated with independent inputs rather than being bound to a common one. As argued in Burzio (2000), (2002a, b), this move provides an effective characterization of morphological irregularity, in the manner illustrated in (14).

(14) **Morphological Irregularity as IO-FAITH**

Input:	/EVIT-able/	IO-F	OO-F	Input:	/compULS-ive/	IO-F	OO-F
Base:	[avoid] ?			Base:	[compel]		
a.	avoid-able	*		a'.	compell-ive	*	
b.	evit-able		*	b'.	compuls-ive		*

As argued in the references, the OO-F that English ‘Level 1’ affixes like *-al*, *-able*, *-ive*, impose on their stems appears to be generally low-ranked, so that it is often overridden by input information under IO-F, thus resulting in bound stems such as the one in (14b) and other types of morphological irregularity such as that in (14b’). Nonetheless, parts of the stem in (14b) are in regular correspondence

with the independent item [compel]. Both inputs in (14) are given as identical to the outputs for explicitness and consistency with Prince and Smolensky's (1993) 'Lexicon Optimization'. It is, however, specifically the portions given in upper case that override the OO-F relation to an independent item in the lexicon. Morphology will thus exhibit irregularity when IO-F dominates OO-F as in (14), while the opposite ranking, holding of the English Level 2 affixes, will reverse the results in (14) yielding regular *avoid-ing/ -ed*, *compell-ing/ -ed* instead, not **evit-ing/ -ed*, **compuls-ing/ -ed*, etc.

Note that the inputs in (14) do not constitute Underlying Representations not only because they are at variance with the corresponding inputs for the base forms, but also because they do not establish a separate level of representation, being non-distinct from the surface forms under Prince and Smolensky's Lexicon Optimization. In this perspective, an input can be taken to differ from the output for the purpose of computation, to see which output it *would* yield. Lexical storage, however, is taken to consist of outputs, not unoptimized inputs. See Burzio (2000), (2002a, b), (2005a, b) for more detailed discussion of this point.³ We will see below that postulating independent inputs for

³ The base for *evitable* (attested alongside fo the more common *inevitable*) is given as [avoid] with a question mark due to the sharp phonological dissimilarity. Nonetheless, an OO-F relation is expected given the related meaning (see discussion of entailments and attraction below). One reviewer raises the question of how this system might fare as regards the process of acquisition. The answer is: better than alternatives, as explained next.

In the proposed system, Level 1 morphology constitutes a set of weak associations (weak schemas in the sense of Bybee 1985, 1988). Such associations can be overridden by lexical information (input). Acquiring violations of OO-F will not be very different from acquiring violations of No CODA e.g. in the word *Kan.sas*. No CODA is satisfied whenever the input happens to be compliant, as in *A.me.ri.ca.*, and violated otherwise, just like OO-F. In this perspective acquisition of morphology consists of progressive summation of entailments from individual surface representations as noted below. In contrast, acquisition of UR-based morphology would be more complex, requiring more radical updates of the lexicon. Thus, surface forms must be stored first to provide a sufficient inferential basis for discovering URs and morphemes, at which point morphemes must be stored instead, for

morphologically related forms also provides an adequate characterization of lexical control of phonological variation.⁴

A second main characteristic of the adopted framework beside the one in (12) is the one described in (15).

(15) **Faithfulness from Entailments (Burzio 2002a, b, 2005a, b):**

- a. The OT notion of Faithfulness (both IO-F and OO-F) is derived from the more elementary notion of ‘Representational Entailment’ (RE). The rank of a Faithfulness constraint in each individual case is the result of summation over REs. The REs pertain to the hypothesis in (b).
- b. **Representational Entailments Hypothesis (REH):** ‘Mental representations of linguistic expressions are sets of entailments. E.g. a representation consisting of A and B corresponds to the entailments: $A \rightarrow B$, $B \rightarrow A$ (if A, then B; if B, then A)’.

The REH of (15) is introduced to account for what appears to be a pervasive generalization that representations interact with one-another in a way similar to attraction of bodies: the shorter the distance, the stronger the mutual attraction or tendency to neutralize into a single representation. The way in which (15) would give rise to attraction is illustrated in (16).

reasons that are not particularly apparent. Matters are made worse by the fact that morphemes and URs are ultimately insufficient given the suppletive allomorphy of (14). By contrast, the present system reduces the difference between regular and suppletive allomorphy to constraint ranking, the basic tool in OT.

⁴ McCarthy (2003) attempts a defense of UR on the basis of Arabic cases which parallel the English alternation of *[dæm]/ [dæmn]-ation*. McCarthy correctly notes that the derivative in such cases cannot be fully calculated from the base since it contains material that the base does not have, here the stem final [n]. He concludes that the derivative therefore needs to have access to a UR. The correct conclusion, however, is only that the derivative needs to have access to an input, which is fully consistent with the present discussion. There is no argument that such input must be a UR. This class of cases is in fact explicitly addressed in Burzio (2000, 62-64), which undercuts McCarthy’s objection.

(16) a. Entailments violated by $\neg D$ in R2,
for R1= A, B, C, D:

	A \Rightarrow D			
	B \Rightarrow D	A \Rightarrow D		
	C \Rightarrow D	B \Rightarrow D	A \Rightarrow D	
	1	2	3	4
	A	A	A	\neg A
	B	B	\neg B	\neg B
	C	\neg C	\neg C	\neg C
	\negD	\negD	\negD	\negD

b. Varying R2:

The illustration in (16) considers a four component representation R1= A, B, C, D and a representation R2 which varies from near-identity to R1 as at point 1, to complete mis-identity as at point 4, as in (16b). The presence of $\neg D$ in R2 violates certain entailments generated by R1, which are reported in (16a). The number of violated entailments is directly proportional to the degree of identity between the R1 and R2, hence inversely proportional to their mis-identity or geometrical distance: at point 1, where distance is minimal, three entailments are violated by $\neg D$ in R2 as indicated in (16a). At point 2, however, only two entailments are violated. The reason for the difference is that, at point 2, R2 no longer features C, hence the entailment 'C \Rightarrow D' due to R1 is now (vacuously) satisfied. The number of violated entailments continues to decrease linearly at points 3 and 4, as one can verify. Hence R2 is attracted to R1 in the sense that each of its components like $\neg D$ of (16b) is under compulsion to conform with the value it would have in R1 in a way that depends on the prior degree of similarity or proximity in space of R1 and R2.

A brief review of both conceptual and empirical issues surrounding the REH may be in order. The REH (15b) corresponds to a well-known principle of neural behavior known as Hebbian learning (Hebb 1949), according to which neurons that are active simultaneously develop connections that tie their activation together in a structural way, thus effectively recording the structure of the stimulus. The REH embodies this very principle in that, given two components A and B that co-occur analogously to

two neurons A and B that detect those components and are thus simultaneously active, mental representation would take A to entail B and B to entail A in analogy to the activation-spreading connection. In the realm of neural net modeling, the REH is more specifically parallel to a Hopfield net (Hopfield 1982), featuring full connectivity of units (each being connected to each of the others). Like neural nets, the REH thus presupposes distributed representations. The simple reason for this in the present context is that, for the entailments due to a representation R1 to be at all relevant to some other representation R2 as in the discussion of (16), it must be the case that those two representations share the same units, like A, B, C, D of (16), namely that they are ‘distributed’ over those units. There would be no reason for this interaction otherwise. Hence, while the REH may well seem radical from the point of view of traditional linguistics, it is nonetheless natural as a well established concepts in cognitive science. In addition, when integrated into a theory of morpho-phonology, the REH reveals a host of desirable empirical consequences that are beyond the reach of traditional machinery. Only some of these will be utilized in the present paper. Several of these consequences center around the attraction effect illustrated in (16). Such effect is applicable to phonemic inventories in ways that subsume the notion of ‘dispersion’ used to characterize such inventories (Lindblom 1986, Flemming 1995). Under the REH, maximal dispersion corresponds to minimal attraction, hence maximal harmony or stability, whereas poor dispersion may result in neutralizations. The REH predicts that attraction effects should be more general, however, not just a property tied to the perception of vowels or consonants. This prediction is confirmed by two well recognized patterns of allomorphy: the ‘Non-Derived Environment Blocking’ (NDEB) and the ‘Lexical Conservatism’ (LexCon). The first phenomenon is represented by cases in which a phonological process P2 applies only if some other process P1 has applied and

‘blocks’ otherwise (see Łubowicz 1999 and refs. for extensive examples). A simple illustration of this is provided by the English pair *rem[ɪ]di-able*, *l[ɛ]vi-able* (as in ‘levy a tax’). In the first item a process lengthening vowels in the context ‘__CiV’ has applied regularly, as it does in *Can[ey]dian*, *Mong[ow]lia*, and many other cases, but the same process is blocked in the second item, witness ungrammatical **l[iy]vi-able*. The two items are independently distinguished by another process. The first item, *remédi-able* is restressed compared to its base *rémedy*, while the second, *lévi-able* is not. In turn, this difference is predictable from the different number of syllables (Burzio 1994, 232). The present account is that the FAITH relation between the adjective and its base is an attraction effect, not one that has a fixed magnitude or rank. Once restressing occurs, attraction is weakened, allowing ‘CiV’ lengthening to prevail. In contrast, maximal attraction evidently outranks CiV lengthening, blocking it. OT-style FAITH relations do not permit this kind of modulation, leaving us with ranking paradoxes (but see Łubowicz 1999 for an alternative to the present account). Note in passing that the present solution would require that *-able* adjectives be faithful to the full-fledged *surface* form of their bases, not some stressless UR, in further consistency with the present framework. For more detailed discussion of this approach to NDEB, see Burzio 2005b).

The second allomorphy effect that appears to instantiate attraction, Lexical Conservatism is illustrated by French ‘liaison’ as discussed in Steriade (1999). In French, an input form like /nuvo ami/ ‘New-MASC Friend-MASC results in output form [nuvɛl ami], where the adjective has the same form [nuvɛl] as the feminine allomorph. Rather than just providing a linking consonant to satisfy ONSET as in hypothetical *[nu.vo.t a.mi.], the repair thus utilizes an independently existing allomorph that provides such a consonant, proving ‘lexically conservative’. In the present interpretation, Lexical Conservatism is

an attraction-induced neutralization effect, due to the overall similarity in sound and meaning of the candidate output form to the independently existing allomorph. The phenomenon of morphological blocking, as in *arrival/ *arrivation* can be characterized in the same vein (identical meanings are prevented from having diverging sound structures), as can the phenomenon of morphological syncretism which we discuss below.

In addition to characterizing attraction effects, the REH (15b) also aids in the formulation of the present system of surface-based morphology. Specifically, subcategorization frames like those listed in (13) can be taken to arise from entailment summation over the lexicon, so that their strength or rank will come for free as types of lexical statistics. For example, a pair of lexical items like *prevent_v*, *prevent-able* will contribute an entailment that *-able* be preceded by a structure identical to a verb in the lexicon, while an item like *evit-able* of (13b), not corresponding to any verb **evit*, will violate such an entailment, contributing negatively to the sum. OO-F effects such as ‘Base identity’ are thus properly understood in the present system as the combination of two effects: an attraction effect (weaker for *remediable* than for *leviable*), and an affix-based selectional effect (weaker for level 1 than for level 2 affixes as argued in the discussion of (14). These two effects combine via the usual summation of entailments to yield the descriptive OT notion of OO-F (see Burzio 2002a, b, 2005a, b for further details).

In what follows we will see that both aspects of this general framework: surface relations with no UR as in (12), and the representational entailments of (15) with their role in FAITH relations, are crucial to solving the above problems.

3. Dominant versus Recessive Affixes

3.1 Nominals in *-os*

We begin with an analysis of nouns that form the Nominative Singular in *-os*. Unlike other classes, this declensional class does not feature a class marker, but rather stems to which inflectional affixes are attached directly, as shown in (17) below. This class is therefore not affected by Problem III above, allowing us to focus on I and II.

(17) Affix \ Stem	I. άνθρω- ‘man’	II. kubár- ‘godfather’	III. uran-ὐ ‘sky’
a. NOM.SG. -os	άνθρωp-os	kubár-os	uran-ός
b. ACC.SG. -o	άνθρωp-o	kubár-os	uran-ό
c. GEN.SG. ὐ-u	ανθρόp-u	kubár-u	uran-ύ
d. NOM.PL. -i	άνθρωp-i	kubár-i	uran-ί
e. ACC.PL. ὐ-us	ανθρόp-us	kubár-us	uran-ύs
f. GEN.PL. ὐ-on	ανθρόp-on	kubár-on	uran-όν

The framework outlined above, and in particular the REH (15b), will automatically place allomorphs of the same ‘morpheme’ in an OO-F relation with one-another, because of the attraction effect of (16) affecting all morphemes, in addition to selectional effects of (13) in addition to the selectional effects of (13) affecting stems. Hence each stem in (17) will be under compulsion to stress uniformly throughout the paradigm –the effect known as Paradigm Uniformity (PU). Similarly, each affix will be under compulsion to maintain consistent metrical properties with all the stems it attaches to. We may refer to this effect as ‘Affix Uniformity’ (AU). We can of course see violations of both mandates in (17). The obvious reason for such violations is that the two mandates conflict. It is the present goal to characterize

all resolutions of such conflicts.⁵ What our framework precludes is the possibility of any of the surface forms in (17), either stems or affixes, being exclusively faithful to representations in which metrical properties are simply absent (underspecification). Under Prince and Smolensky's (1993) 'Richness of the Base' (any input is possible) inputs may well be underspecified, but if each output in (17) is in a FAITH relation to other outputs, the effects of any such underspecification will be suppressed by virtue of the fact that outputs are always fully specified for stress. Hence the NOM.SG. affix *-os* of *kubár-os* is required to be faithful to that of *uran-ós*, and the fact that it appears to be 'recessive', yielding to the stem properties, cannot just be attributed to its being underspecified for stress in the present approach. Similarly, the antepenultimate stress of *ánθrop-os* cannot be reduced to default stress from an underspecified input, since the latter is in a faithfulness relation with penultimately stressed *anθróp-u*, and so on. We will see below that the unavailability of underspecification that follows from the present approach is a virtue. We therefore assume that all co-allomorphs in (17), beside being faithful to each other (PU, AU) are each also faithful to the representations given in the top row (stems) and rightmost column (affixes). These represent in each case the surface allomorph that is most favored by the input. Faithfulness to such representations is thus simultaneously both IO-F and OO-F. As before, different allomorphs could be associated with different inputs. However, in cases of regular morphology such as

⁵ Conflicts would be avoided if all stems and all affixes just had the same specification, say for penultimate stress. The reason this situation does not obtain is that stress can be recruited to express contrasts, that is as a conveyor of meaning, alongside of segmental contrasts. In the formalism of OT, this type of 'dispersion' of accentual properties would be a form of IO-F under the 'Richness of the Base'. Under the REH of the text, the dispersion follows more specifically from entailment satisfaction: sameness of form entails sameness of meaning, whence the different forms for different meanings. Entailments also produce leveling effects, though, by which affixes with different meanings come to exhibit the same form, either segmentally or accentually or both –the phenomenon of 'syncretism', to be addressed below.

those in (17), OO-F is taken to level such differences (discussion of (14)). Input differences thus only separate the different paradigms in (17), not the forms within each paradigm. In the case of recessive suffixes, their input stress cannot be determined since it never has any effect for reasons that we will come to grips with shortly.

In (17) above, the shaded cells in column III identify Problem II above, namely dominant affixes behaving recessively with oxytonic stems. We take up that problem in the next section. In the present one we deal with Problem I: The nature of the Dominant/ Recessive split. That split is not observable with paroxytonic stems (column II) for the obvious reason that here PU and AU do not conflict, both giving penultimate stress. We thus need to focus on the proparoxytonic paradigm of column I. The latter can be decomposed into the two uniform subparadigms separated by the diagonal line in (18).

(18)

	SG.	PL.
NOM.	άνθρωπ-ος	άνθρωπ-ι
ACC.	άνθρωπ-ο	ανθρώπ-ους
GEN.	ανθρώπ-ου	ανθρώπ-ων

We will put aside for the time being the fact that, alongside of cases like (18), there are also proparoxytonic items like *klivan-os* 'kiln' that give totally uniform paradigms as in *klivan-on*, not **kliván-on*, etc. We will return to this issue in section 6 below. Focusing on (18), we argue below that Nominative is the unmarked Case and that Singular is the unmarked number, while Accusative is less marked than Genitive and situated between Nominative and Genitive in terms of its feature structure. If these claims are correct then the distribution in (18) will lend itself to the two observations in (19).

- (19) a. Uniform subparadigms constitute morphological neighborhoods.
 b. Affix dominance correlates with morphological markedness.

The latter two observations can both be tackled in terms of the machinery used in Burzio (2005a) to deal with morphological syncretism, in turn based on the REH of (15) above. The connection is in the fact that the affixes in each of the subparadigms in (18) are syncretic, namely invariant, with respect to their metrical properties: uniformly pre-stressing in the bottom subparadigm, and uniformly recessive in the top one. A brief digression will therefore be required to introduce that approach to syncretism.

4.3. Entailments and Morphological Syncretism

The term ‘syncretism’ refers to the phenomenon whereby affixes that would belong to different cells of a paradigm take on the same form. This phenomenon can be illustrated with the Old English (OE) paradigms in (20), where cells with identical content have either been merged together or shaded.

(20)

OE Weak class:
trymman ‘strengthen’

	PRESENT		PAST	
	INDIC.	SUBJUNCT.	INDIC.	SUBJUNCT.
1SG.	trymme	trymme	trymede	trymede
2SG.	trymest		trymedest	
3SG.	trymeð		trymede	
1PL.	trymmað	trymmen	trymedon	trymeden
2PL.				
3PL.				

Cross-linguistically, syncretism appears to obey two main generalizations. One is that it tends to affect neighboring cells, as (20) would generally suggest, and as stated in (21).

- (21) **Generalization I:** Syncretism tends to affect neighboring cells.

The other is that it affects marked categories, as stated in (22).

schematically illustrated in (25) for an Indicative/ Subjunctive comparison.

(25)	Stem	Mood	Affix	Entailments violated by $\neg D$, given D
a. Indicative:	AB		D/ $\neg D$	$A \rightarrow D, B \rightarrow D$
b. Subjunctive:	AB	C	D/ $\neg D$	$A \rightarrow D, B \rightarrow D, C \rightarrow D$

In the schematic representation in (25), we take components A, B to jointly stand for the sound structure and the semantics contributed by a specific stem, and C to stand for subjunctive mood – a semantic aspect of the representation. In contrast, ‘indicative’ is taken to correspond to lack of such a semantic component -- the assumption in (24). The alternants D/ $\neg D$ correspond to the alternating properties of the affixes – their different sound structure, expressing for instance different persons or numbers. The affix may also carry mood information, but that information does not alternate within each of the paradigms under consideration, namely indicative or subjunctive, but rather only across them. The latter information was reported under ‘Mood’. Now, occurrence of the affixal alternant D results in the overall representations ABD (Indicative) and ABCD (Subjunctive). In turn, the latter representations give rise to a certain number of entailments that are violated when D is replaced by $\neg D$ in the paradigm. These are reported in the rightmost column.⁶ The number of violations is larger in the case of the subjunctive because the invariant part of the representation is higher-dimensional by virtue of component C. Such entailments constitute a leveling or PU effect which competes with the input properties of the affix. The fact that the latter effect is of a larger magnitude in the subjunctive accounts for the first subgeneralization in (23) that there are more contrasts in the indicative, etc., while the other

⁶ In the present conceptions, all combinations of units, whether features, phonemes or morphemes, are necessarily disharmonic and under pressure to neutralize in the way illustrated in (25). Such pressure, due to entailment violation, competes with IO-F as discussed in the text.

subgeneralizations will follow in a similar way given assumption (24) that unmarked categories are unspecified, thus yielding the full generalization in (22) that more marked categories are more syncretic. To distinguish the total leveling that includes affixal distinctions, namely syncretism, from the leveling of just stems in the paradigm, we will henceforth use the label ‘PU+’ for the former, and continue to use ‘PU’ for the latter. The labels for the various empirical effects under consideration are repeated in (26) for convenience.

(26) **Descriptive categories under consideration**

a.	Paradigm Uniformity (PU):	Stems have a consistent form when combining with different affixes in a paradigm.
b.	Paradigm Uniformity+ (PU+):	Stem-affix combination exhibit the same form in different cells of a paradigm (syncretism).
c.	Affix Uniformity (AU):	Affixes have a consistent form when combining with different stems.

All three consistency effects in (26) are consequences of the REH (15b) and can be described as OO-F effects in OT.

The two different leveling effects derived as in (25) can then be expressed in OT notation in the way shown in (27), (28) respectively, to yield the syncretism observable in the subjunctive singular but not the indicative singular of the OE paradigm in (20) (Present or Past).

(27) Indicative:	[ABD]; /AB¬D/	PU+ ³ (Subj.)	IO-F Affix	PU+ ² (Indic.)
a.	☞ AB¬D			*
b.	ABD		*	

(28) Subjunctive:	[ABCD]; /ABC¬D/	PU+ ³ (Subj.)	IO-F Affix	PU+ ² (Indic.)
a.	ABC¬D	*		
b.	☞ ABCD		*	

In (27), square brackets give the attracting output form, while slashes give the input to the calculation. Superscripts give the number of entailments violated in (23), which are translated into the rank of the PU+ constraint. In the indicative case (27), the faithful candidate (a) wins, but in the subjunctive case (28) the syncretic candidate (b) does, because of the higher-ranked PU+ effect, the shaded column being irrelevant in each case.

Just like the OO-F effects, so the IO-F effect in (27)-(28) is here taken to be entailment-based. For instance, in the OE paradigm in (20) IO-F would be instantiated by the entailments in (29).

(29) **IO-F AFFIX (OE):** 1st person \leftrightarrow *-e*; 2nd person \leftrightarrow *-est*

The forms *-e*, *-est* represent respectively D, \neg D in (27)-(28), and the entailments in (29) are both satisfied in the indicative, but violated in the subjunctive. We are overlooking here stem alternations in (20) (single versus geminate *m*) to simplify discussion. However, representational entailments are essentially neutral on whether morphology should be affixal or stem-based, and stem alternations will also be expected to level in the more marked categories in (21) like affixal ones, for the same reasons.

We return now briefly to further evidence supporting the above generalizations. The generalization in (21) that syncretism tends to affect neighboring cells is implicit in other accounts of syncretism, in particular the ‘underspecification’ account: Zwicky (1985); Williams (1994); Blevins (1995); Wunderlich (1996) and others. For instance, underspecifying the OE affix *-en* of (20) above for the feature [person] will make it applicable to all three persons of the plural subjunctive. However, simple underspecification cannot collapse cells that differ by more than one feature and that are therefore not adjacent in the paradigm without collapsing other cells in the process as well, and is therefore only applicable to the extent that (21) holds true. The same generalization is also implicit in the

account of syncretism based on the Impoverishment rules of Distributed Morphology (Halle and Marantz 1993 and others) for the same reason. The person syncretism in the OE subjunctive in (20) can be achieved by deleting [person] in the context of [subjunctive] (impoverishment), thus affecting cells that would differ exactly by the feature [person], as before. Impoverishment differs from underspecification only in generalizing across different affixes, an issue which will not concern us here. The generalization in (21) is sometimes also acknowledged explicitly in the literature, as in McCreight and Chvany (1991). As Stump (2001, chapter 7) and others have noted, however, not all cases of syncretism involve adjacent cells. Stump cites for instance the case of Rumanian verb inflection in conjugations 2-4, where 1sg and 3pl are identical. He also cites the case of Hua verbs in which 1sg and 2pl are identical. It seems nonetheless plausible that similarity is involved in these cases as well, as was suggested for the shaded cells in (20). Consider that, while generally more conservative than Rumanian, Italian reveals a strong connection between 1sg and 3pl, which is in itself fortuitous so far as we know, but which might have led to the Rumanian syncretism. The Italian affixes involved are *-o/-ono*, *-a/-ano*, *-i/-ino* depending on the conjugation and mood, and these are identical except for the syllable *no*, which is, however, extrametrical as clearly shown for instance, by *telefona*<*no*> ‘they telephone’ (with exceptional pre-antepenult. stress). Since stem alternations are caused either by the affix initial vowel or by stress (Burzio 2004), this situation results in total absence of any stem alternations across those two cells in all paradigms and all conjugations. Such PU over the two cells in question can be the basis for PU+ (syncretism) in the present system by virtue of the systematic degree of identity fostering even greater identity (attraction).⁷ As for the 2sg-1pl syncretism of Hua noted by Stump, semantic

⁷ The Rumanian syncretism is in fact duplicated in Italian by the verb ‘be’, as in *sono* ‘I am/they are’

similarity may be involved, since, at least in the ‘inclusive’ reading, 1pl indeed includes 2sg. Hence similarity may well play a role in syncretism rather generally, a claim reminiscent of Bazell (1960). In sum, while the generalization in (21) might appear a bit too narrow, the facts seem generally in line with the REH, which predicts neutralization under similarity of all types. Turning to the generalization in (22) that more marked categories are more syncretic, the latter is also widely acknowledged in the literature, see Boeder (1976)⁸, Wheeler (1993), and Stump (2001, 235), who states that ‘the correlation of high markedness with extensive syncretism ...is widely observable in the world’s languages’. While all languages cited in (23) are Indo-European (IE), non-IE languages appear to conform with the same generalization as well, as suggested by the sample of cases in (30), where SSD= Surrey Syncretism Database: <http://www.smg.surrey.ac.uk>.

(30) **Sample syncretisms in non-IE languages**

a. **Syncretism in the plural:**

Georgian (Kartvelian. Spencer 1991, 219. See also Anderson 1992, 143f.): Subject-object markers in the transitive conjugation. When a first person subject is plural there is number syncretism in the marking for the object. When the object is second or third person plural, there is number syncretism in the marking for the subject.

Somali (Afroasiatic. Stump 2001, 237): No gender distinctions in the plural of past tense verb inflection.

Somali (Afroasiatic. SSD). Vocative distinguished from absolutive only in the singular.

Zande (Niger-Congo. Corbett 1991, 194, cited in Stump 2001, 241): Pronouns exhibit syncretism of masculine and feminine genders in the plural.

Mordvin (Uralic. Aranovich 2005; SSD). Subject-object markers with definite nouns: a plural object results in person and number syncretism in the marking for the subject; a plural subject results in number syncretism in the marking for the object.

⁸ As cited in Surrey Syncretism Database. See text below.

Classical Arabic (Afroasiatic. McCarthy 2005). Inflectional suffixes for nouns exhibit Genitive-Accusative syncretism in the plural (and dual).

b. **Syncretism in non-Nominative cases:**

Koryak (Chukotko-Kamchatkan) (SSD). Dual of nouns is syncretic with plural for cases other than the absolutive (= nominative).

Mordvin (Uralic. SSD). Indefinite nouns mark number in the nominative case only.

Tsakhur (Nakh-Daghestanian. SSD). Adjectives mark gender/ number only in the absolutive (= nominative) case.

c. **Syncretism in the past tense:**

Potawatami (Algonquian. Halle and Marantz 1993). Syncretism of Nominative-Accusative Case of verbal morphology in the preterit (past tense).

d. **Syncretism in the subjunctive/ conditional** (note that the conditional is closely related to the subjunctive, and often syncretic with it):

Nubian (Nilo-Saharan. SSD citing Werner 1987) the conditional exhibits more extensive person syncretism than the indicative).

As for the assumption in (24) that unmarked categories are deficient in their representations, we note that the same assumption would be needed in the framework of Distributed Morphology to ensure that Impoverishment rules apply only in the correct context. If the latter rules could make reference to [indicative] just as well as to [subjunctive], there would be no basis for the noted asymmetry. In addition, the correctness of (24) is also indirectly confirmed by the fact that syncretism is equally attested in cases in which the component added to the representation is not an abstract one, like [subjunctive], but one that is directly observable, as for instance with clitic clusters in the Romance languages, as discussed next.

Like other Romance languages (see: Bonet 1991), Italian obliterates certain clitic distinctions when clitics are combined together, as in (31).

(31) Dative Singular Clitics	Individually	Combined with Accusative
MASC.	gli	gli(e)
FEM.	le	
Ex.:	Gli/ le do un libro <i>to-him/ to-her I-give a book</i> 'I give a book to him/her'	Glielo (*lelo) do <i>to-him/ her-it I-give</i> 'I give it to him/her'

In (31), the contrast *gli/ le* neutralizes to *gli(e)* in the presence of an overt accusative clitic, just as the contrast *-e/ -est* in (20) above neutralizes to *-e* in the presence of the abstract feature [subjunctive]. The analyses in (25) proposed for the latter neutralization will -mutatis mutandis- extend to the neutralization in (31), which are also amenable to an Impoverishment analysis (deletion of [gender]) within Distributed Morphology (see Bonet 1991, Harris 1995).

With this account of syncretism in mind, we can now return to the MG split paradigm in (18) above.

3.3 Markedness and FAITH-AFFIX

We have seen above that the magnitude of certain OO-F/ PU+ effects depends on the dimensionality of the representations. Higher-dimensional representations such as those containing the feature [subjunctive] or any of the marked features in (23) above yield greater syncretic pressure on their affixes. A similar kind of modulation should, however, also affect FAITH-AFFIX itself, thus controlling the AU effects of (26c), and in general the competition between stems and affixes for control of accentual properties. In the split paradigm in (18), repeated in (32), let us then compare the two opposite extremes: the Nominative Singular and the Genitive Plural affixes.

(32)

	SG.	PL.
NOM.	άνθρωπ-ος	άνθρωπ-ι
ACC.	άνθρωπ-ο	ανθρώπ-us
GEN.	ανθρώπ-u	ανθρώπ-on

Those two affixes can be attributed the respective idealized internal structures in (33).

(33)

Idealized component:	Segmental content	Semantic content			Accentual properties
	A	OBJ.:B	POSS:C	PL.:D	E
a. NOM. SG. -os:	✓				✓
b. GEN. PL. -on:	✓	✓	✓	✓	✓

If the analyses in (33) are correct despite this level of idealization, it is clear that the representation in (b) for the Genitive Plural is higher-dimensional: ABCDE, than the one in (a) for the Nominative Singular: AE. That difference would follow from assuming for each of the three morphological Cases in (32) the feature structures in (34).

(34)

	[OBJECTIVE]	[POSSESSIVE]
a. NOMINATIVE:		
b. ACCUSATIVE:	✓	
c. GENITIVE:	✓	✓

While the choice of specific features in (34), namely [objective], [possessive], is largely arbitrary, their distributions in (34) aim to express several claims that appear well-motivated, specifically: i) Nominative is the semantically least marked Case; ii) Genitive is more marked than Accusative; and iii) unmarked values are unspecified. Claim iii) is of course just the assumption in (24) above, which was independently defended. Claim i) is supported by the Case-specific subgeneralization in (23) pertaining to patterns of syncretism: Nominative registers the least amount of internal syncretism (for number or

gender), and hence it must be the least marked Case. As for claim ii), it is also supported by cross-linguistic patterns of syncretism. Specifically, it appears that Nominative is often syncretic with Accusative, as with English *it*: *They bought it_{Acc.} / It_{Nom.} was bought*. In addition, Accusative is often syncretic with Genitive, as in fact with English *her*: *I met her_{Acc.} / Her_{Gen.} book*. But we know of no case in which Nominative and Genitive are syncretic together to the exclusion of Accusative. The data described in (35) provide a few further relevant cases.

(35) a. **Nominative-Accusative syncretism:**

Russian 1st Declension inanimate nouns (Stump 2001, 226).

Latin neuter nouns; Latin class 3, 4, 5 plural nouns (Aronoff 1994, 80-82).

b. **Accusative-Genitive syncretism:**

Russian 1st Declension animate nouns (Stump 2001, 227).

Old English feminine nouns. E.g.: *tale* ‘tale ACC./ GEN./ DAT’; *tala* ‘tales NOM./ ACC./ GEN.’

If syncretism occurs under representational proximity as claimed in (21) above, then it must be the case given the patterns in (35) that Genitive is more proximate to Accusative than to Nominative, and if Nominative is the least marked ((23) above), then in turn Genitive must be the most marked of the three. The feature structure in (34) thus seems appropriate, confirming the analyses in (33). In addition to the above assumptions concerning Case, the latter analyses also assume that Singular is the unmarked number, and this is again in accordance with the discussion of (23). The analyses in (33) assume that both affixes have accentual properties, represented by component E. Under the REH, however, such accentual properties will be controlled by rather different kinds of FAITH, as illustrated in (36).

(36)		Idealized representations	Entailments violated by $\neg E$
a.	NOM. SG. -os:	AE	A \Rightarrow E

b. GEN.PL. *-on*: ABCDE | A→E, B→E, C→E, D→E

In (36), the number of entailments violated by overriding the stress properties E of each affix is greater in the case of the Genitive Plural because of the higher dimensionality of the representation, an effect that can be described in regular OT by assigning the Genitive Plural a higher-ranked FAITH(stress), as in (37).

(37) FAITH(stress) GEN.PL. >> FAITH(stress) NOM. SG.

It is then no longer surprising at this point that the Nominative Singular affix should be metrically recessive, while the Genitive Plural one is dominant, i.e., that, when in competition with a stem for control of metrical properties, the Genitive Plural wins while the Nominative Singular loses. This is now consistent with (37), and describable in common OT notation as in (38), (39).

(38) NOM. SG.:	/ánθrop-;/ /-os/	FAITH-STEM	FAITH-AFFIX NOM.SG.
a.	☞ ánθropos		*
b.	ánθrópos	*	

(39) GEN.PL:	/ánθrop-;/ /-on/	FAITH-AFFIX GEN.PL.	FAITH-STEM
a.	ánθropon	*	
b.	☞ anθrópon		*

In (38), the pre-stressing character of *-os* is of course just hypothetical, entertainable under ‘Richness of the Base’, since such property never surfaces.

Note at this point that we have thus argued that augmenting the representation by an abstract feature like [subjunctive], or [plural] can in fact have opposite consequences depending on circumstances. In the case of syncretism, the augmentation causes the input properties of an affix to be overridden, resulting in neutralization of affixal contrasts. In the case of dominant affixes, the

augmentation causes the input properties of the affix to be more resilient, prevailing over the competing properties of a stem. These claims are not contradictory. On the contrary, the central fact is that the REH and the attraction effect it gives rise to penalize narrow variation. What makes the difference between the two cases is that, in the syncretism case the abstract feature adds to the part of the representation that is *invariant* through the paradigm, thus making it more difficult for affixal variation to occur. In the case of affix dominance, the abstract feature contributes to the alternating part, namely the affix, yielding the opposite effect.

One may wonder whether tying FAITH effects to the dimensionality of the representation would in effect predict that stems should universally tend to be more faithful than affixes contrary to (39), given that they are typically more complex both segmentally and semantically than affixes. This conclusion does not ensue from the present approach. The reason is that dimensionality is not the only contributor to FAITH. Multiple instantiations of the same affix with different stems also contribute to FAITH effects by producing identical entailments multiple times. Stems also occur multiply, with different affixes, but the two multiplicative effects are of different orders of magnitude. Affixes constitute relatively small (and closed) classes, hence providing for only a limited number of expressions of the same stem (small multiplier entering into FAITH-STEM), while stems constitute typically large (and open) classes, hence providing for a large number of expressions of the same affix (large multiplier entering into FAITH-AFFIX). While we are not in a position to exactly assess the relative contributions to FAITH effects provided by dimensionality and by number of occurrences, it suffices for present purposes that no prediction is made that FAITH-STEM should always dominate FAITH-AFFIX, consistently with (39).^{9 10}

⁹ Segalowitz and Lane (2000) provide concurring psycholinguistic evidence that the behavior of closed class items is controlled by their greater frequency compared with open class items. We are

Facts such as those in (39) (and others, noted in section 7 below) thus refute the metaconstraint proposed in McCarthy and Prince (1995) requiring that FAITH-STEM universally dominate FAITH-

grateful to one of the reviewers for pointing this out.

¹⁰ On the other hand, we may expect differences between stems based on their relative dimensionality. Sect. 5 will argue that this is exactly correct, and that stems augmented by a class marker exhibit higher-ranked forms of FAITH. There is also evidence suggesting that monosyllabic stems do indeed manifest lower-ranked FAITH than plurisyllabic ones. Kenstowicz (1996), Albright (2005) and others have noted that the paradigm leveling effect that turned Latin *[honos]/ [honoris]* into *[honor]/ [honoris]* ‘honor NOM. SG./ GEN. SG.’ spared monosyllables: *[os]/ [or-is]* ‘mouth NOM. SG./ GEN. SG.’. This would follow if monosyllables were subject to lower-ranked OO-F/ PU. Similarly, Inkelas (1999) notes that while Turkish place names are generally immune from affix-induced stress shifts – a type of paradigm uniformity, monosyllables are not: *Ánkara/ Ánkara-dan* ‘Ankara NOM./ ABL.’ versus *Bón/ Bon-dán* ‘Bonn NOM./ ABL.’. At the same time, the present system does not predict that plurisyllables should always be more resistant to alternations than monosyllables. The reason is that alternations are controlled by competition between two types of FAITH: OO-F and IO-F, both of which would have a lower rank with monosyllables. For instance in the above case of Latin *[os]/ [or-is]* the alternation is enforced by IO-F to the input /os/ and, assuming with Albright and others that the original rotacism of /os-is/ → [or-is] was no longer active, by IO-F to the input /or-is/ as a case of morphological suppletion like the English *compel/ compul-sive* case of (14) above. However, IO-F is also predicted to be lower-ranked with monosyllables, along with OO-F, therefore there is no wholesale prediction that monosyllables should alternate more due to lower-ranked OO-F. They might as well alternate less, due to lower-ranked IO-F. As a reviewer points out, the latter situation is instantiated as well. For instance, Wedel (2002) notes that, in Turkish, plurisyllables exhibit alternations like *sebep/ sebeb-i* ‘reason-NOM/ -ACC’ due to coda devoicing, while monosyllables are uniformly leveled, as in *ip/ ip-i* ‘string-NOM/ -ACC’, and reports analogous leveling of monosyllables for Catalan and Czech. This would follow if IO-F was lower ranked with monosyllables due to their lower-dimensionality, with OO-F prevailing. The two sets of facts thus seem conflicting, but provide no contradiction to the present approach, which can deal with both in the manner shown in (i), where the subscripts refer to number of syllables.

- (i) a. Leveling except for monosyllables: OO-F_{>1} >> IO-F_{>1} >> IO-F₁ >> OO-F₁
 b. Leveling of monosyllables only: IO-F_{>1} >> OO-F_{>1} >> OO-F₁ >> IO-F_{>1}

In (i), both rankings are consistent with the text, which makes no general claim as to the relative ranking of IO-F and OO-F, only that FAITH_{>1} should dominate FAITH₁, whether IO- or OO-, as is true in each of (ia, b). Hence, while the present perspective makes no prediction as to whether (ia) or (ib) should hold in each individual case, it is nonetheless superior to traditional ones, which provide no clue as to why monosyllables should ever differ one way or another.

AFFIX.¹¹

Having now established a link between morphological markedness and accentual dominance of affixes and accounted for the observation in (19b) above, it remains to extend the analysis to other members of each subparadigm in (32). Here, one might attempt to simply duplicate each of the above analyses for the respective neighboring cells. The Genitive Singular may share enough of the properties of the Genitive Plural to still tend towards dominance, as may the Accusative Plural. Similarly, the Nominative Plural and Accusative Singular may be sufficiently like the Nominative Singular in lacking feature specifications as to warrant their recessive behavior. While this type of account would seem cogent, it is insufficient, however, because the affixes of the Genitive subparadigm in (32) are not just all dominant as this reasoning would predict, but they are also all pre-stressing, resulting in a uniform subparadigm. However, the resources needed to deal with this issue are already in place. We have seen that PU effects are expected as a consequence of the REH (discussion of (13)). At the same time, the REH also predicts an attraction effect between neighboring representations (discussion of (16)). This means that PU effects will hold more strongly over neighboring cells than over a paradigm as a whole. Let us refer to such more local effects as ‘Subparadigm Uniformity (SPU)’. Describing again the effects of entailments by way of regular OT FAITH constraints, we can then entertain the two constraints in (40).

¹¹ McCarthy and Prince cite as supporting evidence the observation that affixes tend to be segmentally and prosodically less marked than stems. This leaves us with the following puzzle, which must be left for further work. When interacting with FAITH-STEM, FAITH-AFFIX appears sometimes to be high-ranked consistently with the summation effect of the text. However, when interacting with Markedness, FAITH-AFFIX generally appears to be low-ranked, as if only the lower dimensionality of affixes, and not the summation effect, was relevant.

- (40) a. SPU_{GEN} (stress): Genitive Singular and Accusative Plural must have the same stress as the Genitive Plural.
- b. SPU_{NOM} (stress) Nominative Plural and Accusative Singular must have the same stress as the Nominative Singular.

SPU constraints, applying to a local cluster of cells, will automatically be higher-ranked than the more general PU constraint in (41) given the enhancing effect that proximity has on all OO-F relations (for concurring evidence on the relevance of *subparadigm* uniformity, see Gafos and Ralli, 2001)¹².

- (41) PU(stress) All members of an inflectional paradigm must have the same stress.

The ranking in (42), where all constraints refer to accentual properties, will now account for the paradigm in (32) in full.

- (42) $SPU_{GEN/NOM} \gg FAITH-AFFIX, FAITH-STEM \gg PU$

The ranking of FAITH-STEM above PU allows the Nominative Singular to stress differently than the forms in the Genitive subparadigm. Analogously, the ranking of FAITH-AFFIX above PU allows the Genitive Plural to stress differently than the members of the Nominative subparadigm. The tableaux in (43), (44) illustrate these two different effects, respectively. The forms in square brackets are those that are relevant to PU in each case.

¹² This view contrasts with the undifferentiated notion of Paradigm Uniformity in McCarthy (2005).

(43) NOM. SG.:	[_{GEN.} .anθróp-]; /ánθrop-/	FAITH-STEM	PU
a.	☞ ánθropos		*
b.	anθrópos	*	
(44) GEN. PL.:	[_{NOM.} ánθrop-]; /-on/	FAITH-AFFIX	PU
a.	ánθropon	*	
b.	☞ anθrópon		*

In (43), (44), the higher ranked SPUs of (42) are inapplicable, because they only refer to cells within each subparadigm, hence not across Genitive-Nominative pairs.

The ranking of SPU constraints is relevant in (45), where the ranking of SPU_{GEN} above FAITH-AFFIX in (42) will prevent affixes within the Genitive subparadigm from imposing different stress patterns, e.g. final versus penultimate stress, even though they may all be dominant.

(45) GEN. SG.:	[_{GEN. PL.} .anθróp-]; /-ú/	SPU_{GEN}	FAITH-AFFIX
a.	anθropú	*	
b.	☞ anθrópu		*

Note incidentally that the Genitive subparadigm in (32) above is a case of PU (26a) when considered with reference to the stem alone: the stem has consistent accentual properties. However, when characterized in reference to the affixes, it also is a case of accentual PU+ (26b) or syncretism: stem-affix combinations exhibit consistent accentual properties through the (sub)paradigm.

The ranking in (42) embodies a few simplifications which will not affect the point at hand. One is in that the relative ranking of SPU_{NOM} and FAITH-AFFIX is in fact underdetermined, since if all affixes in the Nominative subparadigm could be predicted to be recessive on a par with the Nominative Singular one, this would be sufficient to yield a uniform Nominative subparadigm. The two SPU

constraints are thus conflated in rank in (42) only for convenience. Another simplification is in that FAITH-AFFIX for affixes other than the Genitive Plural could in principle be lower-ranked than PU (SPU being sufficient to correctly determine their behavior). Hence the conflation of all FAITH-AFFIX under one ranking in (42) is also just for convenience. The logic of the analysis is unaffected by these simplifications.

Summing up, our account of (32) is that the Nominative Singular and Genitive Plural affixes split the paradigm around a recessive and a dominant pole, and that neighboring cells cluster around those poles under the attraction effect predicted by the REH (15b). The above analysis may seem partly circular in having accounted for the behavior of the Nominative Singular and Genitive Plural affixes *before* the SPU effects were factored in. If we had attempted to deal first with the most central members of the paradigm: Accusative Singular and Accusative Plural, rather than the most peripheral, we might have expected that, given their proximity, they would have come out with uniform stresses. In turn, if we had then defined the SPU constraints with reference to each of those cells, complete paradigm uniformity might have resulted, contrary to (32). Yet there is no incongruity in the above discussion, but rather only expository simplification once again. The fact of the matter is that the present approach correctly predicts two contending and simultaneous effects: a paradigm split due to recessive versus dominant affixes, and PU, which is -however- modulated by distance. It follows from postulating appropriate relative magnitudes for the two effects, that the paradigm will split just as in (32), with Nom. Sg. and Gen. Pl. on different sides, although dominant affixes could in principle have caused finer fragmentations. The above discussion was thus only simplified in that the split in (32) is not caused by the Nominative Singular and Genitive Plural affixes alone, but rather cumulatively, by each of the two

clusters of cells in (32). Nominative Singular and Genitive Plural are simply the largest contributors to the split because they are maximally different. Thus, using them as representatives of their respective clusters did not harm the logic.

This has now completed our solution to the first of the three problems outlined in Sect. 1. The latter consists of two components, both reflexes of the REH: i) Semantically marked affixes tend towards dominance; ii) PU effects are enhanced by proximity of the cells.

4. Oxytonic Stems

4.1 Multiple Correspondence

We now turn to the second of our problems, represented by the oxytonic paradigm in (46).

(46) uran- $\acute{\alpha}$ ‘sky’

	SG.	PL.
NOM.	uran-ós	uran-í
ACC.	uran-ó	uran-ús
GEN.	uran-ú	uran-ón

In (46), the diagonal line is only for comparison with (32) above, as the paradigm is in this case totally uniform. Quite generally, whenever the stem demands final stress, all affixes seem to behave recessively as in (46).

Our solution to this problem will capitalize on the observation already made in passing that there is in MG also a stressed allomorph *-ón*, used by a number of selected items in other declensional classes, such as those in (47) (see also Revithiadou 1999, p.111).

(47)

	iðé-a ‘idea’	stratiót-i ‘soldier’
a. NOM. SG. :	iðé-a	stratiót-i-s

b. GEN.PL. : iðe-ón | stratiot-ón

In (47), the stem-final vowels *-a*, *-i* are class markers, not present in the *-os* class of the previous section. Here, they delete before *-ón* to avoid a vowel hiatus. We return to this effect in the next section. The set of items that receive stressed *-ón* in the Genitive Plural do not constitute an independently definable class, but are rather an idiosyncratic set, a point to which we also return. Under the REH (15b), occurrence of the two *-on* 's is disharmonic, resulting in the two conflicting entailments in (48).

(48) a. [GENITIVE, PLURAL] ↔ ɔ̄-on b. [GENITIVE, PLURAL] ↔ -ón

The question of why the conflict is not resolved by eliminating either allomorph from the language is just one instance of the general question of why morphology is ever irregular, which was partially addressed by (14) above. We return to this as well in the next subsection. For now, suffice it to say that the two allomorphs in (17) contrast analogously to the two English past tenses of *grieve-[d]* and *lef-[t]*, or the two plurals of *chief-[s]* and *wive-[z]*. For the time being we simply take note of their existence, but we assume as well that the one in (48a) is the 'primary' or generally preferred allomorph. We provisionally express this preference simply as in (49).


(49) * -ÓN

The oxytonic paradigm in (46) will now follow from the ranking in (50) in the way discussed below.


(50) PU >> * -ÓN

In the present framework, in which there is no UR, surface forms are related to other surface forms directly, by way of their entailments. Then, any form instantiating the features [GENITIVE, PLURAL] will

activate both of the entailments in (48), making both allomorphs potentially available, but the form *uranón* of (46) will now correctly select the stressed allomorph in the manner of (51).

(51) GEN. PL.:	$[_{NOM} \text{uran-}\acute{\alpha}]$; / $\acute{\alpha}$ -on/; /-ón/	PU	* -ÓN
a.	uránon	*	
b.	 uranón		*

In (51), $[_{NOM} \text{uran-}\acute{\alpha}]$ is the form of comparison relevant to PU. This is the form that obtains in the Nominative subparadigm because of an input $/\text{uran-}\acute{\alpha}/$, the recessive character of affixes within that subparadigm, and SPU_{NOM} , quite analogously to the form $[_{NOM} \text{án}\theta\text{rop-}]$ of (44) above. The affixal alternatives are given as an input disjunction for formal consistency with the discussion of (44)-(45) above. In fact, these are simultaneously also output forms, contained in items like *anθrópon* (44b) and *ideón* (47b) respectively, hence effectively on a par with the stem $[_{NOM} \text{uran-}\acute{\alpha}]$. In (51), candidate (b) is optimal because, although allomorph *-ón* is generally dispreferred, PU compels that choice. Once the Genitive Plural complies with the Nominative subparadigm, the rest of the Genitive subparadigm in (46) will be correctly expected to follow suit, just as it did in (32) above. Tableau (52) illustrates this for the Genitive Singular, quite analogously to tableau (45) above.

(52) GEN. SG.:	$[_{GEN. PL.} \text{uran-}\acute{\alpha}]$; / $\acute{\alpha}$ -u/	SPU_{GEN}	FAITH-AFFIX
a.	uránu	*	
b.	 uranú		*

In (52), the form $/\acute{\alpha}$ -u/ can be seen either as an input (possible under ‘Richness of the Base’) or as an output (part of *anθrópu*, for example). The ranking in (52) is the one that was independently motivated above for (45) and will thus require no further comment. We have again utilized the simplifying assumption defended earlier that the Genitive Plural is the sole determinant of the overall behavior of the

Genitive subparadigm. This assumption has enabled us to first determine the optimal form of the Genitive Plural (as in (44)), and then the rest of the subparadigm (as in (45)). In actuality, we assume that the Genitive Plural only plays the main role in splitting the paradigm as in (32). The present point is that, with oxytonic stems, its ability to split the paradigm is undercut by the availability of stressed *-ón* conspiring with PU: (51). With that ability removed, we expect that no split may occur any more, in the way illustrated in (52).

The newly found alternative allomorph *-ón* will have no effect on our earlier discussion, as (53) shows directly.

(53) GEN. PL.:	[_{NOM.} ánthrop-]; /-on/; /-ón/	PU	* -ÓN
a.	ánthropón	*	*
b.	ánthrón	*	

With proparoxytonic stems like the one in (53), both affixal allomorphs violate PU, hence the unmarked, prestressing one will be optimal. The same conclusion holds with paroxytonic stems like *kubáros* of (17). Here only the unmarked allomorph will satisfy PU: *kubáron*, providing a second reason why it will be optimal.

We have thus provided a solution to our second problem as well: the apparently anomalous behavior of oxytonic stems. Its main ingredient was the ‘Multiple Correspondence’ –the hypothesis that the phonology may select from multiple morphological inputs, in this case both /-on/ and /-ón/. Multiple Correspondence, proposed in Burzio (1998), is natural within Optimality Theory, unique inputs being only a contingency of rule-based systems, and is automatic under the REH: all representations generate entailments that are potentially relevant to any other representation. Multiple Correspondence is virtually synonymous with Steriade’s (1999) Lexical Conservatism discussed earlier

and based on the observation that sometimes allomorphy only obtains if the allomorph exists independently in the lexicon, i.e. if it corresponds to some other output. This situation is instantiated here by the fact that the allomorph *-ón* occurs in *uranón* of (51) precisely because it exists independently in *ideón*, *stratiótón* of (47), etc. In a more traditional framework that insisted on unique morphological inputs, there would seem no reason why the distribution of input */-ón/*, generally idiosyncratic, should become totally regular with oxytonic stems.

4.2 The Nature of Morphological Irregularity

The phenomenon of morphological irregularity is one in which item-specific information, like the information: ‘The Genitive Plural of *iḍéa* is *iḍeón*’ is able to override more general information, like the information: ‘Genitive Plural is expressed by \square -on’. This override of the general by the more specific is often referred to in the literature as Pānini’s principle, and is given the status of a true grammatical principle (Anderson 1969, Kiparsky 1973, Halle and Marantz 1993 among others). In the present framework, Pānini’s principle is -like several other key generalizations- a consequence of the REH: representations that are ‘more specific’ are by definition higher-dimensional than those that are more general, and we have already seen that higher-dimensionality translates into higher-ranked faithfulness effects. Consider in particular the two representations in (54).

- (54) a. [GENITIVE, PLURAL]; \square -on
 b. [GENITIVE, PLURAL]; X; -ón X= a member of {iḍe-, stratiot-, ...}

The representation in (54a) is a generalization over the regular Genitive Plural. It states the general cooccurrence of the features [GENITIVE, PLURAL] with the affix \square -on. It carries no information about

stems to which such affix attaches, because we presume the class of such stems is sufficiently large and heterogeneous that no particular feature emerges as general (except of course that all such stems are nominal, omitted in (54)). The representation in (54b) relative to the marked allomorph, on the other hand, does carry specific stem information, as indicated by ‘X’ which ranges over the members of a specific short list. We are thus implicitly assuming that the system of mental representation has a saturation point, such that lists are not viable beyond a certain length. While we do not wish to pursue this issue in depth, we note that this saturation effect is highly consistent with the REH, and in fact not very different from the syncretism effect already discussed. That is, in the context of an invariant stem one can only keep track of so many affixes (syncretism), while in the context of an invariant affix, one can only keep track of so many stems (present case).

When the representations in (54) are translated into entailments, the following entailments will result, respectively.

- (55) a. [GENITIVE, PLURAL] \Rightarrow $\acute{\text{a}}$ -on
 b. [GENITIVE, PLURAL] \Rightarrow -ón; X \Rightarrow -ón

Each of the entailments in (55) stands for an entailment cluster, since each component on either side of the arrow in either of (55a, b) is effectively multidimensional. Pānini’s principle then reduces to entailment arithmetics: there are more entailments for -ón than for $\acute{\text{a}}$ -on. Victory by the specific over the general cannot be a foregone conclusion, however, else regularity should simply not exist. Alongside of the celebrated Pānini’s principle, one thus also needs some appropriate antidote to it as well. In the present framework, that is also provided by entailment numbers. The entailment in (55a) is instantiated more numerously than each of the ones in (55b), by the very fact that more stems are involved. The

pressure from such entailments is in fact detectable even within the irregularity: the marked allomorph *-ón* is segmentally identical to unmarked \square -*on*, just as the past tense allomorph of *lef-t* is not very different from that of *grieve-d*. While we are not in a position at this point to formulate an entailment calculus or a model capable of making fine predictions as to when irregularity may or may not occur (which would involve quantifying over representational dimensionality, numbers or frequencies of occurrence, etc.), the present approach provides the basic ingredients to deal with both the existence of irregularity and the fact that its presence is less than pervasive. Morphological irregularity from this point of view can be treated as a type of IO-F in OT as was done in (14) above. In this case, it is faithfulness to a representation like (54b), which is an input containing both some *X* and *-ón*. Such IO-F is in competition with a form of OO-F, here FAITH to the representation in (54a), an abstraction over Genitive Plural outputs, the majority of which utilize \square -*on*. Hence, as was argued in connection with (14), morphological irregularity can in this system be attributed to the same resources that allow lexical items to differ from one-another in general within OT, namely IO-F. More traditional approaches will require especially dedicated resources instead.

Having thus argued that the *-ón*/ \square -*on* allomorphy is not a special contingency of MG, but rather a more general fact of morphological life on which the REH can shed light, we can also derive the general dispreference for *-ón*, which was provisionally stipulated in (49) above. The latter is now reducible to the entailment in (56).

(56) $-ón \Rightarrow / X _$

The entailment in (56) states that *-ón* occurs only with a stem ‘X’ –a member of a special class, and is a direct result of the representation in (54b) (representations yielding bi-directional entailments among

components). Since the allomorph *-ón* occurs with *all* oxytonic stems, but only idiosyncratically elsewhere, it must be the case that not all oxytonic stems are Xs in (54b). Taking then a case like *uranón* not to be an instance of ‘X’ for the sake of discussion, we can see that such a case will violate the entailment in (56), which will then provide a more principled replacement for the ‘brute-force’ * -ÓN of (49). Yet, just like the latter, (56) will be violated under compulsion from PU in the way seen in (51).

To conclude this section, within the *-os* class, oxytonic stems succeed in satisfying PU in full unlike proparoxytonic ones by recruiting an independently existing -though morphologically ill-suited- allomorph *-ón* for their Genitive plurals. This is closely parallel to the fact that in French [*bɛl ami*] ‘nice friend-MASC’ ONSET requirements force recruitment of the morphologically ill-suited -normally feminine- allomorph [*bɛl*] in Steriade’s (1999) Lexical Conservatism analysis. Capitulation of the Genitive plural eliminates the main force behind the paradigm split found with proparoxytones, resulting in a fully uniform paradigm.

5. Augmented Stems

5.1 Class Markers and FAITH-STEM

In this section we turn to the third and last of our problems and consider inflectional classes other than the one in *-os* discussed previously. Such classes all feature a Class Marker (CM) intervening between stem and affix, ranging over vowels [*a, e, i, u*]. A sample of cases is shown for the singular paradigm in (57).

(57)	Stem+CM		I.	II.	III.
	Affix		fílak-a- 'guard'	αγόν-a- 'competition'	παρ-ά- 'priest'
i.	NOM.SG	-s	fílak-a-s	αγόν-a-s	παρ-ά-s
ii.	ACC.SG.	-∅	fílak-a-∅	αγόν-a-∅	παρ-ά-∅
iii.	GEN.SG.	-∅	fílak-a-∅	αγόν-a-∅	παρ-ά-∅

Unlike the singular inflections shown in (57), the plural ones shown in (58) are vowel-initial, yielding a vowel hiatus in the presence of the CM. Such hiatus undergoes one of two alternative repairs as shown in (58): epenthesis of a [δ] as in the (a) cases, or deletion of the CM as in the (b) cases.

(58)	Stem+CM		Ia.	IIa.	IIb.	IIIa.	IIIb.
	Affix		fílak-a- 'guard'	αγόν-a- 'competition'	μανάβ-i- 'grocer'	ποιετ-ί- 'poet'	παρ-ά- 'priest'
i.	NOM.PL	-es	fílak- -es	αγόν- -es	μανάβ-i- δ-es	ποιετ- -és	παρ-ά- δ-es
ii.	ACC.PL.	-es	fílak- -es	αγόν- -es	μανάβ-i- δ-es	ποιετ- -és	παρ-ά- δ-es
iii.	GEN.PL.	ί-on	filák- -on	αγόν- -on	μανάβ-i- δ-on	ποιετ- -όν	παρ-ά- δ-on
			Deletion	Deletion /	Epenthesis	Deletion /	Epenthesis

The choice of strategies in (58) --deletion versus epenthesis, does not seem predictable except in the proparoxytonic class I, where only deletion occurs (whence the missing column Ib). We return to these facts below. First we focus on the fact that the accentually dominant behavior of the Genitive Plural affix ί-on shown in column (Ia) is reversed if and only if the CM is present, as in column (IIb). This was the third and last of our initial problems, described in (10) above. In (58), columns (IIa) and (IIIb) fail of course to be telling since there the accentual properties of the stem and of those of the affix coincide. Similarly, the presence of -όν in (IIIa) follows independently from our earlier analysis: -όν is selected instead of ί-on to satisfy PU (Sect. 4). But the truth of the proposed generalization tying stem

dominance to CM is confirmed anyway by cases like the one in (59a) and by the observations in (59b, c).

(59) a.

Affix	Stem+CM	stratiót-i- 'soldier'
i. NOM.PL	-es	stratiót- -es
ii. ACC.PL.	-es	stratiót- -es
iii. GEN.PL.	-ón	stratiót- -ón
		Deletion

- b. When the CM is present (as in 56IIb, IIIb), the Gen. Pl. ending is never *-ón*.
- c. When the CM is present, the Gen. Pl. ending is never realized as \square -*on* unless the stem is oxytonic in the Singular, as in *pap-á-s/ pap-á-δ-on*

The case in (59a) is just like the one in (58IIa) in having a paroxytonic stem and in deleting the CM, except that this stem is one of those that idiosyncratically select for stressed *-ón* in the Genitive Plural as in (54b) above. Unlike the case in (58IIa), the case in (59a) is thus unambiguous in showing that when the CM is deleted, dominant affixes exhibit their normal behavior. Observations (59b, c) confirm the reversal of behavior when the CM is present. If affix dominance ever persisted in the presence of a CM, there should be some cases ending in *-ón* contra (59b), and the distribution of cases ending in \square -*on* should be freer and not as in (59c).

Our solution to this problem appeals again to the dimensionality of representations and to the link between dimensionality and FAITH effects provided by the REH. We note first that, by themselves, CMs must constitute relatively low-dimensional representations, as they consist of a single segment and also have a rather limited semantic content, just class membership. This is the likely reason why CMs are themselves never dominant, the stress pattern being rather determined by either stem or affix, as

shown in (57), (58). The fact that hiatus resolution is achieved by deletion of the CM rather than deletion of affixal material is also consistent with this view. Such deletion entails the ranking in (60), also entailed by the just noted fact that CMs are never dominant, unlike affixes.

(60) FAITH-AFFIX >> FAITH-CM

In standard OT work, it would be more specifically MAX-CM that would be bottom-ranked to permit CM deletion, while some other FAITH constraint: IDENT(stress) controlling the accentual properties could in principle have some unrelated rank. Under the REH, however, we do not expect FAITH constraints controlling different aspects of the same representation to diverge in rank too freely, since they express related sets of entailments (if one member of the entailment set is violated, others will be more prone to violation as well –discussion of (16)). Hence reference to a single, more abstract, FAITH as in (60) seems cogent from our point of view.

The low dimensionality of their representations notwithstanding, CMs can in the present analysis still critically shift the balance of power between stems and affixes in the way suggested in (61), where ‘Stem+’ refers to stems with a CM augment.

(61)	sound/ meaning	CM	Accentual properties	Entailments violated by \neg D
a. Stem:	AB		D	$A \Rightarrow D, B \Rightarrow D$
b. Stem+:	AB	C	D	$A \Rightarrow D, B \Rightarrow D, C \Rightarrow D$

In (61) ‘AB’ is an idealized representation of the semantics and sound structure of the stem, and ‘C’ the corresponding one for the CM, while ‘D’ stands for the inherent accentual properties of the stem. Because of the CM, a challenge to those accentual properties faces more entailment violations in (61b) than in (61a) as shown in the rightmost column. Describing this situation with OT constraint ranking

would give the ranking relation in (62).

(62) FAITH-STEM+ >> FAITH-STEM

Both instances of FAITH in (62) are the usual mixture of IO-F and OO-F/ PU, as different members of the paradigm are faithful to one-another, while at the same time the paradigm as a whole is also faithful to the input properties of the stem. The ranking in (62) will account for the accentual behavior of (58) and (59) above if FAITH-AFFIX were simply interpolated into the ranking as in (63).

(63) FAITH-STEM+ >> FAITH-AFFIX GEN.PL. >> FAITH-STEM

Under this ranking, a bare stem will relinquish its accentual properties in the face of stressed or pre-stressing *-on* as in each of the (a) columns in (58) and as in (59a), but an augmented stem will not, as in the (b) columns of (58) and as further described in (59b, c).

A note of caution seems in order here on the present system's ability to 'predict' rankings such as that of (63). We have already noted that the ranking FAITH-AFFIX GEN.PL >> FAITH-STEM of (63) is not a fully attainable prediction at the present stage of formalization (discussion of (39)). The only prediction the present system makes is that -everything else being equal- a Gen. Pl. affix will exhibit a stronger FAITH effect than, say, a Nom. Sing. counterpart, so that the ranking FAITH-AFFIX GEN.PL.>> FAITH-STEM >> FAITH-AFFIX NOM.SG. is an entertainable hypothesis. The same is true of the full ranking in (63), where only the ranking FAITH-STEM+ >> FAITH-STEM is predictable. The rest of the ranking is only possible rather than necessary.¹³

¹³ The text clarification is prompted by a reviewer's thoughtful question. Note that crude formalization is not the only reason why the present analysis is less than fully deterministic. Another reason is that representations and entailments depend on one-another, so that one can predict the latter given the former or vice versa, but not both. For instance, Modern English lacks Case marking affixes, so that FAITH to any such affix will have rank zero in English given the lack of any entailments, despite

Returning then to (63) with these clarifications in mind, we can conclude that the same mechanism that we invoked to account for affix dominance and for morphological syncretism, namely the link between the dimensionality of a representation and its resistance to variation, can also account for the exceptional behavior of augmented stems. When a CM is added, the overall number of components making up the stem is increased, and so is the number of entailments binding each aspect of the representation to the others, which is the source of FAITH effects under the REH. In the competition between stems and affixes for control of accentual properties, augmented stems gain a critical advantage and can thus prevail over otherwise dominant affixes.

Two other facts pertaining to augmented stems are also consistent with the present approach and will be addressed in the next two subsections. These are, respectively: the pattern of affixal syncretism in the classes that feature CMs; and the unavailability of epenthesis in the proparoxytonic class of (58I) above.

5.2 Accentual and Segmental Syncretism

the text role of dimensionality. Analogously, a language may have some Case marking affix but restrict it in specific ways, resulting in a smaller number of entailments and hence lower-ranked FAITH, again despite the role of dimensionality. As in all theoretical work, predictions thus only hold here within very specific *ceteris paribus* conditions. This caveat applies to the issue of cross-linguistic variation in general. While the present system restricts constraint re-ranking in certain ways, it does not prevent it generally. Rather, linguistic data result in entailments that combine with the inherent biases of the system to yield the overall mental grammar. Different linguistic data will naturally yield different grammars. The inherent biases are the ‘markedness’ constraints of OT, which are also types of logical entailments. As in OT, the prediction is then here that cross-linguistic data will tend to conform with markedness because those data are easier to learn. The present work merely extends the prediction to data involving certain inherent rankings of faith constraints. Hence, for instance, it will predict certain *generalizations* about syncretism as in (21), (22) above, but not specific instances within those generalizations.

The declensional classes that take CMs exhibit a rather different accentual split within their paradigms than nouns in *-os*, as shown by the comparison in (64).

	a.	SG.	PL.	b.	SG.	PL.
NOM.		άνθρωπ- <i>os</i>	άνθρωπ- <i>i</i>		φίλακ- <i>a-s</i>	φίλακ- <i>-es</i>
ACC.		άνθρωπ- <i>o</i>	ανθρώπ- <i>us</i>		φίλακ- <i>a-∅</i>	φίλακ- <i>-es</i>
GEN.		ανθρώπ- <i>u</i>	ανθρώπ- <i>on</i>		φίλακ- <i>a-∅</i>	φίλάκ- <i>-on</i>

In contrast to the pattern in (64a) relative to nouns in *-os* ((18) above), the pattern in (64b) relative to declensions that take CMs has only the Genitive Plural as dominant affix, the rest of the paradigm being accentually uniform with the Nominative. This is of course in the cases that delete the CM in the plural. In the cases that maintain the CM, even the Genitive Plural is accentually uniform with the rest, as we saw.

To make sense of the different accentual split in (64b), we must first consider the pattern of segmental syncretism. We just noted that the more aggressive metrical behavior of augmented stems would, from the present point of view, have essentially the same source as affixal syncretism, as in both cases a stem is acquiring some additional component, thus raising the stakes for any kind of variation. The virtual identity of the two accounts will imply of course that the two phenomena should tend to be coextensive, that is that augmentation by a CM, while enhancing the accentual resilience of stems, may then also cause affixal syncretism at the same time. This is indeed the case in (64b), where Accusative and Genitive Singular exhibit the same null affix, while Nominative and Accusative Plural share the same affix *-es*, in contrast to the segmentally non syncretic paradigm in (64a). These patterns conform with the previously noted generalizations that motivated our distance metric: Accusative is closer to

Nominative than Genitive is, and Genitive is closer to Accusative than to Nominative.¹⁴

There is, however, a slight discrepancy in this account. The CM, which we just identified as the source of syncretism is in fact not present in the plural in (64b). The following consideration may perhaps come to the rescue. The syncretism under discussion does occur in the presence of the CM even in the plural with the items that resort to epenthesis as shown in the (b) columns in (58). With those items, the above account encounters no difficulty, CMs being the expected source of syncretism, both in the singular and in the plural. The extension to the plurals of the deleting subclasses would consist of iterating the notion of syncretism. The two subclasses within each CM-taking declension –one resorting to epenthesis, the other to CM deletion, constitute closely related subdeclensions by virtue of having identical singular paradigms as they have the same CM and the same inflections. There is therefore plausibility in viewing their identical inflections in the plural as a form of cross-declensional syncretism –a frequent phenomenon (inflectional classes often intersect in their paradigms). Hence, while we will not attempt a formal account of cross-declensional syncretism, we can at least intuitively take the affixal syncretism in (64b) to be ultimately caused by the CM augments, despite the fact that the latter delete in the plural in items such as the one in (64b).

Whatever the exact reasons for the segmental syncretism of (64b), however, its mere existence will now help us understand the nature of the accentual split. Segmental identity of affixes will create segmentally uniform representations, which will then predictably tend to accentual uniformity as well, in the way illustrated in (65) for an Acc. Sing.-Gen. Sing. comparison.

¹⁴ Note that the cells that are collapsed by the syncretism in (64b) are precisely the ones that straddle the divide in (64a). This may not be accidental, but does not follow from the present analysis which only predicts that syncretism should affect neighboring cells: (21) above.

(65)		Stem	CM	Affix segmentism	Affix semantics	Stress
a.	ACC. SG.	filak-	a	∅	[OBJECTIVE]	
b.	GEN. SG.					[POSSESSIVE]
						?

Aside from stress, which is to be accounted for as indicated by the question mark, the two representations in (65a, b) are highly similar because of the segmentally identical affixes. They differ only by the different semantics of Accusative versus Genitive Case in the next to the last column, Accusative being [objective], while Genitive is both [objective] and [possessive] according to our (34) above. If stress were to be different in the two cases, it would function as the expression of that difference, consisting of the single feature [POSSESSIVE] in the present analysis. Under such high degree of similarity, however, neutralization of the stress properties will be highly expected, resulting in the same specification (Antepen.) in the rightmost column. Note that this case is correctly distinguishable from the case of \square -*on* versus *-ón* discussed earlier, where segmental identity of the two allomorphs does not result in accentual identity. The difference comes from the fact that the two *-on*'s are selected by different stems, and hence do not instantiate the same level of parallelism as in (65) but rather only a more limited one internal to the affix. A weaker leveling pressure is then to be expected.

Once the pairs of cells affected by segmental syncretism in (64b) are also locked together accentually, it remains to consider why they side with the recessive camp, enlarging the Nominative subparadigm compared with (64a) rather than siding with the Genitive Plural. There is an automatic answer to this for all singulars and the plurals that do not delete the CM: augmented stems are dominant, as in (63) above. This leaves only Nominative/ Accusative Plural *-es* and its recessive rather than dominant behavior in the absence of CMs, in contrast to that of *-on* in (64b). While we will not provide a formal solution to this, it would seem natural to relate this difference to the fact that unlike *-es*,

Genitive Plural *-on* in both of its variants *-ón/ ǫ-on* also occurs in a declension in which its dominant behavior is never challenged by augmented stems, that of nominals in *-os*. The entailments provided by those representations will then favor the dominant behavior of *-on* in a way which is not duplicated for *-es*.

In sum, the difference in the accentual split in (64b) compared with (64a) seems largely predictable from the affixal syncretism that affects the latter but not the former. In turn, that syncretism is itself largely consistent with the presence of CMs in these inflectional classes.

5.3 PU versus Epenthesis: Proparoxytonic Stems

Unlike oxytonic and paroxytonic stems (58 II, III), proparoxytonic ones (58I) exhibit no oscillation between epenthesis and CM deletion, but rather repair a hiatus only by means of vowel deletion, as shown in (66).

(66)	fīlak-a- ‘guard’	a.	SG.	b.	PL.
	NOM.	fīlak-a-s	fīlak- -es / *fīlák-a-δ-es		

This behavior can be accounted for in the way discussed below by postulating the ranking in (67).


(67) FAITH-STEM >> FAITH-CM

Such ranking is implied, at least for accentual properties, by the above observation that CMs are never accentually dominant over stems, unlike affixes. Here, we will take it to cover both accentual and segmental properties, though. The CM thus deletes in (66b) violating FAITH-CM, because its presence would force restressing of the stem in violation of FAITH-STEM, given the noted inviolability of the three-syllable window. The critical factor is that, with these declensional classes, plural affixes add a


syllable. For singulars that have antepenultimate stress, a stress shift will then have to occur in the plural unless the CM is deleted to make up for the syllable added by the inflection, as shown in (66).

While this accounts for the asymmetry between uniformly deleting proparoxytones (58I), (66) and variably deleting/epenthesisizing paroxytones and oxytones (58II, III), it remains to account for the latter variation including the fact that it is not free, but rather under lexical control, each lexical item choosing deletion or epenthesis unpredictably and yet consistently. The general phenomenon of lexically controlled phonological variation of which this is an instance has theoretical consequences that are favorable to the present perspective and in particular to the claim that there exists no serial level of UR, the system for morpho-phonology being fully parallel. As commonly practiced, OT affords a fully parallel structure only when morphological relations are not involved. For that class of cases, it provides a perfectly natural solution to lexically controlled variation by way of the notion of ‘partial order’ and the schema in (68).

(68) **Lexical control of variation:**


/b/	C1	C2	IO-FAITH
a		*	*
 b	*		
	Grammar		Lexicon

In (68) the grammar features an indeterminacy in the form of a missing ranking relation between C1 and C2, a ‘partial order’ of constraints (Anttila 2002). In that situation, the lexicon, in the form of IO-F constraints, can step in to resolve the indeterminacy. In (68), both candidates (a, b) are co-optimal for the grammar. The lexicon will then choose whichever one is faithful to the input, here (b). A simple application of this schema to English material is shown in (69).

(69) Input types: /(<i>cárpen</i>)ter/, /de(<i>cé</i> mber)/	ALIGN FOOT L	ALIGN FOOT R	IO-F STRESS
a. (<i>dé</i> cem)ber		*	*
b.  de(<i>cé</i> mber)	*		
Grammar			Lexicon

The exceptional stress pattern of items like *cárpen*ter, where a heavy penultimate fails to be stressed, can be attributed to the fact that final syllabic sonorants, like the [r] of (69), yield special ‘weak’ syllables that can, but need not, be extrametrical (Burzio 1994, 67-75). The variation within minimal pairs like *de(cé*mber)/ (*cárpen*)ter can then be accounted for in terms of lack of relative ranking of the two Alignment constraints in (69), leaving the choice between two co-optimal candidates to the lexicon (see Revithiadou 1999 and refs., as well as Burzio 1994, 166 for precedents in using such Alignment constraints). In (69), candidate (a) is the winner for *decé*mber, while the analog to candidate (b) will be the winner for *cárpen*ter given their respective inputs (/outputs).

In the UR-less framework, this simple solution extends to the case at hand in the manner of (70) and (71).

(70) ‘grocer’ NOM.PL.:	[manáv], [-i], [-es] /manáviðes/	ONSET	FAITH-CM (OO-F)	DEP	IO-F (derived)
a.	manávies	*			
b.	manáves		*		*
c.	 manáviðes			*	
Grammar					Lexicon

(71) 'soldier' NOM.PL.:	[stratiót], [-i], [-es] /stratiótes/	ONSET	FAITH-CM (OO-F)	DEP	IO-F (derived)
a.	stratióties	*			
b.	☞ stratiótes		*		*
c.	stratiótides			*	
Grammar					Lexicon

The variation in (70), (71) is accounted for by taking FAITH-CM (more specifically MAX-CM), violated by deletion, and DEP, violated by epenthesis, to be unranked as indicated in the tableaux. As before, this results in an indeterminacy which is then resolved by lexical or 'input' information enforced by the IO-F constraint in the tableaux. What is crucial to this solution is the ability to attribute an independent input to morphologically full fledged forms. This is the same ability that was crucial to the account of morphological irregularity of (14) above, and which arises when lexicon and phonology are part of a parallel system, with no UR. The following brief discussion reviews the two tableaux in more detail.

In (70) and (71), the square brackets identify various correspondents for the form under calculation, in particular: the form of the stem as instantiated in other members of the paradigm; the form of the CM for this item and its class; and the form of the affix for the Nominative (or Genitive) Plural. Each piece in square brackets abbreviates a cluster of entailments resulting from other representations in the lexicon with which the one under calculation is thus in some form of 'correspondence.' Cooccurrence of the various pieces in the set of correspondents also reflects certain representational entailments, specifically: the cooccurrence of each particular stem with CM [-i], and the cooccurrence of the CM with Nominative Plural affix [-es]. In addition to representing properties of other surface

representations, each correspondent is also ultimately related to some ‘input’ giving the largely accidental sound-meaning relation in each case. As at various other points in our discussion, faithfulness to such input is here conflated under OO-F to each correspondent. In the tableaux, though, we are concerned with FAITH for the CM. We do not include the epenthetic [δ] among the set of correspondents despite the fact that it also occurs in other items. The reasoning here is that its occurrence is not dependent on any other member of the set of correspondents, but it is rather dictated by the phonology to resolve the vowel hiatus. The representations in which such [δ] occurs will surely generate entailments that would tie it to certain combinations of CMs and inflections. Were those entailments to control the distribution, the [δ] would become part of the morphology, and it would then be correct to include it in the set of correspondents. That is not the present situation, however, in which the phonology is in control.


In contrast to the correspondents, the forms between slashes in (70), (71) give the input for each full-fledged item. It will be noted that such inputs are largely concurrent with the set of correspondents. In principle, that input could have been divergent under ‘Richness of the Base’. A divergent input was in fact what yielded the present account of morphological irregularity. In particular in (14) above it was the input /*compulsive*/ that made for the lack of correspondence with [*compel*] and in (54) above we argued that it was inputs like /*ideón*/, etc. that made for a lack of correspondence with the regular Genitive Plural \square -*on*. Such lack of correspondence can only arise, however, if IO-F dominates OO-F, the opposite ranking yielding a morphological regular output, regardless of input. Indeed, the cases under consideration instantiate regular morphology, with OO-F dominating IO-F as indicated in the tableaux. IO-F is given here as ‘IO-F (derived)’ to indicate

explicitly that it refers to morphologically derived items. In (70), (71) IO-F is dominated not only by OO-F, but also by relevant phonological constraints and quite generally by what can be referred to as the ‘Grammar’. What this means is that the exact form of such input will be irrelevant except in one situation: when the grammar has an internal indeterminacy, as in these cases. It is therefore only the presence versus absence of the CM in the input form that plays any role. The rest of the input is immaterial to the outcome, and -as in (14)- is given here as identical to the output as an instance of Prince and Smolensky’s ‘Lexicon Optimization’. Note that the active portion of the input in each of (70), (71) is not to be confused with the input for the CM itself, conflated under ‘[i]’ in the set of correspondents. The latter consists of the information that the CM for this class of items is [i], whereas the former consists of the information that the CM is either present (70) or absent (71) in each specific surface form.

The insistence that there exists a UR precludes such applications of the model solution in (68) to the cases in (70), (71) by restricting the function of the input to specification of a unique form for each morpheme, thus preventing it from playing a direct role in morphologically complex surface representations. UR-based OT will thus require further complications in these cases, like morpheme specific co-phonologies (Anttila 2002). Specifically, the morpheme /manav-/ of (70) will need to be diacritically marked to invoke the ranking FAITH-CM >> DEP, while /stratit-/ of (71) will invoke the opposite ranking. This type of solution can be argued to instantiate a form of the ‘duplication problem’, by duplicating grammatical information in the lexicon (see Burzio 2005b for discussion).

We can easily verify that this account of the variation will not compromise the earlier analysis of the proparoxytones, which only delete. This is done in (72), which simply adds the ranking of (67)

above and the three-syllable window to extant machinery, ignoring the constraint ONSET of (70), (71), whose effects are straightforward.

(72) ‘guard’ NOM.PL.:	[fɪlak], [-a], [-es] /filakað-es/	3σ	FAITH-STEM (OO-F)	FAITH- CM (OO-F)	DEP	IO-F (derived)
a.	fɪlakaðes	*				
b.	 fɪlakes			*		*
c.	fɪlákaðes		*			
Grammar						Lexicon

In (72), epenthesis is given in the input to show that the calculation will be effective in excluding it from the output (72b). As was discussed in regard to (67), this occurs because the presence of the CM would either displace the stress thus violating FAITH-STEM (72c), or else violate the three-syllable window (72a).

We note that such systematic failure of proparoxytonic stems to choose epenthesis shows clearly that the FAITH-STEM of (72) *must* be a form of OO-F. The reason is that, under Richness of the Base (ROB), an input could freely be unspecified for stress. IO-F could then correctly yield the antepenultimate stress of singular *filakas* under a default assignment, but it would then also incorrectly yield **filákaðes* (72c) in the plural, leaving no reason for the systematic exclusion of epenthesis in this class. That exclusion is only attainable if the FAITH-STEM of (72) is to an output, like the bracketed stems in each of (70)-(72) since we know that, ROB notwithstanding, outputs always have stress, thus making **filákaðes* unfaithful. The correct choice of FAITH is automatic in our framework that has no UR. In a framework that featured only UR and no OO-F the correct characterization of the phenomenon (and of PU effects in general) would not be possible, while in a framework that featured

OO-F along with the traditional UR, the correct choice of FAITH (OO-F rather than IO-F) would have to be made by a ranking stipulation. To conclude, we have now provided a solution to our third and final problem. We have argued that augmenting stems with CMs enhances PU effects similarly to what happens in affixal syncretism (referred to as ‘PU+’ effects in (26) above), where all members of a paradigm also receive a fixed increment of some sort. The enhanced PU effect prevails over any otherwise dominant affix, resulting in fully uniform stress. The presence of affixal syncretism in the classes that take CMs was also traced to the same factors. We have seen that PU is also at work in the systematic deletion of CMs in the plural of proparoxytonic items. A consequence of this account is that antepenultimate stress, while possibly the default pattern, is nonetheless subject to Paradigm Uniformity like other stress patterns.

6. Stress variation in proparoxytones

In this section we refine our analysis in consideration of the fact, noted in Revithiadou (1998), (1999) that proparoxytonic trisyllabic items exhibit the variation in (73a, b) in contrast to quadrisyllabic items like *astráγalos* ‘ankle’, which exhibit only a split paradigm like (73a).

(73) a. Split paradigm

	‘man’	SG.	PL.
NOM.		άνθρωπ-ος	άνθρωπ-ι
ACC.		άνθρωπ-ο	ανθρώπ-υς
GEN.		ανθρώπ-υ	ανθρώπ-ων

b. Uniform paradigm

	‘kiln’	SG.	PL.
NOM.		κλίvan-ος	κλίvan-ι

ACC.	klívan-o	klívan-us
GEN.	klívan-u	klívan-on

In discussing (18) above, we had put this variation aside, considering only (73a). We can now deal with it on the model utilized in (70)/ (71) for the variation between deletion and epenthesis. To do so, we appeal to the ranking indeterminacy or partial order in (74).

(74) (FAITH-STEM & ALIGN FOOT L), FAITH-AFFIX GEN.PL.

The ranking in (74) is based on the assumption that, while a violation of FAITH-STEM incurs a lesser penalty than a violation of FAITH-AFFIX GEN.PL. as expressed by the ranking in (39) above repeated in (75b) below, combined violations of both FAITH-STEM and ALIGN FOOT L incur a penalty comparable to that of FAITH-AFFIX GEN.PL, as expressed by this ranking indeterminacy. We assume that, by itself, the constraint ALIGN FOOT L of (74) (utilized in the English case in (69)) is lower ranked than FAITH-STEM as in (75a) below, and thus, by transitivity, also lower ranked than FAITH-AFFIX GEN.PL given (75b).

- (75) a. FAITH-STEM >> ALIGN FOOT L: as(tráyal-os) ‘ankle-NOM.SG.’
 b. FAITH-AFFIX GEN.PL >> FAITH-STEM: (âstra)(yál-on) ‘ankle-GEN.PL.’

Conjunctive effects such as that in (74) are straightforwardly expected in the present system that is inherently summational. They are entertained as well in mainstream OT, where they constitute exceptions to strict ranking (see refs. in McCarthy 2002, 43). Given the ranking in (74), the variation in (73) will now follow in the familiar way, as in (76).

(76) GEN.PL:	/klívan-/ , / -on/ /klívanon/	(FAITH-STEM & ALIGN FOOT L)	FAITH-AFFIX GEN.PL.	IO-F (derived)
a.	kli(vánon)	*		*
b.	 (klívanon)		*	
			Grammar	Lexicon

In (76), we report three different input forms. Beginning with the full-fledged /*klívanon*/, this is parallel to the full-fledged /*manáviðes*/ and /*stratiótes*/ of (70), (71) above respectively. The other two input forms in (76), /*klívan-*/, / -on/ are the same as in (39) above, and are more like traditional underlying representations, yet they are only abstractions over surface forms, each representing a set of entailments instantiated by a collection of surface forms. As such, and as we have noted repeatedly, such forms thus stand simultaneously for both inputs and outputs. As in the case of the deletion/ epenthesis variation discussed earlier, given the low rank of IO-F(derived) in (76), the input for the morphologically derived form will only have an effect in resolving a ranking indeterminacy between higher-ranked constraints, here deciding in favor of candidate (b). Decision in favor of candidate (a) will be made instead in the case of [*anθrópon*] given the corresponding input /*anθrópon*/. The fact that all members of the Genitive subparadigm behave consistently with the Genitive Plural in each case: [*klívanu*] ..., [*anθrópu*] ..., continues to follow from high-ranking SPU as in (45) above. Note that in the present system the conjunction (FAITH-STEM & ALIGN FOOT L) in (76) already subsumes the effects of the individual constraints, so that (unlike in the OT practice of constraint conjunction) there is no sense in which, alongside of the conjunction, there are also individual and lower ranked FAITH-STEM, and ALIGN FOOT L. If this were the case, we might expect that *they*, rather than IO-F, would decide the outcome, incorrectly.

The ranking introduced in (74) makes no distinction between nominals in *-os* and others, thus predicting that uniform paradigms should also be found in other classes, as is indeed the case. For instance, Revithiadou (1998), (1999) cites cases like *γόνδολα/ γόνδολον* ‘gondola’ NOM. SG. /GEN. PL. (Class Marker *-a-* deleted in the plural).

The noted absence of variation in quadrisyllabic items, which only have split paradigms like (73a) is directly predicted by this analysis, as shown in (77)

(77) GEN.PL: /astráyal-/ / ǫ́-on/	FAITH-AFFIX GEN.PL.	FAITH-STEM	ALIGN FOOT L
a. as(tráyalon)	*		*
b. Ɱ (àstra)(yálon)		*	

As shown, FAITH-STEM and ALIGN FOOT L are not violated jointly by either candidate, so that the conjunction in (74) will not come into play, allowing FAITH-AFFIX GEN.PL. to fully determine the outcome.¹⁵

Summing up, the variation observed with trisyllabic proparoxytones is accounted for by assuming that the penultimate stress imposed by the affix can be effectively opposed by FAITH-STEM and ALIGN FOOT L jointly, each demanding antepenultimate stress.

¹⁵ Note, however, that (77) raises the possibility of a slightly different variant of the present analysis. We could suppose that it is not FAITH-AFFIX GEN.PL. that dominates FAITH-STEM as in (77), but rather only a conjunction of FAITH-AFFIX GEN.PL. and ALIGN FOOT L. In that case, the variation dealt with in (76) could involve a ranking indeterminacy of FAITH-AFFIX GEN.PL. and FAITH-STEM instead and would no longer require a conjunction. In sum, a conjunction is required, but it could be for (77) rather than for (76). We know of no evidence deciding between these two alternatives at this point, and will assume the text analysis for concreteness.

We will also leave open the question of how to deal with a further restriction noted by Revithiadou (1998), (1999), the non-existence of the oxytonic pattern with quadrisyllabic items, the pattern **σσσ-ó* thus being apparently ruled out in contrast to bisyllabic cases like *xorós* ‘dance’ and trisyllabic ones like *uranós* ‘sky’.

7. Entailments versus Head-dominance

The approach presented above is similar in important respects to that of Revithiadou (1998), (1999).

The latter is based on the notion that the winner of the faithfulness competition is the ‘head’ of the word, hence the root if affixes are inflectional, but an affix when this is derivational. The similarity is in allowing inherent properties of morphemes to drive the rank of FAITH constraints, entailment structure in the present approach, headhood in Revithiadou’s.

Revithiadou’s analyses apply to the core cases discussed above in the manner of (78), where the morphemes that would carry underlying stress marks are underscored..

(78)	FAITH MARKED ROOT >>	FAITH MARKED AFFIX >>	Default stress
a. <u>án</u> throp-os	--	--	✓
a’. anθρόp- <u>on</u>	--	✓	*
b. <u>klívan</u> -os	✓	--	✓
b’. <u>klívan</u> - <u>on</u>	✓	*	✓
c. <u>uran</u> -ós	✓	--	*
c’. <u>uran</u> - <u>ón</u>	✓	*	*

As can be seen, the properties of roots uniformly prevail over those of affixes: (b’, c’). The appearance of the opposite effect, as in (a’) is dealt with by assuming that the root is in this case lexically unmarked, resulting in default stress when the affix is itself unmarked (a), but in affix-imposed stress when the affix is marked (a’). Alongside of the general conceptual similarity just noted, the analyses in (78) present significant empirical differences compared to our own, which we review below.

To begin, cases like *idéa/ ideón* ‘idea NOM.SG./ GEN.PL.’ directly falsify the ranking in (78) as *idéa* does not have default stress and yet *ideón* manifests affixal stress. One might note, however, that such cases were regarded as partly idiosyncratic even in the present system (discussion of (54)), thus

weakening the argument somewhat. A more unshakeable counterargument to the ranking in (78) is provided by the augmented stems discussed in Sect. 5 above. As we have seen, root accent never wins in the GEN.PL when CM deletion applies, cf. *stratiót-es/ stratiot-ón; filak-es/ filák-on*, and the generalizations given in (59) above. At the same time, root accent always wins when [δ] epenthesis rather than CM deletion applies: *manáviδ-es/ manáv-iδ-on*. From the point of view of the Head-dominance theory, the following curious correlations would then appear to hold.

(79) **Correlations under the Head-dominance theory**

- a. There is *never* lexical stress if the root deletes the Class Marker: *stratiot-ón, filák-on*
- b. There is *always* lexical stress if the root undergoes epenthesis *manáv-iδ-on*

The mysterious character of such correlations is a clear indication that dominance of roots over inflections cannot hold in full generality. Consider that no such accidents beset our account. Our assumption that the GEN.PL affix is normally dominant over the root removes (79a), while our joint assumptions that: i) there is always an effect comparable to lexical stress (OO-F), and ii) stem augmentation raises the rank of stem FAITH remove (79b).

The notion that headhood controls the accent is thus too crude for stems, since stems do not always control (79a). It is also too crude for affixes compared with our account, as the difference between recessive NOM.SG. *-os* and dominant GEN.PL *-on* remains unrelated to the independent semantic difference in content, neither one being a ‘head’.

A further inadequacy compared with the present analyses results from the difference between the trisyllabic items which exhibit the variation in (78) above and quadrisyllabic ones, which do not, as illustrated in (80).

(80)		FAITH MARKED ROOT >>	FAITH MARKED AFFIX >>	Default stress
a.	astráγal-os	--	--	✓
a'.	astrayál-on	--	✓	*
b.	*servítor-os	✓	--	✓
b'.	*servítor-on	✓	*	✓

The case in (80a, a') is just like that of (78a, a') and would be accounted for by the Head-dominance theory in the same way, by assuming no root marking, only GEN.PL *-on* being marked for stress. Its root-marked counterpart (80b, b'), however, is not attested, in contrast to the attested trisyllabic case in (78b, b') *klivan-os/klivan-on*. Rather, in quadrisyllabic cases, one only finds the pattern in (80a, a') or else paroxytonic stress as in *servítor-os/servítor-on* 'waiter NOM.SG./GEN.PL.' and not (80b, b'). Revithiadou (1998), (1999, 99-107) proposes that the lexical marking of (80b, b') is excluded by a condition that she refers to as Hierarchical Alignment (HA), statable as in (81).

(81) **Hierarchical Alignment** (feet must be aligned with word edges): * #σ(σ σ)σ#

There is some affinity between (81) and our ALIGN FOOT L of (77) above. However, parallel OT does not permit constraints that restrict input specifications in the way in which (81) is intended. This is OT's 'Richness of the Base' axiom. It is easy to see that if HA (81) is interpreted instead as a regular output constraint, paradoxical ranking will result, as shown in (78).

(82) **Ranking Paradox**

a.	as(tráγa)los	Antepen. stress >> HA
b.	* ser(vító)ros	HA >> Antepen. stress

The constraint that is critically responsible for antepenultimate stress in Revithiadou's system that has no ternary feet is NON-FINALITY (= syllable extrametricality). It is thus the latter constraint in particular that must dominate HA to allow (82a), while it must be dominated by it to exclude (82b). No such paradox

arises in the present analysis, where the ALIGN FOOT L of (77) holds regularly over surface forms.

Hence, while the Head-dominance hypothesis seems to fare better than the hypothesis of McCarthy and Prince (1995) that FAITH-STEM universally dominates FAITH-AFFIX, it still only approximates the facts crudely. In addition to the above inadequacies, it is also challenged by other cases such as the ones discussed next.

In Italian verbal inflection, accentual properties of stems can surface in contrasts such as *teléfon-o/ importún-o* ‘I telephone/ inconvenience’, but they are uniformly overridden by certain inflectional affixes, as in *telefon-áte/ importun-áte* ‘You-PL. telephone/ inconvenience’ or *telefon-ó/ importun-ó* ‘She telephoned/ inconvenienced’, showing that FAITH-AFFIX can dominate FAITH-STEM. The same is true in English, where voicing assimilation is regressive in cases like *lef-t* and *wive-[z]* (**lev-d*, **wife-[s]*). While these cases are describable as ‘irregular’, they nonetheless have inflectional affixes, incorrectly predicting progressive assimilation instead under Head-dominance. Note as well that, to the extent that stems in inflectional paradigms tend to be stable, the relevance of Head-dominance is undercut by the widely entertained notion of Paradigm Uniformity (see contributions to Downing, Hall and Raffelsiefen 2005).

Revithiadou’s hypothesis (unlike McCarthy and Prince’s), seems to correctly predict that derivation should behave differently than inflection in featuring affixes that are relatively more stable than stems. The correctness of this prediction is shown for example by the fact that English vowel shortening with Latinate derivational affixes affects stems but not the affixes themselves, as in *sat[ay]re/ sat[ɪ]r-[ay]ze*, except when the affix no longer determines the lexical category and is therefore no longer the head, as in *organ-[ɪ]z-ation*, or *altern-[ey]te* (verb)/ *altern-[ə]te* (Adj.), much as Head-dominance

would predict. Nonetheless, certain English derivational affixes fail to re-stress their stems and are therefore not dominant in this regard, e.g. *Américan-ist*, *éffort-less*. As argued in Burzio (1994, 250-254), for level 1 suffixes like *-ist*, this property is predictable from syllable structure, and hence it cannot be attributed to accidental absence of lexical stress. For level 2 affixes, like *-less*, *-ness*, *-ful* and others, this property is true of the whole level 2 class (as defined independent of stress) and hence it can also not be ascribed to random absence of lexical stress.

In sum, the Head-dominance system is unable to solve two of the three problems addressed in the present paper: the role of class markers in controlling FAITH relations (Problem III of (10) above), and the role of affix semantics in controlling FAITH AFFIX (Problem I of (7) above). The latter system provides an apparent solution to Problem II of (8) above, the affix controlled stress of *astrayál-on* versus the stem controlled stress of *uran-ón*, but closer scrutiny finds a ranking paradox in the analysis. Facts of other languages also seem to challenge the status of Head-dominance as a theoretical primitive.

8. Conclusions

We find the accentual behavior of nominals in Modern Greek to lend support to two points of theoretical significance. The first is that FAITH constraints in OT are best understood as satisfaction of entailments within the ‘Representational Entailments Hypothesis’ of Burzio (2002a, b), (2005a, b) rather than as primitive notions. We have seen that representations that are relatively more complex, like the semantically more ‘marked’ affixes and the augmented stems, behave as if obeying higher-ranked FAITH constraints, as would follow from their entailment structures. We have also seen that representations that are relatively more similar to one-another, like those occupying neighboring cells

within a paradigm, also behave as if bound to each-other by higher-ranked FAITH constraints, as is also predictable from their entailment structures. This was manifested in the fact that Paradigm Uniformity holds more strongly over local subparadigms than over the paradigm as a whole, as well as in patterns of syncretism (leveling of affixes), which predominantly affect neighboring cells.

The second theoretical point is that the relationships among words that generally define the domain of ‘morphology’ are to be understood as faithfulness relations over surface forms (the stem in *[prevent-able]* being faithful to *[prevent]*) rather than as identity relations holding over Underlying Representations (*[prevent]* and *[preventable]* using the same underlying morpheme /*prevent*/). Once the notion of parallel interaction is introduced into the theoretical discourse (Prince and Smolensky 1993, Burzio 1994), the traditional serial view of a lexicon feeding into the grammar needs to be reevaluated, and the present discussion has provided several types of counter-evidence to that view. In particular, the various Paradigm Uniformity effects discussed above show that surface forms are faithful to other surface forms, not Underlying Representations. For Underlying Representations there would be no reason, for example, why all dominant affixes in a paradigm should assign the same stress. Similarly, the notion of neighboring cell which is crucial to characterizing syncretism presupposes simultaneous reference to multiple forms, not some unique Underlying Representation. We have also seen that grammatical effects such as Paradigm Uniformity can select among listed allomorphs (*ón/ -on*), an unexpected effect if the lexicon was confined ‘upstream’ of the grammar. Finally, we have seen as well that the lexicon is able to resolve grammatical indeterminacies (epenthesis/ deletion; Stem Faith/ Affix Faith). If the lexicon were ‘upstream’ of the grammar, such variations should only be free as in *manavides/ *manaves; *stratiótides/ stratiótes; anθrópon/ *ánθropon*, contrary to fact.

References

- Albright, Adam (2005) 'The morphological basis of paradigm leveling', in Laura J. Downing, T. A. Hall, Renate Raffelsiefen, eds. *Paradigms in Phonological Theory*. Oxford: Oxford University Press: 17-43.
- Anderson, Stephen, R. (1969) *West Scandinavian Vowel systems and the Ordering of Phonological Rules*. Ph.D. Dissertation, MIT.
- Anderson, Stephen, R. (1992) *Amorphous Morphology*, Cambridge University Press.
- Anttila, Arto (2002) 'Morphologically Conditioned Phonological Alternations' *Natural Language and Linguistic Theory*. 20.1: 1-42.
- Aranovich, Raúl (2005) 'Optimizing Verbal Agreement in Mordvin', ms. UC Davis.
- Aronoff, Mark (1994) *Morphology by Itself*, MIT Press.
- Bazell, C.E. 1960. A question of syncretism and analogy. *Transactions of the Philological Society*. 1-12.
- Benua, Laura (1995) 'Identity Effects in Morphological Truncation,' in Jill Beckman, Laura Walsh Dickey and Suzanne Urbanczyk, eds. *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory*, Amherst: GLSA.
- Benua, Laura (1997) *Transderivational Identity: Phonological Relations between Words*, Ph.D. Dissertation, U. Mass. Amherst.
- Blevins, James (1995) 'Syncretism and paradigmatic opposition'. *Linguistics and Philosophy*, 18. 113-152.
- Boeder, Winfried (1976) Morphologische Kategorien. In: K Braunmüller and W. Kürschner (eds.) *Grammatik. Akten des 10. Linguistischen Kolloquiums, Tübingen 1975* (vol. 2). Tübingen: Niemeyer. 117-126.
- Bonet, Eulàlia (1991) *Morphology After Syntax*. Ph.D. Dissertation, MIT.
- Burzio, Luigi (1987) 'English Stress,' in P.M. Bertinetto and M. Loporcaro eds. *Certamen Phonologicum*, Papers from the 1987 Cortona Phonology Meeting, 153-175. Rosenberg and Sellier, Torino.
- Burzio, Luigi (1994) *Principles of English Stress*, Cambridge University Press.
- Burzio, Luigi (1998) 'Multiple Correspondence', *Lingua* 103, 79-109.
- Burzio, Luigi (2000) 'Cycles, Non-Derived-Environment Blocking, and Correspondence,' in Joost Dekkers, Frank van der Leeuw and Jeroen van de Weijer, eds. *Optimality Theory: Phonology, Syntax, and Acquisition*. Oxford University Press, 47-87.
- Burzio, Luigi (2002a) 'Missing Players: Phonology and the Past-tense Debate,' *Lingua* 112, 157-199.
- Burzio, Luigi (2002b) 'Surface-to-Surface Morphology: when your Representations turn into Constraints' in P. Boucher (ed.) *Many Morphologies*, Cascadilla Press. 142-177.
- Burzio, Luigi (2004) 'Paradigmatic and Syntagmatic Relations in Italian Verbal Inflection'. In *Contemporary Approaches to Romance Linguistics*, Auger, Julie, J. Clancy Clements and Barbara Vance (eds.), 17-44. John Benjamins, Amsterdam.
- Burzio, Luigi (2005a) 'Sources of Paradigm Uniformity', in Laura J. Downing, T. A. Hall, Renate Raffelsiefen, eds. *Paradigms in Phonological Theory*. Oxford: Oxford University Press: 65-106.

- Burzio, Luigi (2005b) 'Lexicon and Grammar: unequal but inseparable', ms. Johns Hopkins University. <http://www.cog.jhu.edu/faculty/burzio/LexGramPaper05.pdf>
- Bybee, Joan L. (1985) *Morphology: A Study of the Relation between Meaning and Form*, John Benjamins, Amsterdam.
- Bybee, Joan L. (1988) 'Morphology as lexical organization,' in M.Hammond and M. Noonan , eds. *Theoretical Morphology*, 119-141. San Diego, CA: Academic Press.
- Corbett, Greville (1991) *Gender*. Cambridge University Press.
- Downing, Laura J., T. A. Hall, Renate Raffelsiefen, eds (2005). *Paradigms in Phonological Theory*. Oxford: Oxford University Press.
- Flemming, Edward (1995) *Auditory Representations in Phonology* Ph.D. Dissertation, UCLA.
- Gafos, Adamantios, and Angela Ralli (2001) 'Morphosyntactic Features and Paradigmatic Uniformity in two Dialects of Lesvos', *Journal of Greek Linguistics* 2, pp. 41-73.
- Giegerich, Heinz (1981) 'Zero Syllables in Metrical Theory,' in W.U. Dressler, O.E. Pfeiffer and J.R. Rennison eds. *Phonologica 1980: Akten der Vierten Internationalen Phonologietagung, Wien, 29 Juni-2. Juli 1980*, 153-159. Innsbruck: IBS.
- Halle, Morris, and Alec Marantz (1993) 'Distributed Morphology,' in Kenneth Hale and Samuel J. Keyser, eds. *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*. MIT Press, 111-176.
- Harris, James (1995) 'The Morphology of Spanish Clitics' in H. Campos and P.M. Kempchinsky *Evolution and Revolution in Linguistic Theory: Essays in Honor of Carlos Otero*, Georgetown University Press, 168-197.
- Hebb, Donald O. (1949) *The Organization of Behavior: A Neuropsychological Theory*, John Wiley and Sons.
- Hopfield, John J. (1982) 'Neural networks and physical systems with emergent collective computational abilities', *Proceedings of the National Academy of Sciences*, 79, 2554-2558.
- Inkelas, Sharon (1999) 'Exceptional Stress-attracting Suffixes in Turkish: Representations versus the Grammar', in René Kager, Harry van der Hulst, and Wim Zonneveld (eds), *The Prosody Morphology Interface*.
- Kenstowicz, Michael (1995). 'Cyclic vs. non-cyclic constraint evaluation'. *Phonology* 12: 397-436.
- Kenstowicz, Michael (1996) 'Base Identity and Uniform exponence: Alternatives to Cyclicity,' in: Durand, Jacques & Bernard Laks(eds.) *Current Trends in Phonology: Models and Methods*. European Studies Research Institute, University of Salford Publications. (363-394).
- Kenstowicz, Michael (1997) 'Uniform exponence: Exemplification and Extension,' in V.Miglio and B. Morén, eds. *University of Maryland Working Papers in Linguistics 5 (1997): Selected phonology papers from H-O-T 97*, 139-155.
- Kiparsky, Paul (1973) 'Elsewhere in Phonology,' in S.R. Anderson and P. Kiparsky eds. *A Festschrift for Morris Halle*, Holt Rinehart and Winston, New York.
- Kiparsky, Paul (1991)'Catalexis', ms. Stanford.
- Lindblom, Björn (1986) 'Phonetic Universals in Vowel Systems'. In John J. Ohala and Jeri J. Jaeger (Eds.), *Experimental Phonology* (pp. 13-44) New York: Academic.
- Lubowicz, Ania (1999) 'Derived Environment Effects in OT'. In the *Proceedings of the West Coast Conference on Formal Linguistics 17*. ed. Kimary N. Shahin, Susan J. Blake, and Eun-Sook

- Kim, pp. 451-65. Stanford, CA: CSLI. (Available online at: <http://roa.rutgers.edu/index.php3>)
- McCarthy, John (2000) 'The prosody of phase in Rotuman,' *Natural Language and Linguistic Theory* 18, 147-97.
- McCarthy, John (2002) *A Thematic Guide to Optimality Theory*, New York: Cambridge University Press.
- McCarthy, John (2003) 'Richness of the Base and the Determination of Underlying Representations', ms., U. Mass. [<http://roa.rutgers.edu/index.php3>]
- McCarthy, John (2005) 'Optimal Paradigms', in Laura J. Downing, T. A. Hall, Renate Raffelsiefen, eds. *Paradigms in Phonological Theory*. Oxford: Oxford University Press: 170-210.
- McCarthy, John and Alan Prince (1995) 'Faithfulness and Reduplicative Identity,' in Jill Beckman, Laura Walsh Dickey and Suzanne Urbanczyk, eds. *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory*, Amherst: GLSA. 249-384.
- McCreight, Katherine and Catherine V. Chvany. 1991. Geometric representation of paradigms in a modular theory of grammar. In: Frans Plank (ed.) *Paradigms: The economy of inflection*. Berlin: Mouton de Gruyter. 91-112
- Nespor, Marina, and Angela Ralli. (1993) "Stress domains in Greek Compounds: a case of Morphology-Phonology Interaction". *Themes in Greek Linguistics: papers from the 1st international conference on Greek Linguistics, Reading, September, 1993*, ed. Irene Philippaki-Warbuton, Katerina Nicolaidis and Maria Sifianou, 201-108, Johns Benjamins
- Prince, Alan, and Paul Smolensky (1993) *Optimality Theory: Constraint Interaction in Generative Grammar*, Report no. RuCCS-TR-2. New Brunswick: Rutgers University Center for Cognitive Science. Published (2004): Blackwell.
- Revithiadou, Anthi (1998) 'Lexical Marking and Dominance in Modern Greek'. *Themes in Greek Linguistics II*, ed. Brian D. Joseph, Geoffrey C. Horrocks and Irene Philippaki-Warbuton, 23-48, John Benjamins.
- Revithiadou, Anthi (1999) *Headmost Accent wins: Head dominance and Ideal Prosodic Form in Lexical Accent Systems*. Doctoral dissertation, LOT Dissertation Series 15 (HIL/Leiden University). The Hague: Holland Academic Graphics.
- Segalowitz, Sidney, and Lane, Korri (2000) Lexical access of function versus content words. *Brain and Language* 75:376-389.
- Spencer, Andrew (1991) *Morphological Theory*, Basil Blackwell.
- Steriade, Donca (1999) 'Lexical Conservatism in French Adjectival Liaison,' in B. Bullock, Mark Authier and Lisa Reed (eds.) *Formal Perspectives in Romance Linguistics*, John Benjamins, pp. 243-270.
- Steriade, Donca (2000) 'Paradigm Uniformity and the Phonetics-Phonology Boundary, M. Broe and J. Pierrehumbert (eds) *Papers in Laboratory Phonology 5*, Cambridge University Press. 313-334.
- Stump, Gregory (2001) *Inflectional Morphology: a Theory of Paradigm Structure*, Cambridge University Press.
- Wedel, Andrew (2002). Phonological Alternation, Lexical Neighborhood Density and Markedness in Processing. Poster presented at the 8th Conference on Laboratory Phonology (LabPhon8), June 2002, Yale University.
- Werner, Roland (1987) *Grammatik des Nobiin (Nilnubisch)*. Hamburg: Helmut Buske Verlag.

- Wheeler, Max (1993) 'On the hierarchy of naturalness principles in inflectional morphology'. *Journal of Linguistics* 29. 95-110.
- Williams, Edwin (1994) 'Remarks on lexical knowledge'. *Lingua* 92. 7-34.
- Wunderlich, Dieter (1996) 'Minimalist Morphology: the role of paradigms', in Geert Booij and Jaap van Marle (eds.). *Yearbook of Morphology 1995*. Kluwer, Dordrecht, 93-114.
- Zwicky, Arnold (1985) 'How to describe inflection'. In: *Proceedings of the eleventh annual meeting of the Berkeley Linguistics Society*. 372-386.