Constraining Constraints:
NonFinality and the Typology of Foot-extrametricality

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1. Introduction

Prince and Smolensky (1993) have proposed the constraint NONfiNALITY (F',σ') in their analysis of Latin. In this paper I will show that this specific constraint not only faces a number of empirical problems in Latin, but also leads to unwanted typological predictions, namely the existence of quarternary systems. A simplification of this particular constraint will be proposed that, on the one hand, provides an adequate analysis of Latin and, on the other hand, does not lead to the existence of quarternary systems. Moreover, it will be shown that the proposed analysis straightforwardly accounts for the directional asymmetry that can be observed in previous foot-extrametricality.

2. Latin

Based on Mester (1994), Prince and Smolensky (1993) have provided an OT-account of Latin stress in which an analysis is provided for both the distribution of stress in Latin as well as of stress-related shortening processes in Latin by one and the same constraint hierarchy. That is, the various shortening processes are a direct result of one and the same parse.

Prince and Smolensky (1993:56–66) account for Latin shortening (which manifested itself in Pre-classical, but not in Classical Latin) as a direct by-product of one basic parse. Shortened forms are among the candidates that are evaluated for, for instance, HLH and LH inputs. That is, the optimal output for HLH is (<u>H</u>)(LH-) and for LH it is (<u>L</u>H-), whereas for an HLL input the optimal output is (<u>H</u>)(LL) (main stress is indicated by underscoring; shortening by -).

The following constraints are assumed, which are divided into three sets. (1a) presents the constraints responsible for the shape of the feet and (1b) those responsible for the position and parsing of feet that were identical for Classic and

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Pre-classical Latin. Finally, (1c) provides the position/parsing constraints that were ordered differently in the two periods.

(1) a. FOOT FORM

Lx ≈ Pr: A member of MCAT corresponds to a PrWD
FtBin: Feet are binary at some level of analysis (μ,σ)
RhType (T): Rhythm type is trochaic
RhHrm or *(HL): Rhythmic harmony

b. POSITION/PARSING

NonFinality ($\underline{F}$, $\underline{\sigma}$) » Edgemost ($\underline{\sigma}$,R)
because ($\underline{L}$L)L ≻ L($\underline{L}$L)

No head of PrWd is final in PrWd (both head foot and head syllable) dominates the constraint that forces the stressed syllable to be located at the right word edge.

Edgemost ($\underline{\sigma}$, R) » Parse-σ
because L($\underline{L}$L)L ≻ ($\underline{L}$L)(LL)

Parse syllables into feet is dominated by stressed syllable location.

Edgemost ($\underline{\sigma}$, R) » Pk-Prom
because H$\underline{L}$LL ≻ $\underline{H}$LLL

Stressed syllable location dominates $\underline{H}$ is a better peak than $\underline{L}$

c. SHORTENING vs. STABLE QUANTITY
WSP » Parse-μ
because #($\underline{L}$H-)# ≻ #($\underline{L}$H)#
because ($\underline{H}$)(LH-)# ≻ #($\underline{H}$)(LH)#

Weight-to-Stress: heavy syllables are prominent in foot structure and on the grid

Parse-σ » Parse-μ
because ($\underline{H}$)(LH-)# ≻ (H)L(H)#

The ranking assumed for Pre-classical Latin is the one in (1c), where WSP » Parse-σ » Parse-μ has the effect of producing iambo-cretic shortening. In Classical Latin the ranking is changed into Parse-σ » Parse-μ » WSP, which has the effect of creating stable quantity. For instance, an ouput (*ámo:*) with a final long vowel will be evaluated better than (*ámo*) with a final shortened vowel, as a violation of the WSP-constraint is less important than fully parsing all moras. Similarly, *dicito*, for instance, will be optimally parsed as ($\underline{H}$)(LH) and not as ($\underline{H}$)(LH-) with a final short vowel.

It is clear that the analysis thus adequately accounts for shortening in #LH# and -HLH# cases.

Reasons of space prevent us from going into all the details of Latin shortening here. Let us simply point out that a number of problems occur when more shortening facts and the syncope facts are taken into account and that Prince and Smolensky's analysis therefore is arguably in need of modification. In Lahiri, Riad and Jacobs (1999) it is shown that shortening not only occurs in LH words or words ending in HLH sequences, but also, *pace* Mester (1994) on which Prince and Smolensky's analysis is based, in words ending in LLH or HH sequences. The shortening facts, therefore, argue in favor of a more general constraint responsible for shortening any heavy final syllable.

3. NONFINALITY and main stress in Latin

Let us now concentrate on main stress in Latin. Hayes' (1995) End Rule final/initial can be translated in OT terms as the constraints RIGHTMOST (ALIGN HEAD-FOOT, R, PRWD, R) or LEFTMOST (ALIGN HEAD-FOOT, L, PRWD, L) (cf. Kager (1999), which demand that the head-foot be final or initial. The analysis discussed above, however, offers no obvious way for accounting for main stress by using these constraints. Sometimes main stress is on the final foot as in L(LL)L, (LL)L, (H)L or (LL) cases, but other times on the prefinal foot: as in (H)(LL) and (H)(LH) cases.

The reason why Prince and Smolensky make reference to both the stressed syllable and the stressed foot in the constraint NONFINALITY is clear. In an LH-word the optimal parse must be (LH) in Classical and (LH-) in Pre-classical Latin (the *amo:* vs *amo* example given above), instead of either L(H) or (LH). If no reference to the stressed syllable were made, L(H) would be better than (LH). Both violate NONFINALITY of the stressed foot and L(H) would not, contrary to (LH) violate WSP. The candidate (LH) wins because it has only one violation of NONFINALITY: only the stressed foot is final, but not the stressed syllable. Reference to the stressed foot in NONFINALITY is necessary in order to achieve the effect of exhaustive parsing of post-main stressed syllables. Now, the problem of determining what the main stressed foot is can easily be solved by simply omitting reference to the main stressed foot. The constraints we assume are listed in (2).

(2) POSITION/PARSING

a. NONFINALITY: A foot may not be final

b. ALIGN (PRWD, R, FT, R)

c. ALIGN ACCENT/TONE TO PRWD, R

d. ALIGN ACCENT/TONE TO FOOT

e. NONFINALITY » ALIGN (PRWD,R,FT,R) » PARSE-σ » PK-PROM

Constraints (c) and (d) are basically equivalent to Kager's (1999) constraint RIGHTMOST. The constraints in (2) (and with NONFINALITY **doubly** simplified) will always yield main stress on the final foot, as we will show now. A foot will never be final except under compulsion of the higher ranked constraint: FTBIN. This accounts for monosyllabic words. This also means that HH will be optimally parsed as (H)H and not as (H)(H), given that the parsing of the final syllable results in a violation of the higher-ranked modified NONFINALITY constraint. A bisyllabic input LH will still be (LH) and not (L)H which violates FTBIN. Both L(H) and (LH) violate NONFINALITY, but (LH) will be evaluated better, given that, although it violates PK-PROM, it avoids a violation of PARSE-σ ranked above PK-PROM.

Furthermore, we will leave the constraints in (1a) unaltered except crucially for the constraint banning the uneven trochee: *(HL) (cf. Prince and Smolensky, 1993). We assume that this constraint in Latin is dominated by PARSE-σ. This will give us the constraints in (3).

(3) Undominated: LX ≈ PR, FTBIN, RHTYPE (T)
Crucially ranked:
NONFIN » ALIGN (PRWD,R,FT,R) » PARSE-σ » PK-PROM » *(HL)

The constraint ranking in (3) implies that HLL will optimally be (HL)L, and that HLH will be optimal if (HL)H. The joint effect of these modifications (NONFINALITY simplified (neither reference to main foot nor to stressed syllable) and *(HL) dominated by PARSE-σ) will result in main stress being located always on the last foot. Simplifying NONFINALITY and tolerating the uneven trochee as a constituent, not as a primitive foot-type but one resulting from constraint interaction, has not only the effect of permitting a unified account of Latin main stress, but receives independent motivation as it is necessary to account for Latin syncope. Lahiri, Riad and Jacobs (1999) show *pace* Mester (1994) that syncope not only applied to words ending in **H**LH, but also to words ending in H**L**L, LLH and LLL sequences (the syncopated syllable is indicated by boldface) and can therefore not be related to resolving so-called "trapped" syllables. In the first two cases the syncopated vowel would be stressed (that is the head of the foot) in Prince and Smolensky's analysis, whereas in the latter two cases it would be the weak part of the foot. In the present analysis the syncopated vowel always occupies the weak part of the foot.

4. NONFINALITY (F') and quarternary systems

It is a well-known fact that quarternary systems, that is systems where main stress is located invariably on the fourth syllable from the word edge, do not occur. On the other hand, a quarternary pattern, that is main stress located on the fourth syllable in some well-defined cases, sometimes may occur in a language. In this section, we will show, on the one hand, that Prince and Smolensky's version of the constraint NONFINALITY predicts the existence of quarternary systems, and, on the other hand, that the modified version of NONFINALITY we proposed and motivated in the previous section for Latin correctly excludes such systems.

In Prince and Smolensky's analysis of Latin in (1) above, we saw that a ranking NONFINALITY (F′) » EDGEMOST » PARSE-σ resulted in preferring L($\underline{L}$L)L to ($\underline{L}$L)(LL). Now, let us consider the ranking in (4), where we have ranked PARSE-σ above NONFINALITY (F′) and EDGEMOST.

(4)

σ σ σ σ	PARSE-σ	NONFIN(F')	Al-Ft-R	EDGEMOST/ PRWD,R,FT,R
☞ ($\underline{\sigma}$ σ)(σ σ)			σ σ	σ σ σ
σ ($\underline{\sigma}$ σ) σ	*! *		σ	σ σ
($\underline{\sigma}$ σ) σ σ	*! *		σ σ	σ σ σ
(σ σ)($\underline{\sigma}$ σ)		*!	σ σ	σ
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☞ σ ($\underline{\sigma}$ σ)(σ σ)	*		σ σ	σ σ σ
($\underline{\sigma}$ σ) σ (σ σ)	*		σ σ σ!	σ σ σ σ
σ (σ σ)($\underline{\sigma}$ σ)	*	*!	σ σ	σ
(σ σ)($\underline{\sigma}$ σ) σ	*		σ# σ σ ! σ	σ σ
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☞ (σ σ)($\underline{\sigma}$ σ)(σ σ)			σ σ# σ σ σ σ	σ σ σ
(σ σ)(σ σ)($\underline{\sigma}$ σ)		*!	σ σ# σ σ σ σ	σ
σ (σ σ)($\underline{\sigma}$ σ) σ	*! *		σ# σ σ σ	σ σ

Tableau 4 clearly shows that Prince and Smolensky's constraint NONFINALITY (F′) predicts the existence of quarternary systems. Before showing that the modified constraint NONFINALITY that we motivated for Latin does not lead to the same prediction, but correctly excludes systematic quarternarity, let us first briefly return to previous Foot-extrametricality.

5. Foot-extrametricality

Hayes (1995) has proposed to use Foot-extrametricality for a number of languages. The use of Foot-extrametricality can be divided into two types. One, to which we will refer as "Free" Foot-extrametricality and the other, to which we will refer as Clash-Foot-extrametricality. The latter type involves a restricted use of extrametricality. First the word or stress domain is parsed in feet and then a peripheral foot (in all cases the last) is made extrametrical, but only if it is in clash with a preceding foot. One example is Turkish stress in loanwords (see Gussenhoven and Jacobs (1998) for discussion and a reanalysis). In the former type, a final foot is made extrametrical after the parsing is done, but now irrespective of clash considerations. A typical example is Radio Cairene Arabic (cf. Hayes 1995:130).

Hayes (1995) reports no cases of syllabic trochee assignment with Free Foot-extrametricality, which would result in systematic quarternarity. Now, quite strikingly, cases of left-ward footing plus Free Foot-extrametricality are rare, if existent at all: there seems to be disagreement about the data for Hindi (ibid; 165) and no data are given for Malay (ibid; 263). Also, none of these cases results in systematic preantepenultimate stress. All other examples of Free Foot-extrametricality occur in right-ward iambic or moraic trochee footing. Languages include: Palestinian Arabic, Munsee, Unami, Cayuga, Radio Cairene Arabic, Cyrenaican Bedouin Arabic, Negev Bedouin Arabic and Eastern Ojibwa (cf. Hayes (1995) for a more detailed account).

With NONFINALITY simplified as proposed here, this directional assymetry makes direct sense. Left-ward parsing leads one to expect that a violation of NONFINALITY will be minimal, whereas in right-ward parsing the parsing of syllables into feet will stop exactly two syllables form the word end. In other words, preantepenultimate stress is expected if the four last syllables are light in right-ward systems, but not in left-ward systems. This is, as a matter of fact, the case in the languages mentioned above. All these languages can be straightforwardly analyzed by using the modified constraint NONFINALITY motivated for Latin. Before discussing Hindi in some more detail, let us first show that modifying NONFINALITY as we have proposed in this paper excludes systematic quarternarity. This is illustrated in (5).

(5)

σ σ σ σ	PARSE-σ	NONFIN(F)	Al-Ft-R	EDGEMOST/ PRWD,R,FT,R
(σ̲ σ)(σ σ)		*	σ σ	σ σ ! σ
σ (σ̲ σ) σ	* ! *		σ	σ σ
(σ̲ σ) σ σ	* ! *		σ σ	σ σ σ
☞ (σ σ)(σ̲ σ)		*	σ σ	σ
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σ (σ̲ σ)(σ σ)	*	*!	σ σ	σ σ σ
(σ̲ σ) σ (σ σ)	*	*!	σ σ σ	σ σ σ σ
σ (σ σ)(σ̲ σ)	*	*!	σ σ	σ
☞ (σ σ)(σ̲ σ) σ	*		σ# σ σ σ	σ σ
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(σ σ)(σ̲ σ)(σ σ)		*	σ σ# σ σ σ σ	σ σ ! σ
☞ (σ σ)(σ σ)(σ̲ σ)		*	σ σ# σ σ σ σ	σ
σ (σ σ)(σ̲ σ) σ	* ! *		σ# σ σ σ!	σ σ

Let us next consider Hindi stress. In Hindi, according to Hayes (1995), we do find cases of preantepenultimate stress due to Foot-extrametricality. Moraic trochees are constructed from right to left. The final foot is made extrametrical and main stress is accounted for by the End Rule Right. Hayes (1995:165) notes that his analysis predicts that the preantepenultimate maximum only occurs in cases with two disyllabic feet, which, by the definition of the moraic trochee, implies that the four last syllables are light. An example is *ánumati* 'approval' illustrated in (6).

(6) (x)
(x .)<(x .)>
á nu ma ti

Such a quarternary pattern can arise by the ranking given in (7).

(7)

	NONFIN	AL-PRWD/L	AL-PRWD/R	PARSE-σ
$\sigma\ \sigma\ \sigma$				
☞ $(\underline{\sigma}\ \sigma)\ \sigma$			*	*
$\sigma\ (\underline{\sigma}\ \sigma)$	*!	*		*
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$\sigma\ \sigma\ \sigma\ \sigma$				
$\sigma\ (\underline{\sigma}\ \sigma)\ \sigma$		*	*	* *
$(\underline{\sigma}\ \sigma)(\sigma\ \sigma)$	*!			
☞ $(\underline{\sigma}\ \sigma)\ \sigma\ \sigma$			*	* *
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$\sigma\ \sigma\ \sigma\ \sigma\ \sigma$				
☞ $(\sigma\ \sigma)(\underline{\sigma}\ \sigma)\ \sigma$			*	*
$\sigma\ (\underline{\sigma}\ \sigma)(\sigma\ \sigma)$	*!	*		*
$(\sigma\ \sigma)\ \sigma\ (\underline{\sigma}\ \sigma)$	*!			*
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$\sigma\ \sigma\ \sigma\ \sigma\ \sigma\ \sigma$				
☞ $(\sigma\ \sigma)\ \sigma\ (\underline{\sigma}\ \sigma)\ \sigma$			*	* *
$\sigma\ (\sigma\ \sigma)(\underline{\sigma}\ \sigma)\ \sigma$		*!	*	* *
$(\sigma\ \sigma)(\underline{\sigma}\ \sigma)(\sigma\ \sigma)$	*!			

It is important to realise, however, that the predictions of Hayes' analysis along the lines of (6) are different from the ones in (7). In (7), NONFINALITY in the case of a pentasyllabic word will be violated minimally. As a consequence, as shown in (7), antepenultimate stress is predicted, whereas Hayes' analysis predicts preantepenultimate stress in these cases also. Unfortunately we have been unable to check this for Hindi. But fortunately there is a stress system that will allow us to precisely motivate this point. Before turning to that system, let us first consider why the account proposed here is superior to a derivational account.

The constraint NONFINALITY as proposed here allows to exclude in principle quarternary systems. This result cannot be obtained under foot-extrametricality, where leftward trochees are compatible with Free Foot-extrametricality. Moreover, the account we have provided permits a straightforward explanation for the observed directional assymetry of Free Foot-extrametricality, which, again, cannot be achieved in a derivational account.

Let us finally consider a stress system that comes close to Hindi, but which is impossible to account for under the derivational account. This is a case where a quarternary pattern arises in a Latin/Hindi-like system where preantepenultimate stress occurs only in quadrisyllabic words with the first three syllables light, but where the final syllable may be either light or heavy. Pentasyllabic words obey the antepenultimate maximum.

For such a system, there is no way in which foot-extrametricality and a moraic trochee can reach the preantepenultimate syllable in quadrisyllabic words, given that the final heavy syllable will form a foot on its own (viz. L(LL)<(H)>, where extrametricality is indicated by angled brackets). If, prior to foot-extrametricality, the last consonant is made extrametrical, which has the effect of making the final syllable light, one could in principle stress the initial syllable in these cases (viz. (LL)<(LL)><C>), but notice that this so-called 'chained' extrametricality is excluded by Hayes (1995) on principled grounds. Also, given the fact that the use of foot-extrametricality has to be restricted to words of four syllables with the initial three syllables light, because in all other words the normal three-syllable window is respected, makes the analysis if acceptable at all, completely ad-hoc.

The ranking in (7) above straightforwardly derives such a system as shown in (8).

(8)

	NONFIN	AL-PRWD/L	AL-PRWD/R	PARSE-σ
L L L H				
(L L) L (H)	*!			*
(L L) (L H)	*!			
L (L L) H		*!	*	* *
☞ (L L) L H			*	* *

Early Classical Latin (2nd century BC, Plautinian Latin, cf Allen (1973), Fraenkel (1928), Thierfelder (1928) and Lindsay (1894) among others) works exactly this way. Some examples are *fácilius* 'easy', *fáciliter*, 'easily', *básilicus* 'royal', *múlierem* 'woman' and *bálineum* 'bath'.

As predicted by the ranking in (7), in all other cases the three-syllable window is respected, such as, for instance, *maleffícium* 'crime' or *domicílium* 'house'.

6. Summary

In this paper we have modified Prince and Smolensky's NONFINALITY constraint. The problems the analysis had with respect to uniformely accounting for Latin main stress could be solved by simplifying NONFINALITY and by allowing *(HL) to be dominated. The modification/simplification of NONFINALITY was argued to be independently needed in order to exclude quarternary systems. We have shown that the account proposed here is superior to a derivational account given its ability to characterize both the existing quarternary patterns and to explain the directional assymetry of previous foot-extrametricality.

References

Allen, W. (1973) *Accent and Rhythm*. Cambridge, Cambridge UniversityPress.

Fraenkel, E. (1928) *Iktus und Akzent im lateinischen Sprechvers*. Berlin, Weidmannsche Buchhandlung.

Gussenhoven, C. and H. Jacobs (1998) *Understanding Phonology*. London, Arnold.

Hayes, B. (1995) *Metrical Stress Theory: Principles and Case Studies*. Chicago, Chicago University Press.

Kager, R. (1999) *Optimality Theory*. Cambridge, Cambridge University Press.

Lahiri, A., T. Riad and H. Jacobs (1999) 'Diachronic Prosody', H. van der Hulst (eds.) *Word Prosodic Systems in the Languages of Europe*, 335–422. Berlin/New York, Mouton de Gruyter.

Lindsay, W. (1894) [1963]. *The Latin Language*. New York/London, Hafner. 2nd edition.

Mester, R.A. (1994) 'The Quantitative Trochee in Latin,' *Natural Language and Linguistic Theory* 12, 1–61.

Prince, A. and P. Smolensky. (1993) *Optimality Theory: constraint interaction in generative grammar*. Technical Report 2, Rutgers University.

Thierfelder, A. (1928) 'Iktierungen des Typus *facilius*' in E. Fraenkel.