On the typology of metaphony/stress dependent harmony

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1. Phonological and morphemic harmony

The term *metaphony* is a convenient phonological label that covers a set of quite diverse harmonic/assimilatory phenomena typical of a group of Romance languages. It was coined as a translation of the German *Umlaut* and it is applied to the raising or dipthongization

of stressed vowels triggered by a final high vowel. It is different from canonical cases of vowel harmony because it is stress-dependent and, for a subset of cases, because it does not involve strict assimilation but diphthongization. I will consider metaphony as a special case of *stress dependent harmony*, a term borrowed from Majors (2000), that covers assimilatory phenomena that are triggered or targeted by the stressed position. Several typological classifications of metaphony have been proposed, mostly based on the nature of triggering of vowels, the nature of targeted stressed vowels, the metaphonic change, and morphological conditions (see Maiden 1987, 1991). In this article I propose that a set of basic typological effects derive from the distinction between *phonological harmony* and *morphemic harmony* (Finley 2009, Cole 1991 [1987]) and that contrast preservation plays a crucial role in stress-dependent harmony. In this section I introduce these two types of harmony. Section 2 examines metaphony and morphological gemination in Calvello, a dialect with morphemic harmony. In section 3 I introduce contrast preservation in the analysis of Calvello, and in section 4

I illustrate phonological harmony with another Italo-Romance dialect, Servigliano. Section 5 summarizes the results and discusses unsolved problems and prospects.

In phonological harmony the trigger is a segmental phonological element, as in Turkish vowel harmony (Kabak 2011). Morphemic harmony is an extension of a featural affixation (Akinlabi 1996). A featural affix consists of a floating feature (or a set of floating features). Consider the completive/incompletive alternations in Kanembu (Nilo-Saharan, Chad; Roberts (1994), Akinlabi 1994, Finley 2009). In the completive the vowels can be {a, ə, ɛ, ɔ, ɪ, ʊ}, in the incompletive they become {ɜ, e, o i, u}:[1]

(1)	gɔ́nəkì	'I took'	gónɜkì	'I am taking'
	dálləkì	'I got up'	dɜllɜkì	'I am getting up'
	bàrɛ́nəkì	'I cultivated'	bɜrénɜkì	'I am cultivating'

The incompletive morph is not an affix consisting of segmental material, but a floating [+ATR] feature that is linked by a phonological operation to all the vowels of the verbal form. In Akinlabi's (1994) and in Robert's (1994) analysis the incompletive has a floating [+ATR] and the completive is unmarked and gets the default [–ATR] value.

Within stress-dependent harmony, phonological and morphemic harmony can be illustrated with the Italo-Romance dialects of Grado (Maiden 1991, Walker 2005) and Lugo (Savoia and Maiden 1997, Pelliciardi 1977), respectively.

(2) *Grado*

[1] Both /a/ and /ə/ become [ɜ]. I have substituted this vowel symbol for Akinlabi's and Robert's [ʌ] because Jouannet, at least in Jouannet (1982), uses [ɜ] and syas clearly that it is central, in addition to tense.

	méto	míti	'put-1SG.PST/2SG.PST'
	témpo	tímpi	'time-SG/PL'
	rómpo	rúmpi	'break-1SG.PST/2SG.PST'
	fjór	fjúri	'flower-SG/PL'

(3)	b.	spós	spús	'spouse-M.SG/M.PL'
		nér	nír	'black-M.SG/M.PL'
		mó^{a}rt	múrt	'dead-M.SG/M.PL'
		kapǽ^{a}l	kapél	'hat-M.SG/M.PL'
		patáka	patǽ^{a}ka	'simpleton-M.SG/M.PL'

In Grado the height features of the final vowel spread on the preceding stressed vowel, as shown in (2). In Lugo (3) singular and plural are distinguished in masculine nouns and adjectives by the height of the stressed vowel: the plural morph is a floating autosegment that attaches to the stressed vowel and raises it.

The existence of featural affixes follows from the existence of autosegments. Lexical representations can be impoverished in several ways: they can lack phonological content altogether, as in *pro* or expletives, or their phonological content can be impoverished: they can lack skeletal (C, V) information, as in the case of featural affixes, or they can lack featural specifications (see Svenonius & Bye 2012 for important general observations). In some cases morphs have a mixed character: they can consist of both segmental and floating material, or segmental and bare skeletal material (Mc Laughlin 2000, Finley 2009, and references therein). The Romance dialect of Calvello (Basilicata, Italy; Gioscio 1985), that I examine in the next section, illustrates both cases.

2. Metaphony and morphological gemination in Calvello

An instance of *morphemic harmony*, in which a morph contains melodic material that is not linked to any skeletal position, is metaphony in the Italo-Romance dialect of Calvello, where there is raising of mid close vowels to high, and diphthongization of mid open vowels (é→í, ó→ú; ɛ́→jé, ɔ́→wé). Before discussing this process I will analize gemination in this dialect because it provides an interesting case of the opposite situation: a morph that has a skeletal C position which is deprived of any melodic material.

In several dialects of Italy the mass-count distinction is marked by the stem final vowel, as in Servigliano, e.g. *lu péʃʃu* 'the fish-COUNT', *lo péʃʃo* 'the fish-MASS', or in Antrodoco, here only in the definite article and in demonstratives, *lu férru* 'the (piece of) iron', *lo férru* 'iron-MASS' (Maiden 1997: 73-74; for Servigliano, Camilli 1929: 226, Mascaró 2011: 31 33; for Antrodoco, Scorretti 2012: 125-127). In Calvello (Goscio 1985: 58, 38-39) the exponence of mass is not a desinential vowel; mass is marked by gemination of a singular noun's initial consonant when preceded by the definite article (9a); when the noun begins with a vowel or /w/ the asyllabic form of the article /l/ appears (9d), and there is no explicit mass/count distinction. Gemination also takes place after the feminine plural definite article (9b) and after a closed set of determiners, pronouns, prepositions, conjunctions, adverbs, and verbal forms (9c).[2]

(9)	COUNT	MASS	
a.	lu kásə	lu kkásə	'the cheese-COUNT/MASS'

[2] Other examples: *ɛ kkwánnə* 'and when', *pə ffă* 'in order to make'. In the case of noun-intial /v/, /ɣ/, /j/ gemination yields [bb], [gg], [ɟɟ], respectively, e.g. *játtʃə*, *lu ɟɟáttʃə* 'ice'. Calvello doesn't have the phonological gemination triggered by a preceding stressed vowel, as in Italian *sarà [bb]uono* 'it will be good'.

	lu pánə	lu ppánə	'the bread-COUNT/MASS'
	lu fjérrə	lu ffjérrə	'the iron-COUNT/MASS'
b.	FEM SG.	FEM.PL.	
	la kásə	lə kkásə	'the house-F.SG/PL'
	la mánə	lə mmánə	'the hands-F.SG/PL'
c.	li múlə	tre mmúlə	'the mules/three mules'
d.	l attsárə	'steel-MASS'	
	l wóʎʎə	'oil-MASS'	

I will provide ananalysis of this particular case of gemination,[3] an instance of *morphological gemination (raddoppiamento morfologico)*, and will turn then to the analysis of the raising/diphthogization cases. Following Chierchia's (1986) analysis for other cases of morphological gemination, this case can be dealt with by positing a melodically empty skeletal position at the end of the word that triggers the gemination of the initial consonant of the following word (see also Passino 2013 and references). Although several other representational systems would give similar results, here I will assume that tree root of segmental structure is C, V, which represent a timing slot and the features that distinguish vocalic from consonantal elements and dominates the rest of segmental features, here represented by IPA symbols. The underlying structure of definite articles is the one in (10). *l-u*, *l-a*, and *l-i* have a standard segmental representation; *l-ə*, the feminine pural, which causes purely phonological gemination (see fn. 1) has a final, melodically null C that triggers gemination through linking of

[3] Other languages also use gemination to mark morphological features. In Qafar (Cushitic, Ethiopia) the indefinite genitive in feminines is a final bare C that geminates the initical consonant of the following word: *saga* 'cow' *saga ɗɗaylo* 'cow's offspring' (Svenonius & Bye 2012: 443).

the melodic structure of the initial C of the following word; *l-u*, the masculine mass article also displays this final C, and differs in this way from the masculine singular count article.

(10)

	Masculine	*Feminine*
Singular	l-u | | C V	l-a | | C V
Plural	l-i | | C V	l-ə | | C V C
Mass	l-u | | C V C	

The association of the bare C to the melodic structure of the following C is forced by the interaction of the constraints DEP-LINK, *NO-LINK, *uw, ij, *CC:

(11) a. NO-LINK: Floating features/featureless skeletal elements are disallowed.[4]

b. DEP-LINK: Let S be a segment in the input and F a feature in the input, and S', F' their corespondents in the output. Assign a violation mark if S' is linked to F' and S is not linked to F.[5]

c. *CC: Assign a violation mark to any pair of C slots linked to the same segmental features (No geminates).

d. *uw, uj: Assign a violaton mark to any CV sequence linked to the same segmental features (No homorganic falling diphthongs).

[4] Cf. NO-FLOAT in McCarthy et al. (2012).

[5] Torres-Tamarit (2012: 114, passim). It is similar to NoSpread (McCarthy 2000) and to NoLinK (McCarthy 2008: 278).

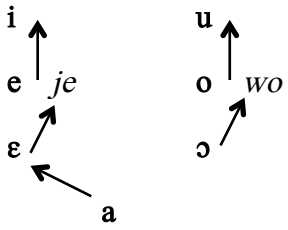
The fully faithfull candidate (12a) satisfies the constraint DEP-LINK but violates *NO-LINK; the preference of geminates to falling high diphthongs favors the candidate (10c):

(12) *NO-LINK > > DEP LINK, *CC; *uw, ij > > *CC

l u k a s ə | | | | | / C V C C V C V /	*NO-LINK	DEP LINK	*uw, ij	*CC
a. l u k a s ə | | ⁄| | | | ☞ C V C C V C V		1		1
b. l u k a s ə | | | | | | C V C C V C V	1W	L		L
c. l u k a s ə | |\ | | | | C V C C V C V		1	1W	L

I will now return to the case of of morphemic harmony in Calvello. This dialect, like all the others discussed here show seven vowel system in stressed position shown in roman boldface in (). Metaphony triggers raising/diphthongiztion as indicated in ().

(10)



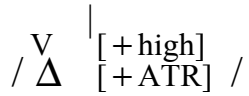
This process shows different kinds of morphologization. First, since vowel reduction merged all the inflective final vowels to [ə], the historical, metaphony-triggering

vowels [i] and [u] are not present anymore in the trigger position, and the metaphonic process must be ascribed to a floating feature that is not realized as a normal suffixal element by concatenation with the stem, but through attachment to a prominent position, the stressed syllable. But in this case we do not have a pure featural affix, like [+ATR] in Kanembu (1) or [+high, +ATR] in Lugo (3); the morph consists of both segmental material, i.e. [ə], and floating material, that I will assume to be [+high, +ATR]. Metaphony affects elements in the noun, adjective and verb paradigm. In verbs it distinguishes the second from the first and third person singular in some paradigms:

(4)		'to reap'	'to peel'	*Verbal suffix*
a.	1SG.PR.IND	sɛ́rrə	mónnə	/ə/
b.	3SG.PR.IND	sɛ́rrə	mónnə	/ə/
c.	2SG.PR.IND	sjérrə	múnnə	/ə, [+high], [+ATR]/

In (4a, b) the morphological structure is /sɛ́rr-ə/, /mónn-ə/[6], with a segmental desinential morph. But in (4c) the desinential morph has the structure in (5a), where a node with the morphological features of 2SG.PR.IND dominates an unordererd set consisting of [V Δ] (where Δ represents the segmental tree of /ə), a floating [+high] and a floating [+ATR]; henceforth I will represent this structure in the form in (5b):

(5) a. 2SG.PR.IND



[6] Although stress in all these dialects is partly predictable, I mark the stress in the underlying form for convenience.

b. /ə, [+ high], [+ ATR]/

Metaphonic raising also distinguishes the second from the first and the third person singular, and the second from the first and the third plural in the present subjunctive; in the latter the morph that causes raising in the stressed syllable is /əvə, [+ high], [+ ATR]/:

(6)	'to peel'		*Verbal suffix(es)*
a.	1SG.PST.SBJV	munnéssə	/é - ss - ə/
	2SG.PST.SBJV	munníssə	/é - ss - ə, [+ high], [+ ATR]/
	3SG.PST.SBJV	munnéssə	/é - ss - ə/
b.	1PL.PST.SBJV	munnéssəmə	/é -ss - əmə/
	2PL.PST.SBJV	munníssəvə	/é - ss - əvə, [+ high], [+ ATR]/
	3PL.PST.SBJV	munnéssərə	é-ss-ərə

In (4a, b) the morph /ə/ is the exponent of 1SG.PR.IND and 3SG.PR.IND, and in (4c) the morph /ə, [+ high], [+ ATR]/ the exponent of 2SG.PR.IND. These floating autosegments cause raising and diphthongization in the root (/sérrə/ → sjérrə, /mónnə/ → múnnə). In (6a) the last morph in the verbal desinence can be, again, either /ə/ or /ə, [+ high], [+ ATR]/. In (6b) we also find segmental afixes, and fixed segmental and floating affixes like the exponent of 2PL /əvə, [+ high], [+ ATR]/.

In nominals, raising/diphthongization has been morphologized differently in nouns and in adjectives. In nouns it distinguishes masculine singulars from masculine plurals:

(7)	a.	réndə	rjéndə	'tooth-M.SG/PL'
		vɔ́skə	vwóskə	'forest-M.SG/PL'
		mésə	mísə	'month-M.SG/PL'
		sórətʃə	súrətʃə	'mouse-M.SG/PL'
	b.	pɔ́rtə	pɔ́rtə	'door-F.SG/PL'
		pérə	pérə	'pear-F.SG/PL'

The gender-number marker is typically syncretic in Italo-Romance varieties. In feminines it is always /ə/; no singular-plural distinction is possible. In masculines, the masculine singular marker is also /ə/, but the masculine plural marker, which is /ə, [+high], [+ATR]/, causes raising or diphthongization of the stressed vowel.

Finally, in adjectives morphologization has taken a different path. Here the morph /ə, [+high], [+ATR]/ is not the exponent of masculine plural, but only the exponent of the masculine:[7]

(8)	*Fem. (sg. and pl.)*	/ə/	*Masc. (sg. and pl.)*	/ə, [+high], [+ATR]/
	apɛ́rtə		apjértə	'open'
	sɔ́ttsə		swóttsə	'flat'
	cénə		cínə	'full'
	sólə		súlə	'alone'

[7] We could also assume that in masculine nouns /ə/ is the gender marker and the floating features are the exponent of plural, and that in adjectives the floating features are the exponent of masculine; similar analyses could be proposed for verbal forms. I owe this suggestion to Eulàlia Bonet.

What has happened historically is that, since the original raising/diphthongization affected both the masculine singular and the masculine plural (presumably *súlu - súli*, but *sóla - sóle* 'alone'), at the point of morphologization, in adjectives it has been naturally transferred to the masculine feature. For nouns, in the masculine type *mústu* (← /móstu/) - *músti* (← /mósti/) 'must', with absolute neutralization, the underlying root /most-/ has been reanalyzed as /must-/, except in a few cases with alternations (*píru - píri* 'pear tree-MASC/PL' vs. *pérə* 'pear-FEM.SG/PL'). The cases with regular singular/plural alternations in (7) derive normally from nouns with an original, non-high final singular stem vowel *-e*, e.g. *més-e - mís-i > més-ə - mís-ə.*

Let us now return to the cases of stress-dependent harmony. I will analyze the simpler mappings e→i, o→u first, and then try to account for the diphthongizing mappings ɛ→je, ɔ→wo. According to our previous discussion, the representation of the gender-number morpheme that triggers metaphony is a morphologically labeled node that dominates the unordered set (ə, [+high], [+ATR]) (13a). This morpheme can be associated to the the root /sórətʃ/ 'mouse' (13b), as the ordered pair (13c), and the constraint hierarchy will force attachment of the floating features to the stressed vowel.

(13) a. $[_{\text{Aff, M.PL}}$ /ə, [+high], [+ATR]/]

b. $[_{\text{Root, M}}$ sórətʃ]

c. $[_{\text{Root, M}}$ sórətʃ] $[_{\text{Aff, M.PL}}$ /ə, [+high], [+ATR]/]

In (13c), the floating features remain unordered with respect to the stem vowel /ə/. The constraint *NO-LINK (9b) disallows unlinked floating material. MAXFLOAT (9a, Wolf

2007) penalizes deletion of floating material, and FLOAT-STR (14) requires that floating material be linked to a the prominent stressed position.

(14) a. MAXFLOAT: Assign a violation mark to any floating feature F in the input that does not have a correspondent feature F' in the output. (Adapted from Wolf 2007)

b. FLOAT-STR: Assign a violation mark to any floating feature F in the input that does not have an output correspondent feature F' linked to the stressed vowel.

(15)

/sórətʃ-ə, [+hi],[+ATR]/	MAX-FLOAT	*NO-LINK	FLOAT-STR
[+hi] [+ATR] sórətʃ-ə		*!*	**
sórətʃ-ə	*!		
[+hi] [+ATR] sórɨtʃ-ə			*!
☞ [+hi] [+ATR] súrətʃ-ə			

3. Stress-dependent harmony and contrast

The diphthongizing cases are more difficult to account for. One of the challenges of metaphony derives from the fact that a purely harmonic spreading process would give as a result the mappings ɛ→ɪ, ɔ→ʊ, e→i, o→u with [+high] as the harmonic feature, and ɛ→i, ɔ→u, e→i, o→u with [+high] and [+ATR] as harmonic features. Calabrese (1985, 1988: 41-58, 313-316, 1995: 396-402, 1999) derives diphthongization from the fact that associating [+high] to a mid open vowel results in a language-particular illicit [+high, –ATR] vowel, i.e. *ɪ*, *ʊ*. This triggers different repair strategies. Let us see how they work in the case of the front vowel. A readjustment process of Fission splits *ɪ* in two segments, S_1 and S_2. S_1 retains the

[+ high] feature of *ɪ*, and S_2 retains its [–ATR] feature. Since S_1 is now unspecified for [ATR], and the unmarked value of [ATR] for high vowels is [+ ATR], we get an on-glide diphthongal [j]. S_2 is [–ATR] and is unspecified for [high]; for [–ATR] vowels the unmarked value of [high] is '–', and we get [ɛ] as the vocalic nucleus. We can adapt Calabrese's insight to an OT framework without having to resort to an intermediate step, the illicit structure that has to be repaired, and by adding two more ingredients. First, I will assume that there is association of both [+ high] and [+ ATR] to the stressed syllable. Second, I propose that contrast preservation also plays a crucial role in these cases. The basic idea is that the mappings ɛ→i, e→i, and ɔ→u, o→u predicted by attachment of [+ high] and [+ ATR] to the stressed vowel, neutralize an underlying contrast, namely ɛ/e and ɔ/o. A constraint that penalizes neutralization of specific underlying contrasts can derive, as we will see, the desired results. I will illustrate the different effects of constraint interaction with the front vowels. If the association of [+ high], [+ ATR]] to the stressed vowel is not disallowed by higher-ranked constraint requirements, we predict the mappings ɛ→i, e→i. But notice that in these cases the underlying /ɛ/-/e/ contrast is lost in a prominent position, main stress. The constraint PRESERVECONTRAST(STRESS,MID), to be formalized below, militates against the loss of potential ɛ/e and ɔ/o underlying contrasts. In the simplified tableaux in (14) I give the basic typological options for the outcome of the front mid open vowel *ɛ* (the mapping e→i is ensured as long as FLOATSTRESS dominates ID(hi)). Assume first that DEP-C is high-ranked, disallowing diphthongization (14a-c). Then if FLOATSTRESS, the constraint that requires that floating material be attached to the stressed syllable, dominates PRESERVECONTRAST(STRESS,MID),[8] we predict the mapping ɛ→i with both [+ high]

[8] Reference to stress is neccessary because of the process of vowel reduction with the

and [+ATR] associated to the target vowel (14a). This is the case of the dialect of Foggia (Calabrese 1995:400, and references), and the cases of hypermetaphony described by Maiden (1991: 179-187, 232-244). If we get the reverse ordering, PRESERVECONTRAST(STRESS,MID) >> FLOATSTRESS, we get at least two different ways in which contrast preservation is enforced by PRESERVECONTRAST(STRESS,MID), (14b, c). The ordering FLOATSTRESS >> ID(ATR) derives (14b), ɛ→e, the chain-shift mapping that is found in Sabine metaphony (Servigliano, Ascrea, Antrodoco), (14b). Under ID(ATR) >> FLOATSTRESS we get ɛ→ɛ (14c) with just mid close to high raising (e→i, o→u), as in Veneto and Grado (Walker 2005: 921-931). Finally, if DEP-C is low-ranked, [+ATR] can be realized on the target vowel and [+high] can be realized as an on-glide at the prize of inserting new material. In this case, if ID(ATR) is ranked below FLOATSTRESS, [+ATR] will associate to the target vowel and we will get diphthongs with mid closed vowels (jé, wó, (14d)), as in Calvello, Arpino, and many other varieties. If we have the reverse ordering, ID(ATR) >> FLOATSTRESS, the original mid open vowel will be preserved (jɛ́, wɔ́, (14e)), as in Francavilla Fontana (Calabrese 1985, 1988: 41-49).

(16)

a.

/ɛ/	DEP-C	FLOATSTRESS	PRCONT(STR,MID)	ID(hi)	ID(ATR)
ɛ→ɛ		*!*			
ɛ→e		*!			*
☞ ɛ→i			*	*	*
ɛ→jɛ	*!				

effect ɛ→e, ɔ→o in unstressed position.

b.

/ɛ/	DEP-C	PRCONT(STR,MID)	FLOATSTRESS	ID(ATR)	ID(hi)
ɛ→ɛ			**!	**	
☞ ɛ→e			*	*	
ɛ→i		*!			*
ɛ→jɛ	*!				

c.

/ɛ/	DEP-C	PRCONT(STR,MID)	ID(ATR)	FLOATSTRESS	ID(hi)
☞ ɛ→ɛ				**	
ɛ→e			*!	*	
ɛ→i		*!	*		*
ɛ→jɛ	*!				

d.

/ɛ/	PRCONT(STR,MID)	FLOATSTRESS	DEP-C	ID(hi)	ID(ATR)
ɛ→ɛ		*!*			
ɛ→e		*!			*
ɛ→i	*!			*	*
☞ ɛ→jɛ			*		

e.

/ɛ/	PRCONT(STR,MID)	ID(ATR)	FLOATSTRESS	DEP-C	ID(hi)
ɛ→ɛ			*!*		
ɛ→e		*!	*		
ɛ→i	*!	*			*
☞ ɛ→je				*	

So far, the constraint I propose, PRESERVECONTRAST(STRESS,MID), has been

presented only in an informal way. Let us give a more formal definition (for other formalizations of contrast constraints see Flemming 2004, Tessier 2004, Hall 2011, Lubowicz 2012):

(17) PRESERVECONTRAST(STRESS,MID) (PRCONT(STR,MID): Let x and y be underlying segments, A an input containing x (A = αxβ), A' one of the candidates of A, and x' a correspondent of x contained in A' (A' = γx'δ)). Then assign a violation mark to A' if there is a potential input B = αyβ if in the evaluation of A and B by the constraint hierarchy, ignoring PRCONTR(MID), the following holds:

B would have a winning candidate B' containing y'
y$\Re$y'
x' = y'
A' is more harmonic than B'.

In order to determine how PRESERVECONTRAST(STRESS,MID) evaluates a given candidate A, we first evaluate the candidate set ignoring this constraint, and we evaluate in the same way the candidates of the *contrasting* input B. If the conditions in (17) hold, A is assigned a violation mark by PRESERVECONTRAST(STRESS,MID). As an illustration, consider the input /rɛndə/ (5a), and the evaluation of the most relevant candidates. Since initially we don't know the effect of PRESERVECONTRAST(STRESS,MID), we evaluate the candidates ignoring it, and we get the violations marked by '*' in (18), and a provisional winning candidate marked by '(☞)'. The violation mark that will ultimately be assigned by the contrast constraint is denotated by '×', and the final winning candidate by '☞'

(18)

/rɛ́nd-ə/	DEP-C	*PRCONT(STR,MID)*	FLOATSTRESS	ID(ATR)	ID(hi)
a. rɛ́nd-ə			**		

b. ☞ rénd-ə			*	*	
c. (☞) rínd-ə		×		*	*

In (18), ignoring PRESERVECONTRAST(STRESS,MID), the winning candidate (marked '(☞)') is *rínd-ə*. Since the input /rɛnd-ə/ can be parsed as αεβ, a potential input meeting the parsing αyβ is /rend-ə/, evaluated in (19).

(19)

/rɛ́nd-ə/	DEP-C	*PRCONTR(MID)*	FLOATSTRESS	ID(ATR)	ID(hi)
a. rɛ́nd-ə			**		
b. rénd-ə			*	*	
c. ☞ rínd-ə					*

The initial evaluation of /rend-ə/ in (19) yields, again ignoring PRESERVECONTRAST(STRESS,MID), the winning candidate *rínd-ə.* Since *rínd-ə* (19c) is identical to *rínd-ə* (18c), and (19c) is more harmonic than (18c) because the latter violates ID(ATR), the former gets a violation mark for PRESERVECONTRAST(MID, ATR), marked in '×'(18). Hence the final winning candidate in the evaluation of /rɛnd-ə/ is *rénd-ə* (and if the contrasting input /rend-ə/ were a real input it would have the winning candidate *rínd-ə*).

4. Phonological stress-dependent harmony

Let us now consider an instance of *phonological harmony*. The stress-dependent harmonic system we find in Servigliano is very different from the morphemic harmony we find in Calvello. Here the harmonic mappings (ɛ→e, ɔ→o. e→i, o→u) are transparent, always triggered by a surface high vowel [i] or [u], and

can be analyzed as an instance of phonological harmony.

Servigliano has a complex set of harmonic processes. Here we will be interested only in harmony caused by [+high], [+ATR] triggers, a regular process with very few lexical exceptions (Camilli 1929, Mascaró 2011: 31-33). A high vowel triggers gradual raising of the preceding stressed mid vowel, i.e. ɛ→e, ɔ→o, e→i, o→u. This is illustrated below with the suffixes /-i/ (masculine plural, 2nd singular present indicative, 2nd singular imperative).

(20)	a.	pɛ́d-e	péd-i	'foot-M.SG/PL'
		rreppréts:-o	rreppréts:-i	'take care-1SG/2SG.PRES.IND'
		bɔ́n-a	bón-i	'good-F.SG/M.PL'
		mɔ́r-e	mór-i	'die-3SG/2SG.PRES.IND'
		pés-a	pís-u	'heavy-F.SG /M.SG.COUNT'
		métt-e	mítt-i	'put-2SG.IMP'
		fjór-e	fjúr-i	'flower-M.SG/PL'
		bótt-e	bútt-i	'cask-M.SG/PL'

I follow Mascaró (2011) in analyzing Servigliano as a case of phonological harmony, governed by the constraints AGREE(+high, +ATR):

(21) a. AGREE(+high, +ATR): For every pair of adjacent vowels one of which is [+high, +ATR], assign one violation mark if they are not linked to the same token of [+high] and [+ATR].

b. IDENT-SUFF(VF): Assign one violation mark for any feature in a suffixal vowel that does not have the same value as its correspondent vowel in the

input.

(Mascaró 2011: 28)

AGREE(+high, +ATR) requires adjacent vowels to agree in [high] and [ATR] if one of them is [+high, +ATR], and ID-SUFF(VF) forces regressive harmony by ensuring suffixal faithfulness. However, I make use of PRESERVECONTRAST(STRESS,MID) instead of Mascaró's (2011) local conjunction IDENT(high&ATR), which disallows the mappings ɛ→i, ɔ→u, also used by other authors (Kirchner 1996, Walker 2005: 959-960, 2011: 260-261). ID-SUFF(VF) >> AGREE(+high, +ATR), since spreading takes place from right to left, and PRCONT(STR,MID) >> AGREE(+high, +ATR), in order to prevent fell-swop raising to high. Consider the evalution of /mɔr-i/ → [mór-i] 'die-2sg.pres.ind':

(21)

/mɔ́r-i/	ID-SUFF(VF)	PRCONT(STR,MID)	AGREE(+high,+ATR)
☞ mór-i			*
mɔ́r-i			**!
múr-i		*!	
mɔ́r-e	*!		

Even if raising harmony in Servigliano is a a good instance of regular phonological harmony, it shows some early signs of morphologization. Serviglano has an adjectival paradigm of five elements: singulars (masculine and feminine), plurals (masculine and feminine), and mass (22a, b). Mass nouns end in the mass marker /-o/, and show metaphonic raising, even though the fianl vowel is not high (22a-c). But

there are also nouns ending in /-o/ that are not mass nouns and show no metaphonic raising (22d).

(22) a. bón-u bɔ́n-a bón-i bɔ́n-e bón-o 'good-M.SG/F.SG/M.PL/F.PL/MASS'

b. nír-u nér-a nír-i nér-e nír-o 'black-M.SG/F.SG/M.PL/F.PL/MASS'

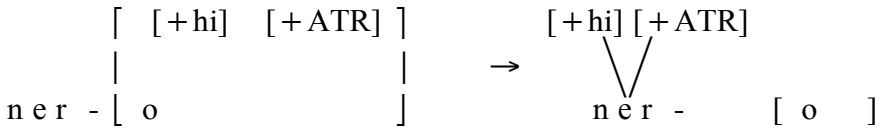
c. lu péʃʃu li péʃʃi lo péʃʃo 'the fish-COUNT/PL/MASS'

d. stéroko 'belch-M.SG

tesɔ́ro 'treasure-M.SG'

We can assume that the underlying forms for the examples in (22d) have the simple segmental affix, /-o/, whereas the mass forms in (22a-c) are /bɔ́n/, /nér/, and /péʃʃ/ with a complex mass marker with a segmental /-o/ and floating [+high], [+ATR], similar to what we found in the morphologized cases we have discussed for Calvello. Following Mascaró (2011: 32-33) the structure of the mass suffix is as in (23), with floating autosegments, which are similar to the structures in (11) for Calvello.

(23)



Conclusion and prospects

We have examined some cases of Stress-Dependent Harmony that indicate that there is an important typological distinction determined by the structure of triggers. They can be morphemes consisting of a floating feature, or a set of features (featural affixation), they can be morphemes formed by both of segmental and floating material (segmental and featural affixation), or they can be a pure phonological element, no morphology

being involved (pure phonological harmony). We have also seen that preservation of underlying contrasts plays a crucial role both in phonological and in morphemic harmony. There remain many open questions, though. First, there are many other cases that will not fit well in this simplified analytic frame. Moreover, even if the opaque cases like Calvello need an analysis in terms of featural floating material, it is not totally clear whether more transparent cases, like Servigliano, might also require this approach. The basic question is whether in cases like Servigliano the trigger is just a high vowel, or a specific morpheme. Counter-evidence to the morphemic analysis that should be checked in future research would be cases in which harmony is triggered within a morpheme. This means basically that we would have to have a large sample of cases of invariable words (mainly adverbs) with apparent harmonic effects and no case, or very few cases, where such effects were missing. This is difficult in Servigliano because the process is neutralizing, and there is always the possibility, in the case of few intramorphemic examples, of analyzing the morpheme with the underlying phonetic stressed vowel. Camilli (1921) offers just the examples *jéri* 'yesterday' and *ódʒːi* 'today'. These words have [ɛ] and [o], respectively, in Vulgar Latin, but in a synchronic analysis of Servigliano they can be represented with their phonetic value in underlying form, i.e. /jéri/, /ódʒːi/. Another possible source of evidence is harmony in proparoxytones. A word like Italian *doménik-a* 'Sunday' has a morpheme-internal post-tonic high vowel that should trigger raising on the tonic. But Servigliano has a regressive process of total vowel copy affecting post-tonic vowels that makes a sequence formed by a possible stressed target, a high vowel, and a nonhigh vowel like *é-i-a* impossible; the word for 'Sunday' is *doménnak-a* (pl. *dóménnek-e;* cf. *ʃtómuk-u, ʃtómik-i* 'stomach-SG/PL'*; prɛ́dok-o, prédik-i, prɛ́dak-a* 'preach-1SG.PRES.IND/3SG.PRES.IND'). In *prédik-i* there is a post-tonic high vowel but

the raising of the tonic is triggered by the final vowel. Other dialects avoid metaphony altogether in proparoxytones, and in other cases, like in Grado, proparoxytones allow harmony, even if the tonic is not affected, suggesting a more pure phonological spreading process (géndene, gíndini 'louse's egg-M.SG/M.PL'; zóvene, zúvini 'youngster-M.SG/M.PL'; álboro, álburi 'tree-M.SG/M.PL'; ánzolo, ánzuli 'angel-M.SG/M.PL'; see Mascaró (submitted)). At the other end we have cases like Lena Asturian (Neira 1955) in which the floating features analysis seems much more justified because the process can proceed regressively from the final vowel to the stressed vowel skipping a potential post-tonic target (péʃaru páʃaros 'bird-SG/PL'; birwíβanu birwéβanos 'wild strawberry-SG/PL').

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