METAPHONY IN SALENTINO

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"**Socrates** [...] What ground, you may ask, have I for saying so? Good sir, there is something welling up within my breast, which makes me feel that I could find something different, and something better, to say. I am of course well aware it can't be originating in my own mind, for I know my own ignorance: so I suppose it can only be that it has been poured into me, through my ears, as into a vessel, from some external source, though in my stupid fashion I have actually forgotten how, and from whom, I heard it".

(Plato, Phaedrus 235c)

Most Italian dialects are characterized by a change in the vowel quality in stressed syllables in the context of high vowel suffixes. In more precise terms, we can say that these dialects display a phenomenon of assimilation between the stressed vowel and the vowel of a suffix, and that the vowels that trigger this phenomenon are the suffixal vowels. In these Italian dialects, the only suffixal vowels that can trigger this type of assimilation are the [+ high] vowels /i, u/. However, in other Romance languages where we find the same phenomenon, e.g., Portuguese and Romanian, the triggering suffixal vowels can belong to a different class; for example, in Romanian, they are the [-high] vowels /e, o, a/.

We decide to follow traditional Romance linguistics and call this phenomenon "metaphony", where with metaphony we mean a local process of change of vowel quality determined by the vowel of a following syllable. This process can produce diphthongization or raising of the vo-

wel. Therefore, we reject the other available term for this phenomenon, i.e. "umlaut", as proposed by C. Leonard, 1978 and others. We feel that although the phenomenon defined by "umlaut" is essentially identical to our "metaphony", there is a strong connotation of "fronting" in the use of the word umlaut that comes from German linguistics. Thus we think that, given this connotation, umlaut is not an appropriate term for the phenomenon that we will be treating here. However, we have to point out that both umlaut and metaphony are expressions of a similar rule of harmonization, as we will see more clearly later. Similarly, we will not use the term "harmony" because of the fact that our phenomenon is restricted to the stressed vowel of the world, and this is not a property that is characteristic of the harmony phenomena where there is a change in vowel quality throughout the word.

Although the phenomenon of metaphony is present in most Italian dialects, it is a typical isogloss of southern Italian dialects such as Salentino for example, wich is a dialect spoken in the southern part of Apulia, in the heel of the Italian boot[1]. In this paper, we will consider a northern variety of Salentino which is spoken in Francavilla Fontana (BR); we will refer to it hereafter simply as northern Salentino.

We must point out that the analysis that we will propose for our northern Salentino data holds for most other southern Italian dialects as well; this is because the facts are essentially similar in all of these different dialects. From time to time we will depart from northern Salentino data and consider pertinent facts of other southern Italian dialects that display different properties.

Most part of the data on northern Salentino that we will present comes from Ribezzo (1912) and Mancarella (1974). Another important source is Rohlfs (1966, 1956-61). As for the verbal morphology, we will use the data given in the AIS vol. IX for a similar variety of northern Salentino spoken in Avetrana (TA) (number 738 of AIS locality list).

The presence of the phenomenon of metaphony in northern Salentino

is displayed in the following facts: the tense mid vowels /e - o/ are raised to /i - u/ when they are stressed and followed by underlying /i - u/. For example, we have alternations like the following in the adjectival paradigms: sing. fem. *frédda* - sing. masc. *friddu* - plur. másc. *friddi* "cold"; sing. fem. *rossa* - sing. masc. *rússu* - plur. masc. *rússi* "red". The lax mid vowels /ę - ǫ/ are diphthongized into /ię - uę/ when they are stressed and followed by underlying /i - u/. For example, we have the alternations like the followingin the adjectival paradigms: sing. fem. *lę́nta* - sing. masc. *lię́ntu* - plur. masc. *lię́nti* "slow"; sing. fem. *grǫssa* - sing. masc. *gruę́ssu* - plur. masc. *gruę́ssi* "big". We will account for these metaphonic alternations in sect. II.1 and II.2. Before doing that, however, we must solve another problem that northern Salentino presents: there are no mid vowels in unstressed syllables; but only the low vowel /a/ or the high vowels /i - u/. However, there are reasons to suppose that in unstressed syllables, there can be underlying mid vowels; this can be shown by alternations in the verbal system and by the fact that not all the superficial high vowels trigger metaphony. To solve this problem, we will argue in sect. I.1 for a rule of raising of mid vowels in unstressed syllables.

In this paper, we will show that the most appropriate analysis for metaphony is the one using the autosegmental framework.

However, the facts that concern us here are the following: in a metaphonic context, the stressed vowels are affected in the following way: they are raised if they are tense mid vowels and they are diphthongized if they are lax mid vowels. Our goal in this paper is to explain why lax mid vowels are diphthongized in a metaphonic context. We will suppose that the diphthongization we see in this case is one of the strategies provided by Universal Grammar to clean up disallowed configurations created by application of rules. For the case of Salentino, our idea is that when the metaphony rule applies to lax mid vowels, it creates lax high vowel. This lax high vowel is disallowed in Salentino and therefore

it must be cleaned up. In order to treat these facts, we propose a variant of the underspecification theory similar to the one proposed by Kiparsky 1982, 1985 with filters that block configurations of phonological features.

Now in order to prevent configurations that violate these filters, we propose clean up rules which change these configurations into allowed ones. We interpret these clean up rules essentially as the linking rules of the markedness theory (c f. Chomsky-Halle 1968).

We will discuss other southern Italian dialects. In these dialects, we find the same metaphonic alternations that occur in northern Salentino. The interesting fact is that in the case of the lax vowels, the results of metaphony in the other dialects are different from the results of metaphony in northern Salentino.

Instead of postulating different rules of metaphony to explain this dialectal variation, we propose that the rule of metaphony is always the same and that the dialectal variation is given by the application of different clean up rules.

I. Description of the facts

1. *RAISING IN UNSTRESSED SYLLABLES*

Before considering the data on metaphony, we have to discuss another phonological phenomenon of northern Salentino that can render the facts opaque.

In stressed syllables, the vocalic inventory of Northern Salentino is composed of seven vowels:

i	u
e	o
ɛ	ɔ
a	

in unstressed syllables, this vocalic inventory is reduced to:

i u

a

In order to explain this fact, we propose a rule like the following:

[1] $\begin{bmatrix} -\text{low} \end{bmatrix} \downarrow > \begin{bmatrix} +\text{ high} \\ +\text{ tense} \end{bmatrix} / \begin{bmatrix} \text{——} \\ -\text{stress} \end{bmatrix}$

[1] raises all the mid.-vowels in unstressed syllable.

There are arguments that justify the existence of a rule like that in [1]. First of all, as we shall see better later, there are the facts of metaphony. We know that only high vowels trigger metaphony. We can suppose this, cross-linguistically, from strictly correlated dialects (e.g. the dialect of Campi Sal. [LE]) where only final *-i, -u* are triggers of metaphony, but not final *-e, -o, -a*, and, intralinguistically, from the fact that final *-a* does not trigger metaphony. Let's consider now the following pairs where the forms in b) have undergone metaphony.

[2] a) péssi "fish" b) píssi "fishes"
a) dénti "tooth" b) diénti "teeth"

In [2] we can see that no metaphony rule applies in the singular form, but it does apply in the plural. So we have to suppose that at the level in which the metaphony rule applies, the ending of the plural is [+ high], while the ending of the singular is [- high]. (See sect. II.1 for a description of the metaphony rule). This means that the metaphony rule applies at a level in which the northern Salentino forms must be similar to their Italian correspondent in [3] (cf. footnote 2) (Note that in Italian there is no metaphony rule):

[3] a) pésce b) pésci
a) dénte b) dénti

As we can see in Italian, the ending of the singular is a mid-vowel and the ending of the plural is a high vowel. If we suppose that this is also true for the underlying forms of northern Salentino, we can account for the fact that in the a]-forms of (2) there is no metaphony. But in order to explain the superficial aspect of the a]-forms in (2), we have to suppose that a rule like (1) has been applied after the metaphony rule.

Another synchronic evidence for the existence of a rule like (1) in northern Salentino comes from the consideration of the verbal system where we have stress shifts depending on the conjugations (from AIS: 1683, Ribezzo (1912)):

(4)	a]	*1ps* trọ́u "I find"	b]	séntu "I feel"
		2ps truéi		siénti
		3ps trọ́a		sẹ́nti
		1pp truámu		sintímu
		2pp truáti		sintíti
		3pp trọ́anu		sẹ́ntunu

	c]	*1ps* canóscu "I recognize"	d]	créu "I believe"
		2ps canúsci		críti
		3ps canósci		créti
		1pp canuscímu		critiámu
		2pp canuscíti		critiáti
		3pp canóscunu		crétunu

There are several points to be noted in (4). First of all, the metaphony rule affects only the second person singular; this means that only in this case can we have an ending with an underlying high vowel. Therefore in the case of the first person and the third person singular of b], c] and d], the ending must be an underlying mid-vowel that has been later raised by (1). Let's now consider the effects of the stress shift: in (4) we can

see that the stem mid vowels which can be lax or tense when stressed (if not metaphonized) are reduced to the corresponding high vowels when unstressed. Therefore, the underlying vowel quality of the forms must be the one that shows up when the vowel is stressed. If not, we wouldn't understand the variation in tenseness. Therefore, we must suppose that the Salentino speaker knows that an unstressed vowel can be either tense or lax, as he/she can deduce from alternations like those in (4). A correct understanding of (4) is possible only if the underlying difference in tenseness is blocked and merged in [+ high, + tense] in unstressed syllables, so that the difference shows up only in stressed syllables. This suggests that we must apply (1) to underlying representations like the following, in order to get the right superficial forms of (4).

(5)	a)	troo	b)	sento
		troi		senti
		troa		sente
		troamo		sentino
		troate		sentite
		troano		sentono
	c)	canosco	d)	creo
		canosci		creti
		canosce		crete
		canoscimo		cretiamo
		canoscite		cretiate
		canoscono		cretono

An objection against this last argument could be that there is a lowering rule that applies to high vowels in stressed syllables. This objection, however, is easily countered. In northern Salentino, we have high vowels in stressed syllables as one can see in (6):

[6] vívu "alive", fílu "string", múlu "mule", lúna "moon".

We also have pairs like the following:

[7]	1ps.sing.pres.	1ps.plur.pres.
	vívu	vivímu "to live"
	nnúcu	nnucímu "to bring"

The pairs in [7] suggest that we cannot talk of lowering in stressed syllables.
In conclusion, it becomes clear that in northern Salentino we need a rule that raises unstressed mid vowels: i.e. [1].

Having clarified this, we can now give a description of the phenomenon of metaphony in northern Salentino.

2. *DATA ON METAPHONY*

In northern Salentino, metaphony is triggered only by the presence of an underlying high vowel in the syllable following the stressed syllable of the word as mentioned previously. If we have an underlying low or mid vowel in this syllable, no metaphony in the preceding syllable occurs. This underlying difference, however, is superficially merged in northern Salentino by the presence of the late rule [1] which raises all the unstressed mid vowels. Thus, in order to have a careful description of northern Salentino data, following the proposal made in footnote 2, we will give the Italian and Latin correspondent of the Salentino word as hints about the underlying representations that we propose, when we do not have alternations in the language that show the correctness of that hypothesis.

Metaphony is a phenomenon characterized by the fact that, in a

stressed syllable, a mid vowel[3] is raised if tense, or diphthongized if lax, when it is followed by a syllable with a high vowel. Metaphony occurs both in open and closed syllables: the structure of the syllable does not affect its occurrence: what is important is that it is stressed.

In northern Salentino, we have the following facts [from Ribezzo [1912]]: *the underlying tense front mid vowel /e/ is raised to /i/ when followed by the underlying mid vowels /i/, /u/.* Consider the following pairs:

[7]	sing	plur.
	paréti	paríti "wall[s]"
	réti	ríti "net[s]"
	mési	mísi "month[s]"
	fitéli	fitíli "faithful"
	ngrési	ngrísi "english"

In [7], for the forms of the singular, we have to suppose an underlying ending in *-e* raised to /i/ by [1] after metaphony: for the form of the plural, we have to suppose instead an underlying ending in *-i*. This is straightforward if we consider the Italian correspondents of [7]: *parete - pareti, rete - reti, mese - mesi, fedele - fedeli, inglese - inglesi.*

In closed syllables, we find the same phenomenon as before. Metaphony applies without any restriction. Consider the following pair:

[8]a) péssi [sing.] píssi [plur.] "fish[es]"

or an adjectival paradigm like the following:

[8]b)		masc.	fem.
	sing.	fríddu	frédda
	plur.	fríddi	fréddi

where the comparison with Italian is again useful: it. *pesce - pesci, freddi - fredde*. We have a high vowel in the ending of the masculine singular and plural of (8)b, but not in the feminine.

We have alternations caused by the metaphony rule in the verbal conjugation as well. Consider the alternation that we get in the stressed vowel in the forms of the second and third person singular of the present:

(9)	2nd pers.sing	3rd pers. sing.
	crí̀ti	créti "believe"
	ví̀ti	véti "see"
	ví̀nni	vénni "sell"
	spí̀nci	spéngi "extinguish"

where again a comparison with Italian shows that when we have metaphony, the underlying vowel of the ending is high (2ps); but, when we don't, it is a non high vowel (3ps); cf. ital. *credi - crede, vedi - vede, vendi - vende, spengi - spenge*.

The underlying lax front vowel /ę/ is diphthongized in /ię/, when followed by the underlying vowels /i/, /u/. Again, as before, the fact that the stressed vowel is in an open or closed syllable does not matter. Thus we have the following pairs (we will represent the diphthongs as vocalic sequences, thus following italian orthography. Phonetically, however, the first member of the diphthong is a glide):

(10)	sing.	plur.
	pę́ti	pię́ti "foot/feet"
	mę́li	mię́li "honey"
	mę́a	mię́i "my"
	lę́pri	lię́pri "hare"
	dę́nti	dię́nti "tooth/teeth"
	pę́ddi	pię́ddi "skin(s)"

We know that the underlying vowel of the ending of the nouns of this class is a [- high]/e/. Thus we do not have any metaphony in the singular, but we do have metaphony in the plural, where the underlying vowel of the ending is /i/.

We also have adjectival paradigms like the following:

(11)

	masc.	fem.
sing.	liéntu	lénta "slow"
plur.	liénti	lénti

where the same argument as that for (8)a) holds. In verbal conjugations, we find the same alternations as we found for (9):

(12)

2ps.	3ps. (present tense)
siénti	sénti "hear"
ciérki	cérki "look for"
siékki	sékki "dry"
ssiétti	ssétti "sit"

Now we know that the underlying ending of the 2nd person singular is /i/and that the underlying ending of the 3rd person singular is /-e/. Thus we get metaphony in the first case, but not in the second.

The underlying tense round mid vowel /o/ is raised to /u/, when followed by the underlyng vowels /-i/, /-u/. We have the following facts:

(13)

	sing.	plur.
nouns:	cróci	crúci "cross"
	nóci	núci "nut"
	staššóni	staššúni "season"
	tórri	túrri "tower"
	vórpi	úrpi "fox"

adjectival paradigms:

	masc.	fem.
sing.	pilúsu	pilósa "hairy"
	carúsu	carósa "young"
	rússu	rossa "red"
plur.	pilúsi	pilósi
	carúsi	carósi
	rússi	rossi

verbal conjugations: (present)

2ps	3ps
fútti	fótti "fuck"
canúsci	canósci "recognize"
cúsi	cósi "sew"

The underlying lax round mid vowel /o̯/ is diphthongized to /ue̯/, when followed by the underlying vowels /i/, /u/. We have cases like the following:

(14)

	sing.	plur.
nouns:	co̯ri	cue̯ri "heart"
	fo̯rti	fue̯rti "strong"

adjectival paradigm:

	masc.	fem.
sing.	bue̯nu	bo̯na "good"
	mue̯rtu	mo̯rta "dead"
	lue̯ngu	lo̯nga "long"
plur.	bue̯ni	bo̯ni
	mue̯rti	mo̯rti
	lue̯nghi	lo̯nghi

verbal conjugations: (present)

2ps	3ps
mmuéri	mmóri "die"
arduéri	ardóri "smell"
cunzuéli	cunzóli "comfort"

It is important to note that in a metaphonic context, we do not have what we should expect diachronically from Latin: that is, all the mid vowels that we should diachronically expect from Latin are either raised if tense or diphthongized if lax. This observation is important because it allows the linguist to discover metaphony even in cases where there is no clear alternation. We hypothesize that the underlying vowel in these cases is that one expected from Latin, and that it is precisely this underlying vowel which is changed by metaphony. We find this situations in the case of masculine singular nouns with ending in / -u/, where we cannot find a context withouth metaphony: there is no feminine, and in plural there is also metaphony. We have cases like the following:

(15)	a) fiezzu	< lat. foeteu "bad smell"
	b) suenu	< lat. sŏnum "sound"
	c) truenu	< lat. tŏnum "thunder"
	d) fuecu	< lat. fŏcum "fire"

In all the forms in (15), we should expect /e, o/ from Latin. We can explain the diphthongs only if we hypothesize that the metaphony rule applied. Observe that in northern Salentino, we do not find the diphthong /ie, ue /, except where they are in a metaphonic context. This is an important point for the argument that the forms in (15) derive by metaphony.

However, a more careful research gives us alternant forms for the words in (15). We have to consider either verbs corresponding to the

nouns in (15) or different correlated nouns. So we have the following forms:

(16) a) féti = 3 ps sing. pres. of fitére "smell"
b) sóna = 3 ps sing. pres. of sunáre "sound"
c) tróna = 3 ps sing. pres. of trunáre "thunder"
d) fócara "big fire"

The forms in (16) show that our hypothesis that the underlying vowels of (15) are /ę/ and /ǫ/ is correct. In (16), we do not have a metaphonic context and therefore the vowels show up unchanged.

It seems that there are some exceptions to the metaphony rule: metaphony does not occur, when there is the palatal occlusive kʸ between the trigger and the stressed vowel[4]: (the facts are from Ribezzo (1912))

(17) Spékkʸu "mirror"
vékkʸu "old"
supérkʸu "outrage"
cupérkʸu "cover"

We will account for these exceptions...

There is, however, another class of exceptions which appears very mysterious: no metaphony occurs in words like the following (from Morosi (1874)):

(18) lamentu "lament"
parmentu "floor"
šumentu "pack animal"
turmentu "torment"
cumentu "convent"

However there are several exceptions to this exception: *parlamientu* "parlament", *suramientu* "oath", *cangiamentu* "change", *testamientu* "will". Morosi (1874, pag. 127) says that in words like those in (18), /e̯/ is diphthongized only if preceded by two or more syllables. But this would be very strange and there are several counterexamples to this claim: *sienti* "you hear", *nienti* "nothing", *cientu* "hundred". We choose not to treat the class of exceptions in (18) in this paper.

3. *EXCURSUS*

Before proposing our analysis, we want to distinguish the phenomenon of metaphony from another phenomenon that we find in standard Italian and several Italian dialects, but not in Salentino. The phenomenon in question in the case of Italian is the following: stressed vowels are always lengthened when in open syllable:

(19) fi:lo "string", ti:po "type"
te:la "linen", se:ta "silk"
ca:ne "dog", ca:sa "house"
pu:ro "pure", cu:po "dark"

there is no lengthening when the stressed vowel is in a closed syllable:

(20) mírto "myrtle", capéllo "hair"
cámpo "field", cúffia "bonnet"

When the stressed vowel in an open syllable is a lax mid vowel, it diphthongizes. We can clearly see the fact from the following alternations in the verbal morphology:

(21)

1ps	3ps	(present tense)
téṇgo	tiéne	"to hold"
séḛggo	siéde	"to sit"
vóḛglio	vuole	"to want"

mǫ̣rto (past part. of morire "to die") muore (3ps pres.)

Therefore, in all the open syllables in which we expect a lax vowel by diachronical evolution from Latin /ĕ //ŏ/, we find the correspondent diphthong:

(22) piéde (<lat. pĕde(m)) "foot"
miéle (<lat. mĕle(m)) "honey"
fiéle (<lat. fĕle(m)) "bile"
buóno (<lat. bŏnum(m) "good"
cuóre (<lat. cŏre(m) "heart"
uómo (<lat. hŏmo) "man"

Now, observe that, in Salentino, under metaphony, stressed lax mid vowels diphthongize with the same superficial form with which the Italian stressed lax mid vowels in open syllables diphthongize. Given this, one could be tempted to hypothesize that there must be a single explanation of the two facts in order to account for their similarity. However, if we consider this similarity more carefully, we see that it is very superficial. First of all, in Italian we don't have any diphthongization in closed syllable: similarly, we don't have lengthening either, as we can see in (21). But in Salentino, we can have diphthongization by metaphony both in open and closed syllables, as we can recall in (23):

(23) pę́ti/pię́ti, dę́nti/dię́nti
cǫ́ri/cuę́ri, fǫ́rti/fuę́rti

Secondly, there is a constraint on lengthening and diphthongization in Italian: no lengthening or diphthongization occurs when the stressed vowel is in an antepenultimate syllable, i.e. in case of antepenultimate stress. Thus we have the following words with a stressed lax mid vowel in an open syllable:

(24) mẹ́dico "physician", sẹ́colo "century", pẹ́cora "sheep", pọ́polo "people", vọ́mere "ploughshare", mọ́naco "monk" stọ́maco "stomach".

In the words in (24), we should have diphthongization of the stressed vowel since we have the appropriate conditions. Nevertheless, nothing happens. We suppose that there is a constraint which blocks the phenomenon in antepenultimate syllables[5,6].

No such constraint holds for diphthongization by metaphony; in a metaphonic context, we have diphthongization in stressed antepenultimate syllables:

(25) miẹ́tucu "physician", siẹ́culu "century", muẹ́nici "monks", stuẹ́mici "stomachs"

Therefore, it appears that diphthongization under lengthening and diphthongization under metaphony cannot be correlated and must be treated in a complete different way.

A final argument in favor of the differentiation of the two types of diphthongization comes from another southern dialect, the Pugliese, where, unlike Italian, we have metaphony. In Pugliese, as in Italian, we have lengthening of all the stressed vowels; but, unlike Italian, in this dialect the lengthening of a stressed open syllable always leads to its diphthongization, i.e. the diphthongization is not restricted only to lax mid vowels, as in Italian, but it occurs with all vowels. However, interestingly, we don't find rising diphthongs in Pugliese as we do in Italian (i.e. diphthongs in which the glide is the first member of the vocalic complex), but falling diphthongs (in which the glide is the second member); thus we have the following facts (we give the Latin bases of the Pugliese words since we suppose that they can give clues on how to

reconstruct their underlying representations]: [data from the dialect of Trinitapoli [BA], Stehl [1980]]

[26] spéina [<lat. spīna] "thorn", aléiva [<lat. olīva[m] "olive"
máis [<lat. mēnse[m]] "month", gráit ə [lat. crēta[m]] "clay"
póid ə [<lat. pĕde[m]] "foot", móilə [<lat. mĕle[m]] "honey"
kóip ə [<lat. caput] "head", nóis [> lat. nasu[m]] "nose"
nóuvə [<lat. nŏve[m]] "nine"
sáulə [<lat. sōle[m]] "sun"
nóutə [<lat. nūdu[m]] "naked"

note that there is no diphthongization in closed syllables:

cíng ə [<lat. quīnque] "five", fíggə [<lat. fīliu[m]] "son"
léngua [<lat. lĭngua[m]] "tongue", stédda [<lat. Stēlla[m]] "star"
sétt ə [<lat. sĕpte[m]] "seven", péll ə [<lat. pĕlle[m]] "skin"
vakka [<lat. vacca[m]] "cow"
frónt ə [<lat. frŏnte[m]] "forehead"
vókka [<lat. bŭcca[m]] "mouth"
frútt ə [<lat. frūctu[m]] "fruit"

As we can see in [26], in the diphthongs that we get in open stressed syllables, the glide is always the second member.

But now observe that the diphthongs that we get by metaphony always have the glide as the first member. Consider these alternations where we have a closed syllable: [as in nort. Salentino, we suppose that,

there is an underlying high vowel only in the plural or in the masculine form of the adjectives. Later this vowel is affected by a rule that reduces all the non low vowels to schwa)

[27]	*sing.*	*Plur.*	
	dẹ́ndə	diẹ́ndə	"tooth/teeth"
	masc.	*fem.*	
	gruọ́ssə	grossa	"big"
	cuọ́rpe	[<lat. cŏrpu[m]]	"body"
	piẹttə	[<lat. pĕctu[m]]	"breast"

In open syllables the diphthongs that are the results of metaphony can remain the same or can be reduced to a long high vowel:

[28]	poidə	pi:də	"foot/feet"
	nouva	nuọvə	"new[fem.]/new[masc.]"

In the case of the reduction of the diphthong, we can suppose a stage with lengthening and diphthongization like *pieiti* with later assimilation of the middle vowel.

By comparing [27] and [28] to [26], we can conclude that the rule that gives diphthongization in [26] must be different from the rule of metaphony that gives [27] and [28], since the outputs and the context of the two rules are completely different.

Finally, note that the lack of lengthening and diphthongization in stressed antepenultimate syllables occurs in this dialect as well: consider the following words:

[29] pẹkura "sheep", mọnəkə "monk [sing.]", stọməkə "stomach"

However, as before, metaphony behaves in a different way:

(30) mi̯edəkə "physician"
muo̯nəkə "monk(plur.)"

In (30), we have metaphony in the antepenultimate syllable.

II. Analysis

1. *THE METAPHONY RULE*

We have seen that metaphony in Salentino is a modification of the quality of a stressed mid vowel, when it is followed by a high vowel. A simple way to account for this phenomenon would be to state that in the phonological system of Salentino, there is the following segmental rule:

$$(1)\quad \begin{bmatrix} -\text{high} \\ -\text{low} \\ \text{V} \end{bmatrix} > [+\text{high}] \quad / \quad \begin{bmatrix} \text{——} \\ +\text{stress} \end{bmatrix} \quad C_0 \quad \begin{bmatrix} +\text{high} \\ \text{V} \end{bmatrix}$$

Rule (1) changes a stressed mid vowel into a high vowel in the context of a high vowel. We can then assume that when the high vowel that results from (1) is lax, because the mid vowel was lax, there is a rule of diphthongization that applies to it. For the time being, let's simply state this rule as (2) (we will give a more accurate and explanatory account of this phenomenon later):

(2) [I, U] > [ie, ue]

With (1) and (2), we can explain all the facts of metaphony. For example, consider the following pairs that we give here in their

underlying forms, i.e. before the application of the raising rule to the unstressed vowels:

(3) a) frédda fríddu
b) lénta liéntu
c) róssa russi
d) grossa gruéssi

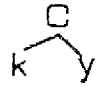
In (3), metaphony applies only to the second members of the pairs in which we have high vowel suffixes. In them, rule (1) changes stressed mid vowels into high vowels. We can see this clearly in a) and c). In b) and d), the mid vowels that are the target of the rule are lax. So by (1) we have to suppose that we get the high lax vowels /I, U/. Therefore by (2), we will obtain /ie, ue/, i.e. the right results.

However, as we have seen in I.2 (32), we have exceptions[7] to (1). When the consonant(s) that intervene(s) between the target and the trigger of the rule in (1) is(are) the palatal occlusive k^y, the rule (1) does not apply anymore, for ex.:

(4) spékk^{y}u
cupérk^{y}u

In (4), we don't have the diphthongs that we should expect by (1), even if we have the right context.

Let's consider the nature of the consonant k^y. We can suppose that it is an affricate. Following Clements & Keyser (1983)'s analysis of affricates, we can propose that k^y is a complex segment of which the first member is a velar occlusive and the second member a glide, i.e. a complex segment like the following:

(5) 

Given this analysis of k^y, we can restrict (1) by stating that no glide can be contained in C. This would be enough to describe the facts correctly.

However an analysis like the preceding is only descriptive and not explanatory. We would like to propose an alternative analysis.

In treating the vowel harmony system of Turkish, Clements & Sezer (1982) observe that the harmonization of a suffix with a stem vowel can be blocked by the presence of a certain consonant between the two elements. Let's quickly examine the facts that concern us. In Turkish, suffixes harmonize in backness and roundness with the stem vowels. Thus in the case of a word with a [+back] vowel, a suffix will show up with a back vowel; in the case of a word with a [-back] vowel, a suffix will show up with a [-back] vowel; we can see the facts in (6):

(6)

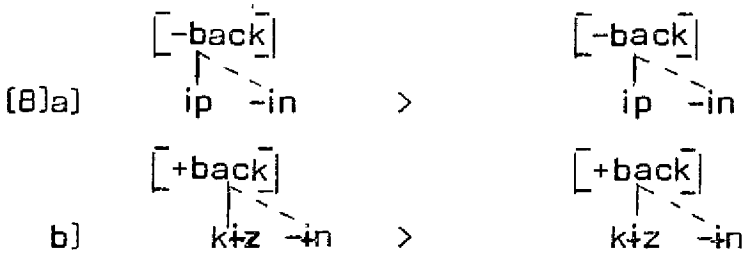
	nom.sing.		gen.sing.	nom.plur.
a)	ip	"rope"	ip-in	ip-ler
b)	kɨz	"girl"	kɨz-ɨn	kɨz-lar
c)	el	"hand"	el-in	el-ler
d)	sāp	"stalk"	sap-in	sap-lar

in (6)a) & c), the stem vowel of the word is [-back] and we have a suffix with a [-back]; in (6)b & d), the stem vowel of the word is [+back] and the vowel of the suffix is [+back].

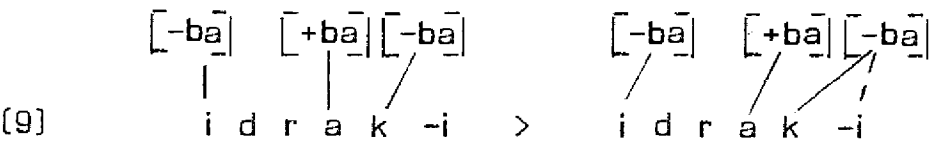
However, there is a regular series of exceptions to this rule: when we have a palatal /k/ between the last stem vowel (the trigger of harmony) and the vowel of the suffix, we don't find the expected harmony; for example, consider the following words:

	nom.sing.	acc.sing.
[7]	idrak "perception"	idrak-i
	imsak "fasting"	imsak-i

In the words in [7], we should expect a [+ back] vowel in the suffix, since the last stem vowel is [+back] instead, we find a [-back] vowel. Clements & Sezer propose an explanation of these facts in the autosegmental framework. In Turkish, vowels are associated with [back], [round] on their proper tier respectively. The vowels of the suffixes are unspecified for both features. To surface as fully specified, they must receive the features that they lack. They receive them through spreading of the features associated with the closest vowel. Therefore [6]a] & b] are explained in the following way:



Now what about [7]? Clements & Sezer propose that the consonants can be associated with vocalic features like [back]. In case of the palatal /k/, they suppose that it is associated with a feature like [-back] that is usually pertinent only in the case of vowels. This feature has a blocking effect on the spreading of the feature [+back] associated with the preceding vowel: both the features are on the same tier and we know that association lines cannot be crossed. Eventually there is spreading of [-back] associated with the /k/ into the unspecified vowel of the suffix[8]. Thus we explain[7]:



We can see that the explanation of the Turkish facts is straightforward, if we assume the autosegmental framework: we need only to assume that consonants can be associated with a feature like [back] usually pertinent only in the case of vowels. In this way we can account for the fact that these consonants are blocking segments: the association lines between them and the feature [-back] represent a barrier to spreading from a preceding feature to a following segmental slot.

Now we want to propose that the use of the autosegmental framework can give interesting results in the case of northern Salentino too.

First, we must stress that metaphony is not a case of vowel harmony: harmony rules are characterized by their being applied throughout the word, so that an unbounded sequence of segments can receive the harmonic value. On the contrary, the metaphony rule is restricted: the target of the rule is only the stressed vowel of the word: nothing besides that can be changed in the word by that rule. We see this clearly when there is a shift of stress. This is the case, for example, when we have stress shift in the derivational morphology. Consider the verbal root *pę̣ns* - "to think", we know that it must have a lax vowel from the following alternations:

(10) pię̣nsi (2ps pres.) pę̣nsa (3ps. pres.)

But when we add the nominalizing suffix *-ę̣r -u*, where the final /u/, the ending of the masc. sing., is a trigger of metaphony, we obtain:

(11) pinsię̣ru "thought"

if metaphony were not restricted to the stressed vowel, we should obtain (12):

(12) pięnsięru

But this is not the case. Therefore we have to conclude that metaphony is not a bounded rule that applies iteratively like vowel harmony.

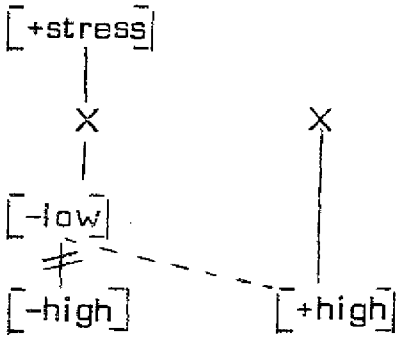
However vowel harmony and metaphony have something in common: they are both non-local rules. Both rules violate strict segmental adjacency. Neither vowel harmony nor metaphony take into consideration consonantal segments that can intervene between the trigger and the target of the rules, unless these consonantal segments a-re specified with a feature peculiar to the vocalic system, as in the case of Turkish.

The fact that the rule of metaphony is non-local is a good argument in favor of its treatment in the autosegmental framework. The non-locality of the vowel harmony rules is derived from the fact that they apply between features (or feature-slot in the case of underspecified segments) that are adjacent on their proper tier. The adjacency that non-local rules require is not a segmental adjacency, but a proper tier-adjacency, i.e., the features pertinent to these rules must be adjacent on their own tier. Of course, this property of the non local rules can be treated only in the autosegmental framework where we ha-ve the notion of tier. Therefore it appears that metaphony can be nicely treated in the autosegmental framework.

Our proposal is that the metaphony rule operates on the tier on which the feature [high] is specified, since [high] is the feature that seems pertinent to the rule, as we have seen in (1). Unlike vowel harmo-ny, however, the metaphony rule must apply when the target vowel is fully specified: we have to know that it is [-high, -low, tense]. Moreover, it must apply after the stress rules have applied, since it is sensitive to

stress. This means that it must apply at a late level of the lexical phonology. We won't be concerned with this problem here. We can state the metaphony rule in the following way:

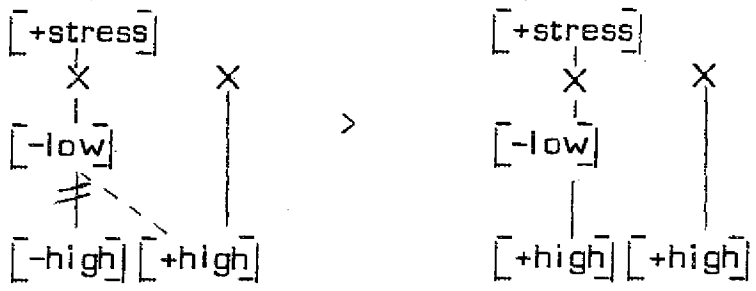
(13)



As we can see in (13), we assume that the metaphony rule is a rule of spreading-cum-delinking. We propose that metaphony is a rule by which a feature [+high] is spread into the preceding adjacent slot and thereby causes the delinking of a present [-high] feature. This spreading applies when the [-high] feature is associated with a timing slot which is [-low] and carries word stress.

Before considering some concrete case of metaphony, we have to propose a natural complement rule (13). We suppose that after the application of the metaphony rule, the spread [+high] is included in the feature bundle of the target and that the spreading line is deleted; i.e. a rule like the following:

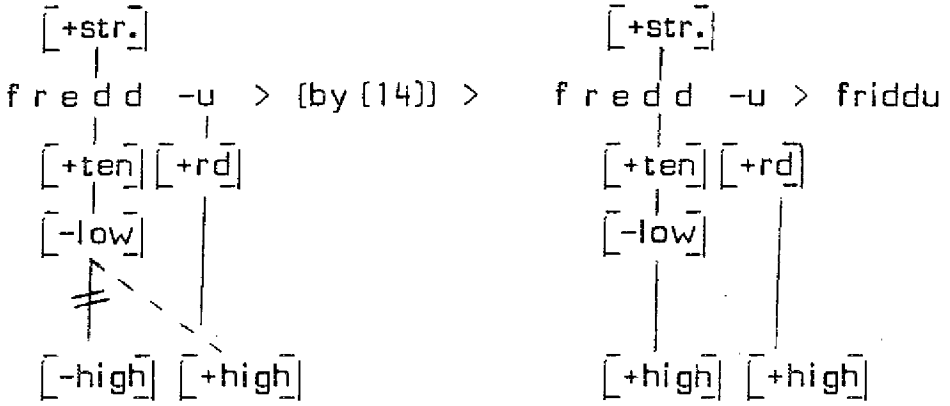
(14)



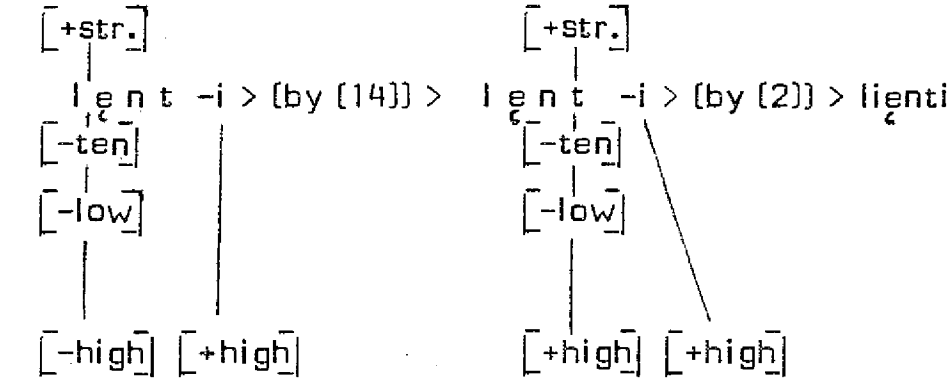
In sect. II. 2, we will argue for rule (14).

Therefore, we propose that we have derivations like the following:

a)

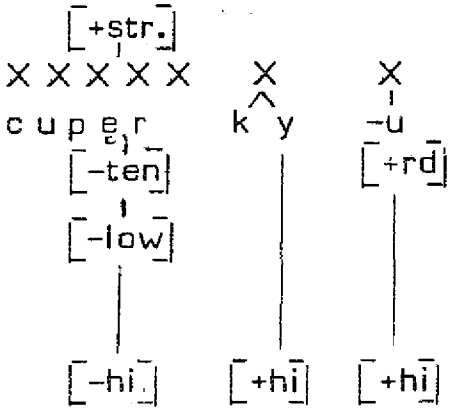


b)



What about the exceptions in (4)? Now we have a way to treat them very nicely. Let's first assume, as natural, that only [+high] features associated with vowels can be triggers in (13), and let's suppose that glides are specified with the vocalic feature [+high].. In this way, we immediately derive the impossibility of application of (13) in the exemples in (4): given that association lines cannot be crossed, the presence of the [+high] associated with the glide /y/ contained in the affricate k^y will represent an insurmountable barrier to the spreading of [+high] of the following vowel. We can visualize this in (15):

(15)



The presence of the [+high] associated with the glide in (15) breaks the adjacency between the triggering [+high] and the target [-high].

Therefore, we believe that the autosegmental formulation of the metaphony rule as in (13), is more appropriate and enlightening than the segmental formulation we proposed in (1).

There is, however, a final problem to solve. The feature [+high] associated with the glide does not trigger the rule of metaphony. This can be accounted for by stating that the feature [+high] that trigger the rule of metaphony must be associated with a segment that is also [+syllabic]. Therefore the feature [+high] of the glide cannot trigger metaphony because the glide is [-syllabic]. This property of the trigger of metaphony must be connected to the fact that metaphony, as vowel harmony, applies only between vowels.

2. *DIPHTHONGIZATION*

In this section, we shall propose an explanatory account of the rule of diphthongization that we gave in (2). We repeat (2) as (16):

(16) [I, U] > [ie_c, ue_c]

By (16), lax high vowels are changed into diphthongs. However, (16) does not give any explanation as to why lax high vowels must diphthongize in Salentino and why they must diphthongize in that way. These are the two problems which we shall now consider.

First of all, we want to observe that the rule of diphthongization that we stated in (16) must be connected to the lack of the lax high phonemes /I, U/ in the vocalic system of northern Salentino, and of the Romance languages in general. In Salentino, as in Italian and other Romance languages, the opposition in tenseness that we find in the mid vowels, where we have the pairs: /e~ɛ/, /o~ɔ/, is not present in the high vowels: the high vowels can be only tense, i.e. /i, u/: their lax counterparts /I, U/ are not present. Therefore, we can hypothesize that, in case a phonological rule produces these disallowed lax high vowels, as occurs with the metaphony rule, we need a rule that changes them into allowed segments. This is precisely the function of rule (16) that roughly states that a disallowed lax high vowel is changed into a diphthong composed of two allowed vowels: a tense high vowel and a lax mid vowel.

Let's now analyse these impressionistic observation in a more accurate way. Our first problem is how to state the lack of lax high vowels in the vocalic system of nort. Salentino. In order to do this, we will use the framework of the underspecification theory, as proposed in Archangeli (1984), Pulleyblank (1983, 1985). Pulleyblank briefly and neatly describes the proposals of the underspecification theory in the following way:

"The [...] framework [of the underspecification theory] adopts as a point of departure the proposal that "the lexicon is minimally redundant" (Kiparsky (1982a). In particular, only non-redundant feature values may be included in underlying representations; predictable feature values are filled in by redundancy rules - rules that are of a

highly constrained nature. A central claim is that most redundancy rules are either a) provided by Universal Grammar or b) derived by principles of Universal Grammar. The plausibility of this claim depends primarily on being able to demonstrate that such rules do not exhibit language-specific idiosyncrasies. That is, if such rules are supplied by Universal Grammar, then their properties should be derivable by principles of Universal Grammar". (Pulleyblank (1985)).

Our vision of the conceptual system of the Underspecification theory differ somewhat from the approaches proposed by Archangeli [1984], Pulleyblank [1983, 1985]. It is more similar to the approach delineated in Kiparsky [1980, 1982a,1985]. As a first point, the minimal value specification of the features of a phonological system of a given language is based on what is distinctive in that language; only the features that are distinctive in that language, i.e., features which are actually necessary to distinguish two sounds, have specified values. Any feature which is non-distinctive in some environment is a redundant feature, and its values are supplied by rule. These filling in rules are provided by UG.

Let's hypothesize that if there is a choice of aF as the minimal feature value, then the opposite value -aF is introduced by default by a rule provided by UG. We suppose, therefore, that in UG there exists the principle that follows, which we shall call the Privative Principle:

[17] The phonological matrices are so constructed that, in a feature bundle T, you can fill in the unspecified value of a feature F with a value α only if α is not a distinctive value for F and if the presence of α in that feature bundle is not blocked by any filter. Otherwise fill in the unspecified value of F with $-\alpha$.

Suppose then that UG has a simple rule like the following in order to fill the unspecified values:

(18) Fill in the unspecified values.

Given α as the distinctive value for the feature F, because of Privative Principle, (18) will insert $-\alpha$, wherever that value for is missing.

In this way, the redundancy rules of Archangeli (1984), Pulleyblank (1983, 1985) are radically simplified: we have only a general rule like (18) and a principle like (17); nothing else is needed to fill in the missing values of the matrices: we can easily derive them from the modular interaction among the selection of the distinctive values, the general rule (18) and the Privative Principle. Given a distinctive value, the Privative Principle provides us automatically with the value that we have to fill in.

Stated in this way, the filling in of the missing values is completely free. Nevertheless, there must be some restrictions on their possibility of being filled in; in fact, there are configurations of specified features which are disallowed, e.g. we cannot find the feature [+high] and [+low] in the same bundle. This is a problem which must be adressed.

Following Kiparsky (1980, 1985), let's suppose that there are filters that block configurations of specified features. A filter of this kind says, for example, that feature aF and feature aG cannot cooccur in the same bundle of features. Given a filter of this kind, the Privative Principle will force (18) to insert a value of F opposite to the one present in the filter. We want to propose that these filters can be part of UG or can be language specific as we will see later.

So given a class of sounds minimally specified as in (19):

[19]

	V_1	V_2	V_3	V_4	V_5
F_1	+				+
F_2		+			
F_3			+		

and given a filter like [20]:

[20] $* \begin{bmatrix} +F_1 \\ -F_3 \end{bmatrix}$

By the Privative Principle and rule [18] in interaction with [20], we will obtain a fully specified system as in [21]:

[21]

	V_1	V_2	V_3	V_4	V_5
F_1	+	−	−	−	+
F_2	−	+	−	−	−
F_3	+	−	+	−	+

We want to suggest that these filters have the function that the systematic gaps in the system had in the European structuralism: they indicate what are the sounds which are missing in a specific phonological system. In this way, we can say that they represent the peculiarity of the system, its specific form.

We may even suppose that a child does not need to learn the filters. What he needs to learn is the list of phonemes present in the language that he is learning. We can then hypothesize that UG provides a device that deduces the gaps in the system by comparing the learned list of phonemes to all the possible phonemes. These gaps are then translated

into filters. Thus if a child learns a language with a vocalic system lacking lax high vowels und unrounded back vowels, he will have filters like $*\begin{bmatrix}+hi\end{bmatrix}$ $\begin{bmatrix}-tns\end{bmatrix}$

$*\begin{bmatrix}+ba\end{bmatrix}$ · $\begin{bmatrix}-rd\end{bmatrix}$

If this supposition is valid, we have to assume that a phonological system of a particular language is given by the difference between its list of phonemes and the list of all possible phonemes. This difference is represented by filters. Of course in representing the phonological system of a given language, only a pertinent subset of all the possible filters is needed. However, we suppose that the other filters are always available in some way.

We suppose that the Archangeli's Feature Minimization Principle, reformulated in a different way, also holds in our system. We differentiate between *distinctive features* and *redundant features*. *Distinctive features* are features that have at least a distinctive value for some phoneme in the system. *Redundant features* are completely unspecified in the system. Our reformulation of the Feature Minimization Principle would be the following:

> [22] A grammar is most highly valued when underlying representations include the minimal number of *distinctive* features necessary to differentiate the phonemes of the language.

Distinctive features are the features learned by the child. Redundant features are those filled in by rule [18] in conjunction the Privative Priciple and the filters. We believe that the filters which intervene in filling in redundant features make use of α-notation, so that dependencies between feature values are created. Let's consider an unspecified phonological matrix like the following:

[23]

	V_1	V_2	V_3
F_1	+		
F_2		+	
F_3			

and a filter like the following:

(24) $$* \begin{matrix} \alpha F_1 \\ | \\ -\alpha F_3 \end{matrix}$$

When rule (18) applies, by the Privative Principle, (23) will be filled in the following way:

(25)

	V_1	V_2	V_3
F_1	+	−	−
F_2	−	+	−
F_3	+	−	−

The values of F_3 parallel the values of F_1 in a redundant way, as a result of filter (24).

One of the most important points here is one which is common to both our theory of Underspecification and the theory of Archangeli and Pulleyblank and it is, quite simply, that we assume that rule (18) can apply after at least some phonological rule of grammar. In this way, we suppose that there are phonological rules that operate on underspecified segments. An example of these kind of rules are the vowel harmony rule of Akan and Hungarian discussed in part III.

Let's now consider the feature composition of the northern Salentino vocalic system. We suppose that the feature [high], [low], [round] and [tense] are appropriate for fully appropriate representations of the seven Salentino vowels; here we give the fully specified feature values for Salentino vowels:

	i	e	ɛ	a	ɔ	o	u
high	+	−	−	−	−	−	+
low	−	−	−	+	−	−	−
round	−	−	−	−	+	+	+
tense	+	+	−	−	−	+	+
back	−	−	−	+	+	+	+

Given the theory of underspecification, it is impossible to posit these representations as underlying representations since they contain many redundancies. Redundant specifications must therefore be eliminated from such representations and then filled in by rule (18) at some point during the phonological derivation.

We propose that the Salentino vocalic system with its minimal feature specification is the following:

(26)

	i	e	ɛ	a	ɔ	ɑ	u
high	+						+
low				+			
round					+	+	+
tense		+				+	
back							

In (26) we have chosen the underlying feature in the following way: [back] is a redundant feature; [+high] must be present because it intervenes in the formulation of rules like metaphony or the assimilation of the post-tonic vowel (see sect. II.6), where we suppose that the triggering suffix is represented as underspecified. The same holds for [+round] and [+low]; we need them as underlying feature for the representation of the rule of assimilation of the post-tonic vowel. As for [+tense] the choice is more complicated; our reasoning is based on the fact that high vowels in northern Salentino cannot be lax. Therefore, we have to suppose that there is a filter like the following in

northern Salentino:

[27] * +hi
-tns

Filter [27], in conjunction with the Privative Principle, thus states that a [+high] vowel will always be specified as [+tense].

Now, if the distinctive value for tense is -, which is associated with the lax mid vowels /e, o/, the Privative Principle leads to filling in the unspecified values for [tense] with + for all the other vowels. However, /a/ is not [+tense], but [-tense]. Therefore, we would have to suppose a filter that blocks the coexistence of [+low] and [-tense] in the same bundle. But we do not need such a filter in the grammar of northern Salentino. Therefore the simplest hypothesis is that the distinctive value for [tense] is +, which is associated with the tense mid vowels /e, o/. [27] in conjunction with the second proposition of the Privative Principle leads to the specification of high vowels only as [+tense]. For the first proposition of the Privative Principle, /a/ and the lax mid vowels /e, o/ will be specified as [-tense] as required. In this way, we get the right array of facts.

In order to fill in all the other missing values and to get the fully specified system that we showed before, we need to apply rule [18] in conjunction with the Privative Principle and filters like [27]. Another filter that is needed in order to have the correct specification is the following:

[28] * +hi
+lo

A filter like [28] has a different status with respect to [27]. While [27] is a language-specific filter, [28] must belong to UG, given that its

content cannot be language specific, but must be shared by every possible language.

Another filter that must be present in the northern Salentino Grammar is (29) which indicates that the filling in for the feature [back] is redundantly dependent on the specification of the feature [round] in the case of the non-low vowels:

(29) $$* \begin{matrix} \alpha\ rd \\ -\alpha\ ba \end{matrix} \Big/ \underline{-lo}$$

(29) states that the features [round] and [back] must always match in their values, when they are [-low].

Finally, we need a filter that correlates lowness and backness:

(30) $$* \begin{matrix} +lo \\ -ba \end{matrix}$$

As mentioned before, the filter that mostly concerns us here is (27). It states the fact that in Salentino, as in the majority of the Romance languages, we do not have lax high vowels.

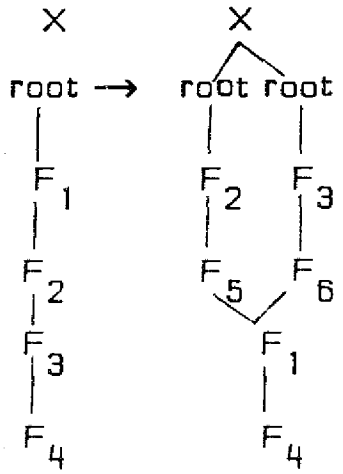
Now we want to hypothesize that the filters continue to function even after they have exhausted their primary task of controlling the right filling in of the missing features of the underlying representations. In this way, they preserve the configurations of features that they have produced. This means that, if a phonological rule produces a configuration of features that violates a filter, this configuration is blocked and something must be done to "clean-up" the disallowed configuration. We propose that this is what happens in the case of the lax high vowels produced by metaphony.

We want to propose that Universal Grammar provides rules to clean up configurations of features that violate filters. We will call them clean up rules. We want to propose that a configuration of features disallowed by a filter is marked in relation to the phonological system that contains that filter, while a configuration of features that does not violate any filter is an unmarked case for that phonological system; so it is possible to interpret the clean up rules essentially as an example of linking rules of the Markedness theory. The clean up rules have the function of changing something that would be marked in that phonological system into something that is unmarked in that phonological system...

Here we want to propose that there are only two ways to clean up configurations that are disallowed by the filters: we shall call the first "linearization" rule and the second "negation" rule.

By the linearization rule, we mean a rule that takes the root node (in the sense of Clements (1985)) which dominates the two conflicting features and clones it in two root nodes each one dominating only one of the conflicting features. We suppose then that the conflicting features are associated with compatible features in their own root node and that the non-conflicting features will be shared by the two resulting root nodes, so that we get fully specified segments. We furthermore assume that the clonation does not affect the timing slot to which the root node, which is target of the rule was associated. We can visualize the rule in the following way:[9]

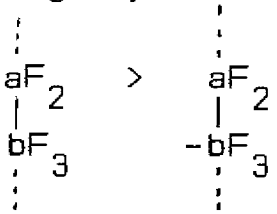
(30)



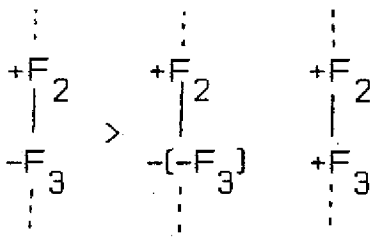
where F_2 and F_3 are conflicting features and F_5 and F_6 are features compatible to F_2 and F_3 respectively.

Through (30), we obtain a complex segment in the sense of Clements & Keyser (1983), i.e., a segment which is characterized by having two fully specified segments associated to the same timing slot.

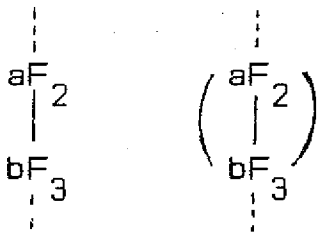
By the negation rule, we mean a rule that takes one or more of the conflicting features and negates their values, so that they come out with the opposite value: we have essentially two cases: one in which only one of the conflicting features is negated and so its value is changed to its opposite, and the other in which more conflicting features are negated and changed in their opposite values. We can represent the first case in the following way:

(31)  where aF_2 and bF_3 are confliting features

Thus, given a configuration like (32) in which $\left[\overline{-+F}\right]$ and $\left[\overline{--F}\right]$ are conflicting features, rule (31) provides the following clean up:

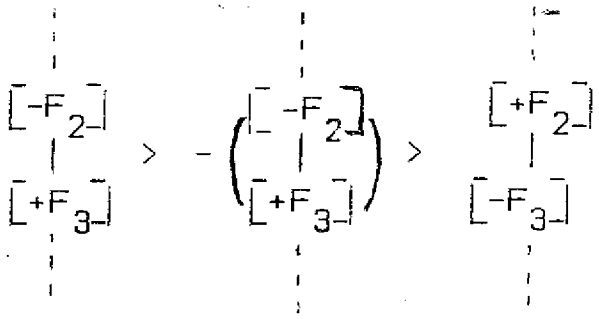
(32) 

We can represent the second case of the negation rule as in (33):

(33)  where F_2 and F_3 are conflicting features

Thus, given a configuration where $\left[\overline{--F}\right]$ and $\left[\overline{-+F}\right]$ are conflicting features

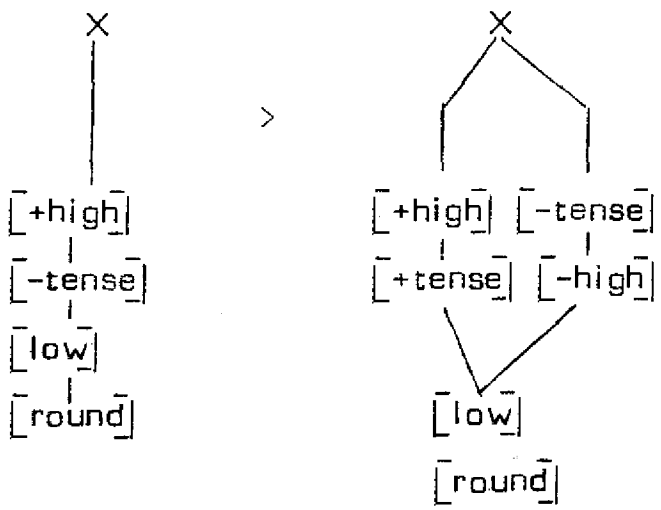
because of a filter, we will obtain the following clean up by [33]:



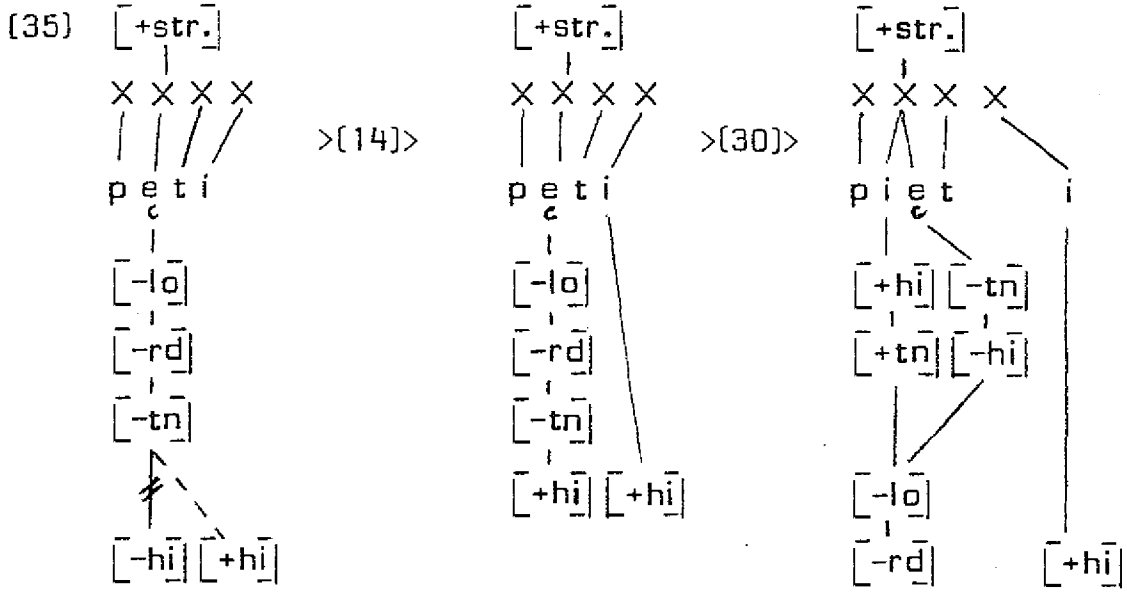
We shall see several examples of these kind of rule.

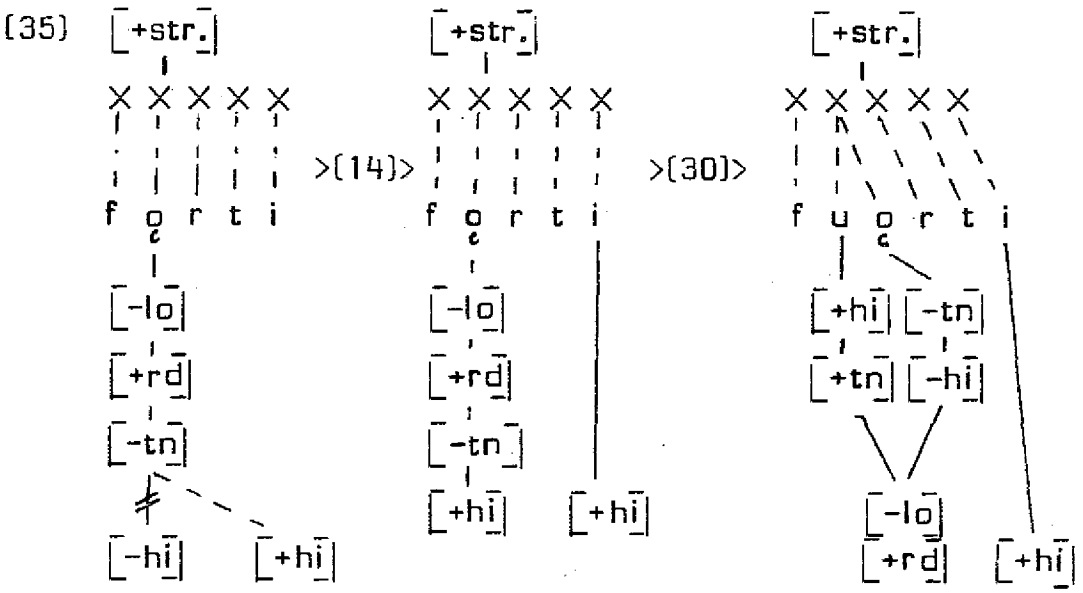
Let's turn again to northern Salentino. Now we can explain why we obtain diphthongs when the metaphony rule applies to lax mid vowels... The resulting lax high vowel is blocked since we have a configuration with the two features [+high] and [-tense] that conflict with each other because of the filter [27]. If we, now, suppose that, between the two possible clean up rules, Salentino selects the linearization rule for this case, we can understand the diphthogization: the two conflicting features, [+high] and [-tense], are linearized in a complex segment[10], and get the compatible features through reapplication of the rule [18]. Thus we obtain the following derivation:

[34]

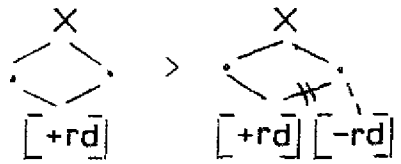


Let's consider concrete case of metaphony. We have the following derivation for *pieti, fuerti:*





In the case of (36), we got *fuorti*, that is not the right form for northern Salentino[11]. To get the correct form we have to suppose a rule of dissimilation in roundness that applies in the complex segment, i.e. a rule like the following:

(37) 

By (37), we get the correct surface form *fu̯erti*.

Observe that in (35) and (36), we need to apply a rule like (14) to obtain the configuration which is blocked by the filter (27) and which is then cleaned up by the linearization rule. Because of this, we believe that a rule like (14) must be introduced into the grammar.

Let's consider now the other strategy of "cleaning up" incompatible features that we proposed, namely the negation rule. In order to do this, we will consider other sothern Italian dialects where the outputs of the metaphony rule are different from the outputs that we find in northern Salentino. In northern Salentino, we have raising of tense mid vowels and diphthongization of lax mid vowels; in these other dialects, we have only raising: tense mid vowels are raised to high vowels, as in northern Salentino, and lax mid vowel are raised to their tense correspondent. Let's consider southern Umbro (data from Rohlfs (1966)). In southern Umbro, we have the following pairs:

(38) in case of tense /e/:

vérde	vírdi	"green"
néra	níru	"black"

in case of tense /o/:

tónna	túnnu	"round"
rássa	rússu	"red"

in case of lax /ɛ/:

céka	céku	"blind"
péde	pédi	"foot/feet"

in case of lax /ɔ/:

nóstra	nóstru	"our"
nóva	nóvu	"new"

In (38), we observe that in the case of the tense vowels, we have the same output of the metaphony rule as we do in northern Salentino: tense mid vowels are raised to the corresponding high vowels. However, we do find a difference in the case of the lax mid vowels, in which we do not have diphthongs as in northern Salentino, but find instead the corresponding tense vowels.

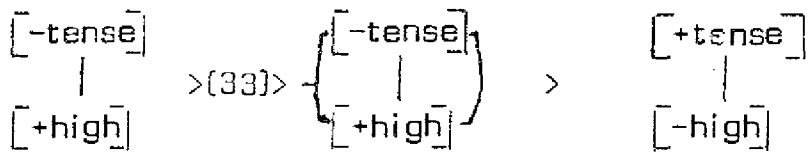
To explain this last fact, we want to propose that, in southern Umbro, the negation rule, i.e., the alternative to the linearization rule has been selected as clean up rule. Consider the configuration that we get in the case of the lax mid vowels after applying the metaphony rule:

(39)
$$\begin{bmatrix} \vdots \\ [-\text{tense}] \\ [+\text{high}] \\ \vdots \end{bmatrix}$$

As we know, these two features are incompatible, and in northern Salentino they had to be cleaned up by the linearization rule. In southern Umbro, the incompatibility is solved by using the negation rule

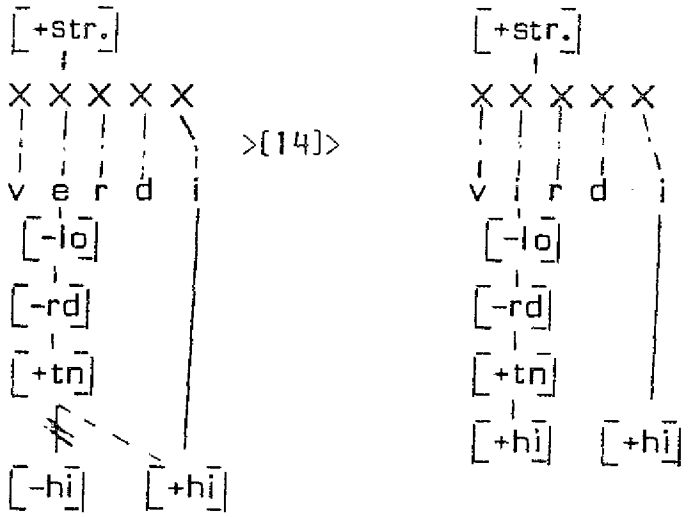
(33) where more than one feature is negated. In this case both the conflicting features are negated. Thus we have the following derivation:

(40)

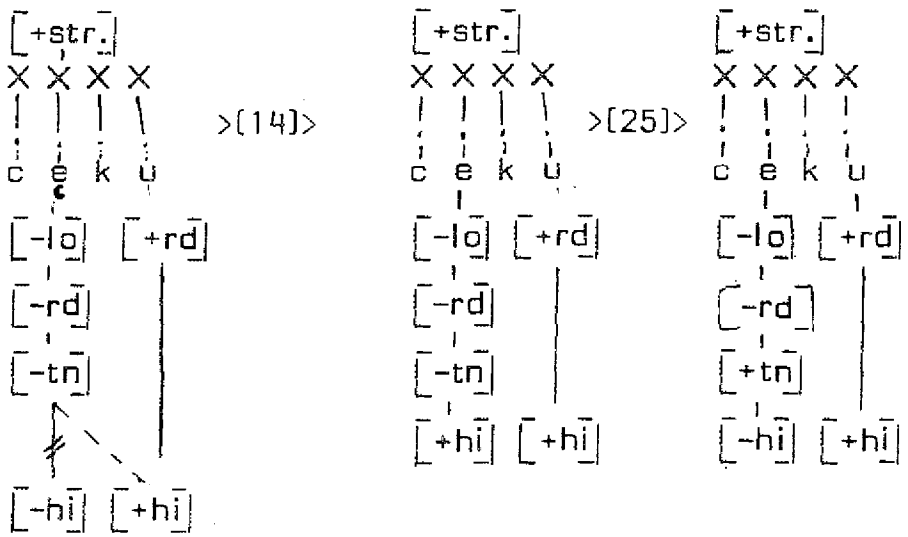


This means that the supposed lax high vowel that is produced by the metaphony rule is changed into a tense mid vowel. This is the correct result: lax mid vowels become tense in a metaphonic context. We shall give derivation for two cases in which the metaphony rule applies in Southern Umbro. the words are *virdi, ceku:*

(41)



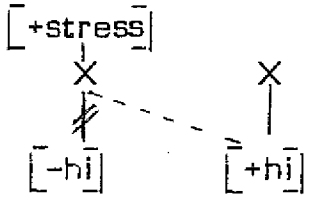
(42)



In (42), we can see how the negation rule works.

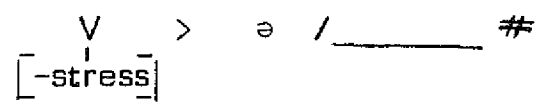
Another interesting piece of evidence in favor of the existence of the linearization and negation rules comes from another southern Italian dialect, the Abruzzese. In this dialect, the metaphony rule can also apply to low vowels, so that we must formulate it as follows:

(43)



Before giving the facts of this dialect, we have to point out that they are superficially obscured by a rule which transforms all of the unstressed final vowels in schwa, i.e. a rule like the following:

(44)

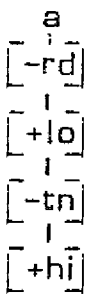


Having established this, we will present pairs in which the second member, where we have metaphony, is plural; for this case we can assume the presence of an underlying ending /-i/. We have the following facts in the dialect of Agnone (from Rohlfs (1966)):

(45)

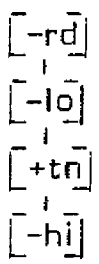
tense /e/:	Kéllə	kíllə	"that"
tense /o/:	rɔ́ssə	rússə	"red"
lax /ɛ/:	bɛ́llə	béllə	"beautiful"
lax /ɔ/: no data			
/a/:	pátrə	pétrə	"father(s)"
	sándə	séndə	"?"
	kánə	kénə	"dog"

As we can see in (45), the outputs of the metaphony rule for the mid vowels are essentially similar to those found in southern Umbro.
A characteristic of this dialect is that metaphony applies to the low vowels and the output is a tense /e/. We can explain this fact very easily. Consider the configuration of features that we have when the metaphony rule applies to a low vowel:

(46)


In the configuration (46), the feature [+high] is in incompatible with both [-tense] and [+low] -- due to the filters (27) and (28).

Thus if we apply the negation rule, as we did with the mid vowels, to all the incompatible features of (46), we will obtain the configuration in (47):

(47)


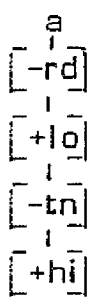
The configuration of features that we see in (47) is the configuration of features that is associated with the vowel /e/. Therefore, we correctly obtain all the facts in (45) through metaphony and the application of the negation rule of cleaning up.

We find an interesting fact in an Abruzzese dialect closely related to the dialect of Agnone. In this dialect, spoken in Trasecco (AQ), we have pairs like the following (from Rohlfs (1966)):

(48) u kanə i kianə "the dog/the dogs"

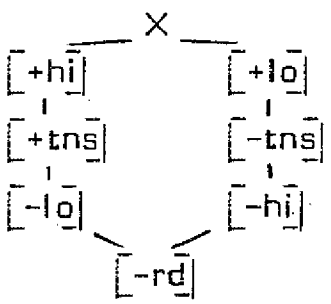
where we can suppose that the disallowed configuration that we see in (46) has been solved through the application of the linearization rule. In fact, in (48) the application of the metaphony rule to the low vowel /a/ produces the following feature bundle:

(49)



In (49), [+high] is incompatible both with [+low] and [-tense]; the solution that is given to this situation in this dialect is the application of the linearization rule. Therefore from (49) we obtain (50):

(50)



i.e., the segment /ia/.

Finally we have the dialect of south Lucania, a southern Italian dia-

lect in which the disallowed configuration created by the application of the metaphony rule to lax vowels seems to be cleaned up by the negation rule (31): only one of the incompatible features is negated and thereby changed into its opposite value. This dialect is spoken around the towns of Oriolo and Castrovillari (points 745 and 752 of AIS) in south Lucania.

The dialect of south Lucania presents very interesting evolution of the Latin vocalic system that is similar to the one found in Sardinian: the Latin high/ī, ĭ/ and /ū, ŭ/ are merged in the high vowels /i/ and /u/ respectively: and the Latin mid vowels /ē, ĕ/ and /ō, ŏ/ are merged in the mid lax vowels /e̯/, and /o̯/ respectively . . In this dialect, then, we do not find the merging of /ĭ/, /ē/ and /ŭ/, /ō/ in the tense mid vowels /e/ and /o/, respectively, which is typical of Italian and northern Salentino. We have the following correspondences between Latin and southern Lucanian (the data from Rohlfs (1966) concern the variety of southern Lucanian spoken in Oriolo):

(51)	*Latin*	*Oriolo*	
	fīlu	filə	"string"
	nĭve	nivə	"snow"
	lĭngua	wingə	"tongue"
	cēra	ce̯rə	"wax"
	stēlla	ste̯llə	"star"
	lūce	luc ə	"light"
	nŭce	nucə	"nut"
	crŭce	cruc ə	"cross"
	sōle	so̯we	"sun"
	frŏnte	fro̯nte	"forehead"

We shall analyse the problem posed by this peculiar evolution of the Latin vocalic system in part IV. For the time being, let's simply consider the results of the metaphony rule in the dialect of Oriolo. As we have

mentioned, this dialect does not have any tense mid vowels. Therefore, the metaphony rule has only lax mid vowels as targets. We have alternations like the following (data from AIS) where we have to propose a rule like (38) as we did for Abruzzese, so that underlyingly, in the case of the noun we have /-i/ in the plur. and /-e/ in the masc. sing., and in the case of the adjective /-a/ in the fem. sing., /-u/ in the masc. sing., /-i/ in the masc. plur.:

(52)

sing.	plur.	
u pɛ̰d ə	i pidə	"foot/feet"
u mɛ̰s ə	i misə	"month/s"
u dɛ̰nt ə	i dintə	"tooth/teeth"

fem. sing.	masc. sing.	masc. plur.	
bɔ̰nə	bunə	bunə	"good"
nɔ̰v ə	nuvə	nuvə	"new"
grɔ̰ss ə	grussə	grussə	"big"

We observe in (52) that the application of the metaphony rule produces a raising of the lax mid vowels to the correspondent high vowels. If we suppose that in this dialect, we apply the negation rule only to one of the incompatible features, we arrive at the correct result. Suppose that this dialect has the same filter (27) as northern Salentino, Abruzzese and southern Umbro. When the metaphony rule applies in (52) to the lax mid vowels, we obtain the disallowed configuration in (53):

(53)
$$\begin{bmatrix} -tns \\ +hi \end{bmatrix}$$

Let's now apply the negation rule to only one of the incompatible features, i.e., to $[\overline{-tns}]$. We will get the following derivation:

(54) $$\begin{array}{ccccc} -\text{tns} & & -(-\text{tns}) & & +\text{tns} \\ | & >(31)> & / & > & | \\ +\text{hi} & & +\text{hi} & & +\text{hi} \end{array}$$

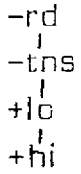
In this way, the application of the metaphony rule to a lax mid vowel will produce a high tense vowel. And this is what we find in this dialect.

As a final point about this dialect, we want to observe that if the rule of negation applied to $[\overline{+\text{hi}}]$ we would get again the vowels /e, o/, as if metaphony were not applied. Actually there are certain dialects similar to the one of Oriolo in which there is no metaphony. But it is difficult to decide whether these dialects don't have the rule of metaphony or whether the negation of $[\overline{+\text{hi}}]$ nullified the application of metaphony. This topic needs further work.

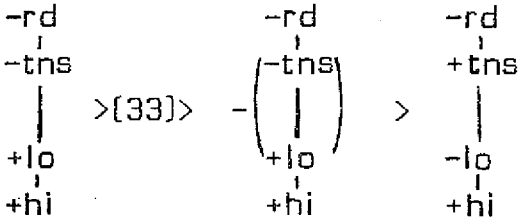
Another dialect spoken at Crecchio (CH) in southern Abruzzo presents an interesting set of data. Despite the fact that this dialect is spoken in an area geographically quite removed from the area in which the preceding dialect is spoken, we find the same configuration of data as far as the mid vowels are concerned: /e̞, o̞/ become /i, u/ in a metaphonic context, cf. the alternation *pet*ə */pit*ə "foot/feet". The peculiarity of this dialect, common to other Abruzzese dialects we have considered, is that the low vowel /a/ can also be the target of the metaphony rule. When this happens, /i/ is the result. We have the following alternations (we must suppose a rule like (44) for this dialect also): (data from Rohlfs (1966))

(55)	sing.	plur.	
	ap ə	ip ə	"bee"
	ak ə	ik ə	"needle"
	ann ə	innə	"year"
	spall ə	spillə	"shoulder"

For this dialect, we suppose that the application of the metaphony rule to the low vowel /a/ creates the configuration of features that we have seen in (46) and that we repeat here:

(56)


where [+hi] is incompatible with both [-tns] and [+lo]. To clean up this configuration, we apply the negation rule to only two of the incompatible features, i.e. to [-tns] and [+lo]. Therefore, we have the following derivation:

(57)


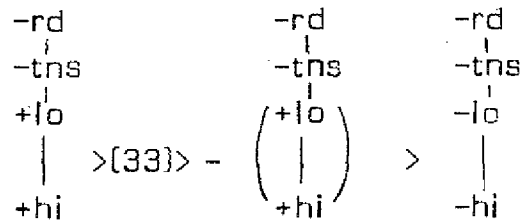
In this way we get /i/ from /a/ in a metaphonic context.

A dialect spoken in Scanno (AQ) is essentially similar to that spoken in Crecchio, but has a different result when /a/ is the target of metaphony: in the case of the dialect of Scanno we obtain /e̞/ rather than /i/. We have the following alternations (from Rohlfs 1966):

(58)	sing.	plur.	
	u kanə	ji k.e̞nə	"dog"
	u watt ə	ji ge̞ttə	"cat"

In this case, from a configuration like that shown in (56), we have a de-

rivation like [59] where the negation rule applies only to [−hi] and [−lo]:

[59] 

In this way, we obtain /e̯/ from /a/ in a metaphonic context[12].

In summary, we have seen that different southern Italian dialects have different solutions in cases in which the metaphony rule creates a disallowed configuration. Thus, depending on the dialect we can obtain /ie̯, e, i/ and /uo̯ [ue̯], o, u/from /e̯/, /o̯/, respectively, in a metaphonic context; similarly, we obtain /ia, e, i, e̯/ from /a/. We have shown that all these possibilities are predicted by our clean up rules, i.e., linearization and negation. In a metaphonic context, where the feature [+high] is associated with a stressed mid (or low) vowel and produces a disallowed configuration in the case of a lax mid (or low) vowel, we can have the following possibilities:

(1) Linearization applies; so from /e̯/, /o̯/, /a/, we will obtain /ie̯, / /uo̯ [ue̯]/, /ia/, respectively.

(2) Negation of all the incompatible features applies; so from /e̯/, / o̯/, /a/, we will obtain /e/, /o/, /e/, respectively.

(3) Negation of only one feature applies; so from /e̯, o̯/, we obtain / i/, /u/. This last possibility does not hold in the case of /a/, because there are three incompatible features in /a/: if only [+high] were negated, we would again get /a/ and so we would not be able to say whether metaphony applied or not; if only one of [+low] and [−tense] where negated, [+high] would still be incompatible with the other feature and we suppose that a clea-

ning up rule must produce an allowed configuration or otherwise be blocked.

[4] Negation of some of the incompatible features applies. This is possible only with /a/ where there can be three incompatible features so that from /a/, we can obtain /i/ or /e_c/.

One might object that our system is too loose and that it allows too many possibilities. This is not the case. First of all, we predict that a feature which is not blocked by a filter will never be affected by the clean up rules. This is supported by the data that we have presented. Secondly, we posit that only two clean up strategies are possible: linearization and negation of feature values. We suppose that for each situation in which a disallowed configuration is created or present, the speaker can select only one of the two strategies in order to produce an allowed configuration. If he/she selects the strategy of negation, a further choice must be made concerning how many features will be affected by the rule. We think that this is a very constrained way to proceed. However, further work is needed to clarify the implications inherent in this approach.

As a last point of this section, we want to discuss an interesting consequence that seems to follow from what was said in the preceding pages. We have seen that the results of metaphony can vary from dialect to dialect. Instead of proposing a different rule of metaphony for each different dialect to account for this dialectal variation, we have proposed that the metaphony rule is always the same and that the dialectal variation is a result of the fact that a different clean up rule is chosen to clean up the disallowed configuration produced by the metaphony rule. Our hypothesis is that there are different strategies potentially available to the speakers to clean up the disallowed configurations produced by metaphony. We will see the actual synchronic variation produced by these rules in case of the Italian pronunciation of the

German front rounded vowel /u/ in sect. II.3., where speaker can freely choose one of the clean up rules. For the case of the particular dialect, where only one of the possible clean up rules is found, we simply want to propose that in its historical development, one of the possible clean up strategies had been established as the linguistic norm to treat those disallowed configurations. In other words, the history of the dialect lexicalized one of the clean up strategies as the right solution to the disallowed configuration produced by the phonological rule. In this way, we account for the dialectal variation in the phenomenon of metaphony. Therefore, the range of possible variation that we find in this case should be limited to the range of possible configurations produced by the clean up rules. This is an empirical claim that needs to be verified.

3. *ALTERA : Other evidence for the cleaning up rules.*

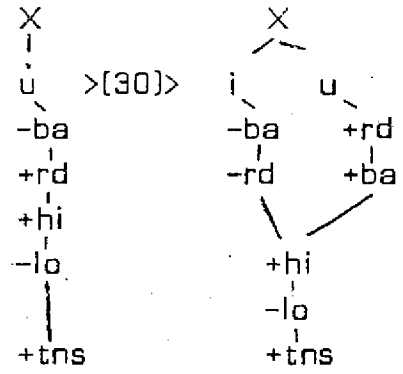
Up to this point,we have described how the clean up rules function in the case of metaphony in the southern Italian dialects. Now we wish to consider a series of cases which do not exhibit metaphony, and yet in which the cleaning up rules do seem to play a role. We will consider the ways in which different languages treat vowels not present in their own phonological systems, e.g., in the case of pronunciation of words from different languages that do have these vowels. We will then consider some rules of vowel coalescence and a rule of umlaut in Icelandic.

We shall begin with standard Italian and consider the Italian pronunciation of the German phoneme /ů/, the round high front vowel. The point is that round front vowels do not exist in Italian; neither do unrounded back vowels. In fact, in sect. II.2, we discussed northern Salentino, which has essentially the same underlying vocalic system as Italian, and we proposed the following filter:

(60) $\begin{matrix} *\alpha rd \\ -\alpha\ ba \end{matrix} \Big/ \begin{matrix} -lo \\ \underline{\quad 1 \quad} \end{matrix}$

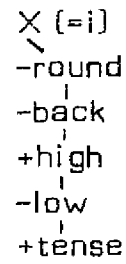
From (60), it follows that the features [+round] and [-back] are incompatible in the Italian vocalic system. This means that for an Italian speaker, the German phoneme /ü/ presents two incompatible features. The solution that the Italian speaker provides to this problem usually is the diphthong /iu/. A German word like *führer* is pronounced /fiurer/ in Italian. This means that the disallowed configuration with two incompatible features [+round] [-back] is cleaned up by the application of the linearization rule. Thus, we have the derivation in (61):

(61)



With (61), we can explain how we get in Italian / iu / from the German /u/.

There are, however, two other possible pronunciation of the German front rounded /ü/. One is /i/ and the other /u/. Thus, the word führer can be also pronounced as /firer/ or /furer/. These two cases are obtained by applying the rule of negation to one of the incompatible features as the clean up strategy. In the first case, the feature [+round] is negated so that we get the following feature bundle:



In the second case, it is the feature [-back] to be negated so that we get

the following feature bundle:

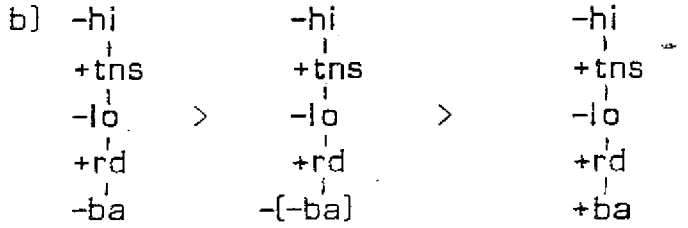
X [= u]
|
+ round
|
+ back
|
+ high
|
- low
|
+ tense

We suppose that all three forms /fiurer, firer, furer/ are available to the speaker, and that the choice of one of them in the performance is purely arbitrary. Of course, in the history of the language, it can happen that only one of the forms derivable by the clean up rules is established as the norm. In this case, the loan word will be apparently cleaned up by only one rule.

A problem to this approach is posed by the Italian pronunciation of the German phoneme /ö/. In this case, the Italian speaker will not say /eo/ as would be expected from the correspondent of [30] for this case - but rather /e/ [or /o/ especially in case of Town names]. The German name *Goethe* is pronounced in Italian /gete/ [or the German town *Göttingen* is in Italian "Gottinga"]. This means that in this case the Italian speaker does not apply the rule of linearization, but rather the rule of negation. Given filter [60], the negation rule cannot be applied to the two incompatible features because the result would still be a configuration which is blocked by it. Therefore, the negation rule applies to only one of the two incompatible features. Thus, we can have the two following derivations:

[62] a)

-hi		-hi		-hi
+tns		+tns		+tns
-lo	>	-lo	>	-lo
+rd		-[+rd]		-rd
-ba		-ba		-ba



In [62]a] from /ö/, we will get /e/; in [62]b] from /ö/, we will get /o/.

The problem, clearly, is why we don't get linearization in this case, why there is no similar treatment of /ü/ and /ö/. We believe that the answer to this question may be that Italian does not allow a diphthong with no difference in height like /eo/. In fact, in words where the vocalic sequence *eo*, it clearly belongs to two different syllables, e.g. *ge.o.gra.fia* and not *geo.gra.fia* ["geography"], *le.o.ne* and not *leo.ne* ["lyon"]. Therefore, we could suppose that linearization can apply only if the result of its application is an allowed complex segment. Given the nature of the cleaning up rules, this should be expected. This is a very strong hypothesis, and must therefore be worked out more throughly. Unfortunately, we cannot take the time to do that here.

We find an interesting set of facts in Romanian, that seems to argue for our approach. In Romanian, the vocalic sequence *eo* is treated as a diphthong: *"L'hyatus e-o dans des mots savant est adapté en diphthong en Roumain : geo.lo.gie, geo.me.trie, geo.gra.fie"* [O. Nandris [1963], p. 79]. Interestingly, in Romanian, the phonemes /ü/, /ö/ in loanwords from Turkish, German and French are treated in a similar way: from /ü/, we can get /iu/, /i/, /u/ and from /ö/, /eo/, /e/, /o/[13]. As expected, when /eo/ is a possible diphthong, we can get /eo/ by linearization. We have the following configuration of data [from O. Nandris 1963 p. 202]:

[63] in case of loanwords with /u/

linear.:	*liulea* [turk. lüle] "pipe"	*chiuveta* [fr. cuvette]
neg. of -ba:	*lulea* " "	*cuveta* " "
neg.of +rd	0	*chiveta*

tiutiun [turk. tütün] "tobacco"
0
titiun " "

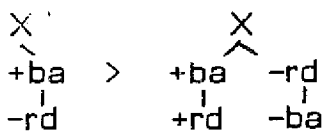
in case of loan words with /ö/:

linear.:	bleo [fr. bleu]	0	0
neg.of -ba	0	0	regizor [fr. regisseur]
neg.of +rd:	0	portofel [fr. portefeuille]	0

H. Anderson [1972] observes that in Lithuanian, which does not have unrounded back vowels, the slavic /ɨ/ is rendered with the diphthong /ui/, for example, lith. muilas "soap", tuinas "fence" from Russian mylo, tyn. Thus, the disallowed configuration:

[64]


is rendered by linearizing the two incompatible features in the following way:

[65]


In [65] we obtain the complex segment /ui/.

Thus far, we have shown the application of linearization and

negation of only one of the incompatible features. We have not seen the case in which more than one of the incompatible features are negated. In fact, in our research on how speakers pronounce phonemes disallowed in their system, thus far we have not yet met any case, in which this kind of negation has applied. We don't know if this is an accidental circumstance or if this fact is meaningful. We still don't have the right tools to understand this. More work is needed to understand when the different rules apply as this is a very important question.

A case in which the negation rule is applied to more than one of the incompatible features could be the author's pronunciation of the English lax high vowel I in the case of words like /pin/, /bit/, etc... According to the English speaker, it is heard tense /i/ or tense /e/, but not as the right sound (sic!). In Italian, the language of the author, as in Salentino, there are no lax high vowels. Therefore, it seems that the author applies either the negation of one of the incompatible features, hence /i/, or the negation of both incompatible features, hence /e/. However, we don't know if this is a reliable case.

What is more clear is that the negation of more than one of the incompatible features seems to apply to the result of a phonological rule. Here we will consider some cases of vowel coalescence and a case of application of a rule of umlaut.

In Sanskrit, there is a constraint that does not allow sequences of immediately adjacent vowels in different syllables, so that these vowels are resyllabified and undergo certain changes exemplified in (66) (in the description of the Sanskrit, we follow Borowsky 1985):

(66) a) ati + iva > atīva
b) juhu+upabhart > juhūpabhrt
c) raja+āsit > rajāsit

d] ca+aprajah > cāprajah
e] iti+aha > ityaha
f] yadi+etat > yadyetat < f'] yadi+aitat
g] dhani+ojasa > dhayojasa < g']...ni+auj...
h] mr̥du+asti > mr̥dvasti
i] tava+eva > tavaiva < i'] tava+aiva
j] na+ojah > nāujah < j'] na+auja
k] mama + āisvaryam > mamāisvaryam
l] sa+āutsukyavati > sāutsukyavati

Two identical vowels form the corresponding long vowel: *i* and *u* followed by a different vowel or diphthong are converted to the corresponding high glide: *a* followed by *i* becomes long *e*, followed by *u* becomes long *o*. These last two alternations also occur internally as the guna forms of various roots -see (67):

(67) Guna

a]	dveṣṭi	< √dviṣ	dveṣa	dveṣṭum
b]	dohmi	< √duh	dohas	dogdum

It is claimed that e and o in the forms in (67) are underlyingly (or were historically) diphthongs ai and au. All the changes are summarized in (68):

(68) a] $V_i + V_i = \bar{V}$ b] $\begin{Bmatrix} i \\ u \end{Bmatrix} + V = \begin{Bmatrix} y \\ v \end{Bmatrix} V$

c] a + i = e d] a + u = o

e] $a + \begin{Bmatrix} e \\ o \end{Bmatrix} = \bar{a} \begin{Bmatrix} i \\ u \end{Bmatrix}$ f] $a + \begin{Bmatrix} ai \\ au \end{Bmatrix} = \bar{a} \begin{Bmatrix} i \\ u \end{Bmatrix}$

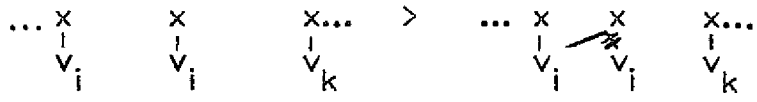
The purported underlying forms of *e* and *o* become apparent if we consi-

der the changes in (66)i) and j): *a* followed by *e* or *o* becomes *ai* and *au*. This suggests that the underlying form of these should be considered to be *a+ai.* and *a+au.*

The coalescence of a + i and a + u can also occur in situation of external sandhi as we can see in (69):

(69) tava + indra > tavendra
raja + urjah > rajorah
sa + uvaca > sovaca

We shall not be concerned with the process of resyllabification, although it must be presupposed for our analysis. Nor shall we be concerned with the process of glide formation showed in (68)b). Borowsky (1985) and Steriade (1985) offer an interesting analysis of these topics. Here we restrict our interest to the phenomenon of vowel coalescence shown in (68)c)-d). Before we proceed, let us briefly consider the phenomenon shown in (68) e)-f), (68) e)-f) show that vowel coalescence is blocked when the final *a* of the preceding syllable meets the *ai* of the second syllable. We wish to propose that this blockage is caused by the Obligatory Contour Principle of Mc Carthy (1983) in cojunction with the proper formulation of the rule of vowel coalescence.
According to the OCP, when the two identical vowels (68)e)-f) meet, one of them will be delinked from the timing slot with which it is associated and the other one is spread to that timing slot. Thus, we have the following rule:

(70) 

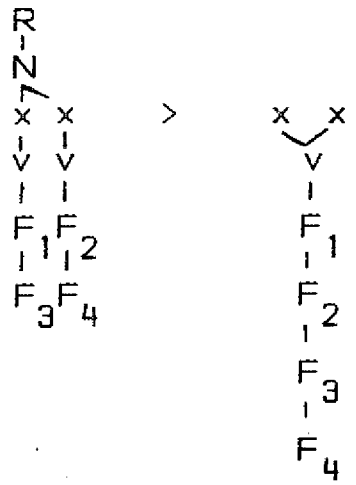
Following Steriade (1985), let's suppose that in the case of Sanskrit vowel coalescence is possible only if the two vocalic segments are in

the same syllabic nucleus. Let's hypothesize then that a syllabic nucleus in Sanskrit can contain no more than two timing slot. Therefore when (re-) syllabification applies to the result of (70), the vowel associated with the two timing slot will automatically form the syllabic nucleus. The third vowel can then be included only in the syllabic coda. Therefore, vowel coalescence between this vowel and the other vowel in the syllabic nucleus is not possible. Steriade (1985) offers a more thorouh analysis of this.

Having stated this, we now turn to the problem of interest here, i.e., vowel coalescence in (68)c)-d).

The first thing to note is that vowel coalescence must be a very late phenomenon in the phonological derivation in Sanskrit. It can be a sandhi rule which can be applied between different words. Therefore, if Kiparsky (1985) is right, it must be a post-lexical rule; and if it is, the segments that are affected by the rule are fully specified. Let's suppose now that vowel coalescence is a rule which takes the feature bundle of two segments contained in the same syllabic nucleus and fuses them by putting them under only one root:

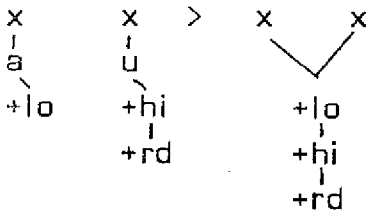
(71)



However, not all the features of the two segments can be fused together; if they could we would surely create a very strange feature bundle composed of the addition of all the features of the two segments. Therefore, we want to propose that a selection is made among the features. Let's suppose that even in a fully specified feature bundle, it is possible to recognize the distinctive features of the segment represented by that feature bundle, perhaps through some sort of diacritic. Let's hypothesize then that only these features are the features fused together by rule [17]. The other features are deleted. We can propose that in Sanskrit the distinctive feature(s) for *a* is [+low], for *i* [+high] and for *u* [+high] and [+round].

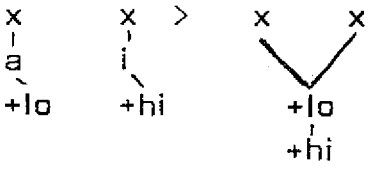
Now in applying [71] to *au* we get the following derivation:

[72]



Similarly, in applying [71] to *ai*, we get the following derivation:

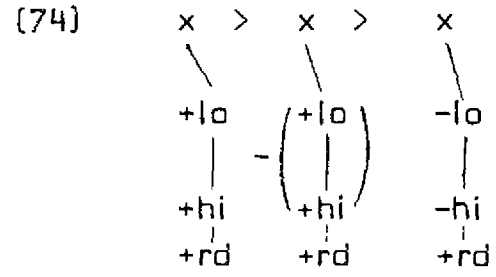
[73]



The results of both [72] and [73] show disallowed configurations with [+low] and [+high] in the same feature bundle. Let's assume that they are cleaned up by applying the negation rule to both the incompatible features. Therefore, we will have [74] for the configuration we obtained in

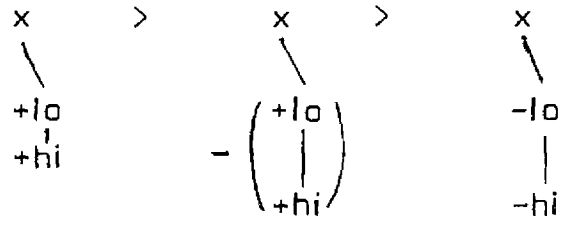
(72):

(74)



and we will have (75) for the configuration we obtained in (73):

(75)



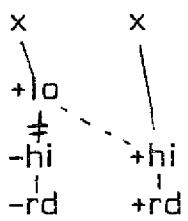
We can then hypothesize that the remaining features are filled in (74) and (75), at this point, so that we will obtain *o* and *e*, respectively. Thus we believe that we can account for the coalescence of *au* in *o* and of *ai* in *e* with our system. For this account, we need the application of the negation rule to more than one feature.

It would be interesting to consider another case in which the negation rule is applied to more than one of the incompatible features. We think that this is the case of u-umlaut in Icelandic (cf. Kiparsky (1984)). The u-umlaut of Icelandic is a process by which *a* becomes *ö* before *u* in the next syllable; for example, we have cases like the following:

(76) dat. plur.: hard +um > härdum
nom. plur.: saga + ur > delet. of /a/ > sag + ur > sögur

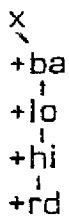
We can represent this process autosegmentally in the following way:

[77]



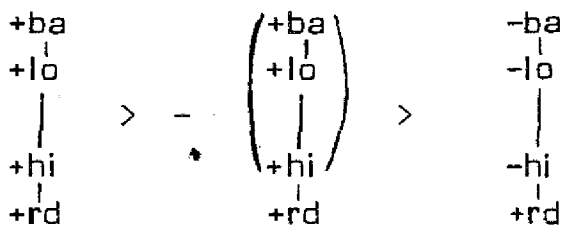
If we suppose that [77] applies when the vowels are already specified, we will obtain the following configuration for the vowel target of the rule:

[78]



In [78] the two features [+lo] and [+hi] are incompatible with each other, and therefore they must be cleaned up. By simply negating [+hi] and [+lo] however, we would get the wrong result; in fact, we would get /o/, rather /ö/. Thus, we need to hypothesize something more. Observe that the features [+ba] and [+lo] are strictly interdependent. In fact, across languages, the low vowels are more than often inherently back. Let's therefore suppose that [+lo] and [+ba] are strictly connected, so that it is not possible to negate one of the features without negating the other. If this is a valid assumption, we can have the following derivation of cleaning up:

[79]



In this way, we obtain the right solution: from /a/, we will get /ö/ in a u-umlaut context.

Note that the behavior of [+lo] and [+ba] as though they were strictly connected is not something peculiar of Icelandic. As we observed in footnote [12], the same assumption must also be made for the cases in which the metaphony rule applies to /a/. Otherwise, we would not be able to obtain the [-ba] vowels /e, e, i/ from /a/[14,15].

4. *PROPAROXITONES*

In this section, we will consider another interesting phenomenon that can be observed in Salentino. In words with antepenultimate stress, in northern Salentino, there is an assimilation between the vowel of the penultimate syllable and the vowel of the final syllable. When the final syllable contains the suffix /-i/ or the suffix /-u/, the assimilation may lead to metaphony of the stressed vowel, but does not always. The patterns are as follows: when the suffix is /-i/, we always have metaphony, but when the suffix is /-u/, we don't: in some words, we get metaphony and in other we do not. Let's consider some pairs:

	sing.	plur.	
[80]	a] mónocu	muénici	"monk/s"
	b] stómocu	stuémici	"stomach/s"
	c] cófunu	cuéfini	"barrel/s"
	d] miétucu	miétici	"physician/s"

In [80] we can observe that there is assimilation between the vowel of the final syllable and the vowel of the penultimate syllabe and that these two vowels have always the same melodic quality. Secondly, we can observe that, although metaphony has always been applied in the case of the suffix of the plural /-i/, this does not happen in the case of the suf-

fix of the singular /-u/: in (80)a) - c), we don't have metaphony, and in (80)d), we do have it. Now a sound objection would be that in (80)d), we don't have metaphony at all and that the underlying form of the word is *miẹtic-*. There are, however, reasons to believe that the underlying form is *mẹtic-*. First of all, one finds words like (81) which are morphologically related to the word /miẹticu/:

(81) mitichessa "female physician"
miticina "drug"

Given the raising rule that applies to unstressed mid vowels, it is difficult to decide immediately whether the high vowels that appear in the words in (81) are underlyingly high vowels or mid vowels. But if we compare the words in (81) to the word in (80)d), we can surely suppose that the underlying stressed vowels of /miẹtucu/ is a lax mid vowel which is tensed and raised in (81) because it is unstressed there: if it were an underlying high vowel in (81), we would not explain the diphthong in (80)d).

Secondly, it would be extremely difficult to explain the presence of an underlying form with a diphthong like /ie/: all the diphthongs /ie/, in northern Salentino, are produced by the metaphony rule. Moreover, /mietucu/ cannot be a loan word from Italian because in this language, the correspondent word is /medico/. Perhaps it could come from another dialect, but in all the other southern dialects, we have the same facts so we would only transfer the problem.

What about the penultimate vowel of /miẹtucu/? In (81), it shows up as an high vowel: is it a raised underlying mid vowel or an underlying high vowel? If it is an underlying high vowel, it would trigger metaphony and therefore we would have the correct result. However, we propose that the underlying vowel is a mid vowel. There are no alternations in northern salentino to support this claim, so we cannot rely on synchronic evidences. If we consider the Latin basis of this word, i.e.

mĕdĭcu(m), we see that there is a short /ĭ/ in the penultimate syllable; therefore we expect a tense /e/ diachronically.

Notice that, given the stress rules of Latin, all the words with antepenultimate stress must have a short vowel in the penultimate syllable. In Salentino, even if Latin quantity and related stress rules have been lost, there are the same stress patterns one find in Latin: words with antepenultimate stress in Latin have antepenultimate stress in Salentino. We can hypothesize that, historically, the Latin stress rules have been interpreted in such a way that words with antepenultimate stress in northern Salentino must have the correspondent of the Latin short vowels in penultimate syllable. This means that we cannot have a high vowel in that position in Salentino. This is in fact what we find in Salentino words with antepenultimate stress which are etymologically related to Latin words with a short vowel in penultimate syllable. Consider the following words [assimilation with final /-a/ is optional]:

[82]	pé̜rsika	"peach"
	fémmina	"woman"
	tó̜lica	"kind of bean"
	duménica	"sunday"

For each word in [82], we must suppose that the vowel in the penultimate syllable is not an underlying high vowel, but a mid vowel, because it does not trigger metaphony in the preceding stressed vowel. This is what we expect diachronically from the Latin bases of the words in [82] as given in [83]:

(83) pĕrsĭca(m)
fēmĭna(m)
tŏlĭca(m)
*dŏmĭnĭca

Of course, we do not want to suggest that the speaker of Salentino must know Latin in order to guess the underlying forms of (82) or (80)d) from the Latin bases. *What we do want to say, however, is that the speaker of Salentino knows that it is not possible to have a high vowel in the penultimate syllable in words with antepenultimate stress.* Therefore we propose that the underlying representation for /mięticu/ is *mętec - u.* We can thus say that in (80)d), the final /-u/ produced assimilation and metaphony.

There is another property of the assimilation between the final and penultimate syllables in proparoxitones. While a final /-u/ always triggers assimilation in roundness, a final /-i/ does not change the roundness of the preceding vowel; it only raises the vowel to [+high]. Consider the following pair:

(84)

sing.	plur.
kurpęvuli	kurpięvuli "guilty"

We know that the underlying suffixal vowel of the singular form of an adjective like the one in (84) is /-e/, and that the underlying suffixal vowel of the plural is /-i/. In (84), we can see that the final /-i/ cannot affect the roundness of the preceding vowel. This is not true of /-u/ which always changes the preceding vowel to [+round], as we can see in (85):

(85)

a) ánčulu	ánčili	"angel"
b) čĩčuru	čĩčiri	"chickpeas"
c) tĩsutu	tĩsiti	"finger"

We can see the two properties discussed before at work in the following pair:

(86) sie̯culu sie̯culi "century/s"

In (86), we observe that /-u/ triggers metaphony in the singular and that /-i/ does not trigger assimilation in roundness in the plural.

We now propose our analysis. The first problem to address is what the underlying representations of these words are. We have already proposed the underlying representation for (80)d) /me̯tec-/. Using the same kind of argument and the fact that /-i/ cannot affect the roundness of the preceding vowels, we propose that the underlying representations for (84) - (86) are:

(87) a) /korpe̯vol-/ (=(84))
b) /ánčel-/ (=(85)a))
c) /číčer-/ (=(85)b))
d) /tʃet-/ (=(85)c))
e) /se̯col-/ (=(86))

Let's now consider (80)a) - c). In Salentino, we have found morphologically derived forms only for (80)a) and c):

(88)a) munacie̯ddu "spirit under the form of a little monk" or "kind of snail that has the shape of a monk habit"
b) ncufaniciare "to pour into a barrel"

(88) leads us to think that the underlying forms for (88)a) and c) are:

(89) /mo̯nac-/
/co̯fan-/

i.e. the forms that we should expect from the latin bases *mŏnachum(m)*, *cŏfanu(m)*.

Given this and the similar properties of (80)b), we can propose that its underlying representation is:

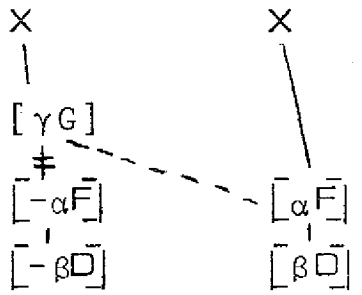
(90) /stomac-/

Form which is similar to the Latin etymological base *stŏmachu(m)*.

Now, we can analyze the effect of the suffixes /-i/ and /-u/ on the vowels of the unstressed penultimate syllable. /-u/ seems to trigger assimilation in roundness and raising of the vowel target of one degree. /-i/ triggers only complete assimilation in height.

How can we express these two properties? Our proposal is that the following rule applies in the proparoxitones:

(91)



if X and X don't carry any beat on the foot level.

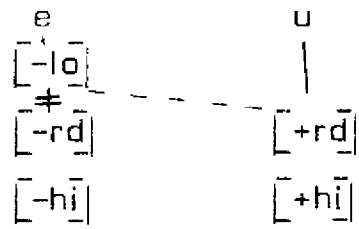
The constraint on the application of the rule restricts the rule to only the last foot of proparoxitones. In fact, it is only in that case that two adjacent syllables don't carry any stress on the foot level: the last syllable is extrametrical and the penultimate syllable is skipped by the Rythm rule (cf. Prince 1983)).

We can describe the rule in (91) in the following way: the features associated with the trigger are spread into the target and thereby cause the delinking of the features of opposite value associated with the target.

To account for the different properties of /-i/ and /-u/, we suppose the following: (91) is applied at a point of the lexical derivation in which the vowels of the lexical stem are fully specified, but in which the vowels of the suffixes are still underspecified. This means that only the underlying features of the suffixal vowels play a role in (91): [+high] for /-i/, [+high], [+round] for /-u/.

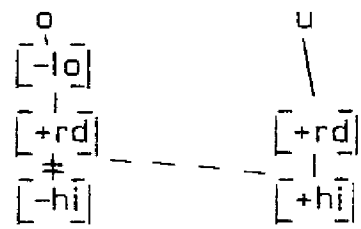
What happens to the vowels which are the targets of (91)? We will consider first the case in which the trigger is /-u/. Let's take the case in which the target is a unrounded mid vowel:

(92)



in (92) the vowel /e/ becomes /u/. Let's consider the case in which the target is a rounded mid vowel:

(93)

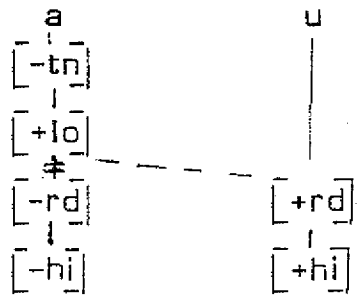


In (93), there is spreading of only [+hi]; however, we will get /u/ in the same way.

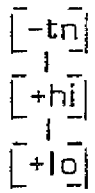
In both the preceding cases, the assimilated vowels in the penultimate syllable have become high and will therefore trigger metaphony of the preceding vowel in the stressed antepenultimate syllable. This is the case of (80)d) and (86).

Let's consider the case in which the target is the low vowel /a/:

(94)



In (94), we get a configuration of features that is blocked by the redundancy rules, i.e. we get:



If we hypothesize that this disallowed configuration is cleaned up by the negation rule, we will obtain:

so that eventually, we will obtain the following configuration:

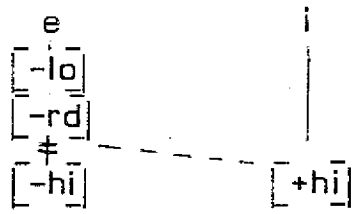
(95)

(95) is the configuration of features associated with /o/. Therefore, we suppose that from /monac -u/, we will obtain /monoc -u/. The /o/

cannot trigger metaphony and thus we will explain the lack of metaphony in (80)a)-c). The /o/ is then raised to /u/ by the raising rule, because it is unstressed. So will obtain the correct form /mɔnucu/.

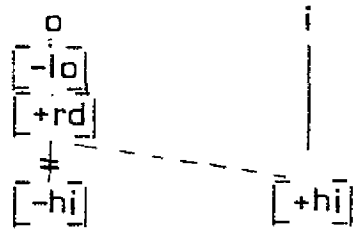
Let's now consider the case in which the trigger of (91) is /-i/. First we consider the case of an unrounded mid vowel:

(96)



In (96) we will obtain the high vowel /-i/. If we consider the case of a rounded mid vowel:

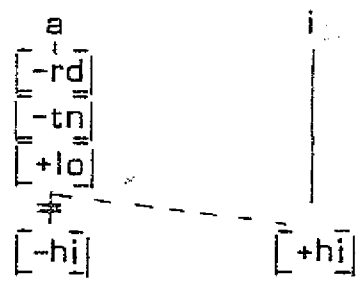
(97)



we will obtain the high vowel /u/. (96) and (97) show what happens in (80)d), (84) and in (86): the mid vowels of the penultimate syllables become [+high] and thereby trigger metaphony, but they don't change in roundness.

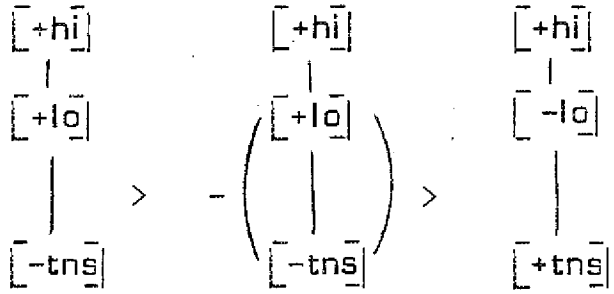
Now, let's consider the case in which the target of (91) is the low vowel /a/:

(98)



In this case, we should expect the application of the negation rule as in (94) & (95). But, as a matter of fact, this does not happen. In the case of (98), the /a/ surfaces as a high vowel, and not as a tense mid vowel as we should expect if we applied the negation of all the incompatible features. This is a problem for us. However, we can propose that in this case the negation of only [-tense] and [+low] applies:

(99)



With (98) & (99), we can account for (80)a)-c): the penultimate vowel which is originally low is trasformed into a high vowel and can therefore trigger metaphony, as we can see.

As a last point, we want to consider in which the suffixal vowel is the low vowel /-a/. We have facts like the following:

(100) a) femmina / femmana "woman"
b) posima / posama "starch"

In (100), we can see that the assimilation of the penultimate vowel is optional, when the suffixal vowel is /-a/. To solve this problem, we propose that rule (91) can be applied optionally when the triggering vowel has the feature [+low].

III. SOME CONSEQUENCES OF THE PRECEDING ANALYSIS

FILTERS AND RULES

Our idea of using filters to block configurations of features that represent phonemes not allowed in a phonological system is developed from that of Kiparsky (1980). However, there is a difference between the way in which we use filters and the way in which Kiparsky does. In our treatment of metaphony and of the phonological phenomena treated in sect. II, we have tacitly assumed that the filters intervene after the application of the phonological rules, but do not interfere with them. We can obtain configurations of features that are then blocked by filters and cleaned up by linearization or negation only in this way. Kiparsky uses filters differently: according to his theory, the filters block the application of phonological rules so that a configuration that is not allowed is not even produced. He thereby explains the behavior of neutral and opaque vowels in vowel harmony systems. To illustrate this, we shall briefly summarize his analysis of Akan and Hungarian vowel harmonies. Let's first consider the case of Akan (We will not be concerned here with what happens post-lexically in this language; for this case cf. Kiparsky (1985)).

Phonemically, Akan has nine vowels, grouped into two sets according to their specification for the feature [+Advanced Tongue Root]:

(1)

[+ATR]		[-ATR]	
i	u	ɪ	ʊ
e	o	ɛ	ɔ
		a	

In words containing no low vowels, all vowels must be either [+ATR] or [-ATR], e.g. *e-bu-o* 'nest', ɛ-*bu* - ɔ 'stone'. The low vowel *a* co-occurs with either set, e.g. *bisa* 'to ask', *pɪra* 'to sweep'. Moreover, vowels of the two sets freely co-occur if *a* intervenes, e.g. *fuŋanɪ* 'to

search', and only exceptionally co-occur otherwise, e.g. *ɲinsɛɲI* 'to be pregnant'. Prefix and suffix harmony are controlled by the first and last root vowel, respectively, e.g. *o-bisa-I* 'he asked (if)': *o-ɲinsɛ ɲI-I* 'she became pregnant'.

We can slightly modify Kiparsky's analysis in the following way: as we can see in (1), this language lacks a [+ATR] low vowel; we can therefore hypothesize a filter like (2):

(2) *[+ATR]
|
[+low]

The vowel harmony of Akan is then explained in this way: following Clements (1980) the feature [+ATR] is autosegmentalized and affixes are taken to be inherently unspecified for this feature. Therefore, the feature [+ATR] is spread in order to fill in the unspecified values for [ATR]. If there is no spreading of [+ATR] the unspecified values are filled in by [-ATR] by default.

Kiparsky then suppose a constraint like the following:

(3) * F
V V V

(3) states that no vowel can be skipped over in the association with the harmonic value.

In assuming that (2) blocks the spreading of the feature [+ATR] to a low vowel, Kiparsky explains the facts of vowel harmony in Akan. Because of (2) and (3), a is the neutral and opaque vowel of the harmony system of Akan. Given that it cannot be associated with [+ATR], it may occur freely with the two sets of vowels in (1). Moreover, because of (3), its presence blocks the spreading of [+ATR] in a word. Thus in the following word:

(4) $\overline{[+ATR]}$
|
funan-I

the presence of *a* in the middle syllable impedes the spreading of the feature $\overline{[+ATR]}$ to the last vowel which therefore remains $\overline{[-ATR]}$.

The same kind of analysis may account for the vowel harmony of Hungarian. Hungarian is characterized by a rule of harmony that spreads the feature $\overline{[+back]}$. If there is no spreading of $\overline{[+back]}$, $\overline{[-back]}$ is filled in by default. Thus in Hungarian, we have alternations between back and front vowels in inflectional and derivational suffixes. The back vowels appear after back vowel stems and the front vowels appear after front vowel stems, as exemplified by the suffixes *-nak/-nek* "dative" and *-tol / -töl* "ablative":

(5)	ház "house"	háznak	háztól
	radír "eraser"	radírnak	radírtól
	öröm "joy"	örömnek	örömtol
	tömeg "crowd"	tömegnek	tömegtöl

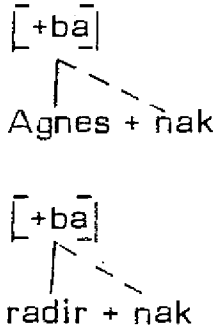
The characteristic of the Hungarian vocalic system is that there are no non low unrounded back vowels. Thus, we must suppose a filter like (6):

(6) * $\overline{[+back]}$
|
$\overline{[-round]}$
$\overline{[-low]}$

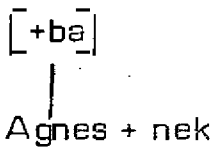
The peculiarity of the Hungarian harmony system is that (3) does not apply and therefore the effect of the filters is that the segments in which the spreading of the harmonic feature would produce a disallowed

configuration are simply skipped by the harmony rule. In this way, filter (6)makes *i, e* harmonically neutral. Therefore, we find words like the following:

(7)



where *e* and *i* are not associated with the feature [+back] as predicted by (6). Observe, however, that the constraint (3) can apply in the case of *e*, so that *e* becomes an opaque vowel. We can see this in the following case:



where the presence of *e* blocks the spreading of [+back] to the suffix.

In the preceding pages, we have seen how many results we can obtain in using Kiparsky's proposal that the spreading rule which accounts for the harmony systems of Akan and Hungarian is blocked by filters like (2) and (6). We believe that Kiparsky's proposal is on the right track for the case of vowel harmony system like those of Akan and Hungarian. But if this is true, a question arises immediately. Why do the filters not block the rules of metaphony or u-umlaut? Our answer is that we believe that the vowel harmony rules of Akan and Hungarian apply in

a stage of the phonological derivation different from that in which the metaphony rule and the u-umlaut rule apply.

Kiparsky's treatment of those vowel harmony systems is based upon the fact that the targets of spreading are unspecified segments. In our treatment of metaphony and of u-umlaut, we have instead supposed that the target of the rule is a fully specified segment: only in this way can we obtain the correct array of facts. This is particularly evident in the case in which the vowel *a* is the target of the rules. To obtain the correct results for both metaphony and u-umalaut, we must suppose that at least [-tense] and [+back] are already specified in the feature bundle of *a*. Note that both of them are redundant features in the context of [+low] which is the distinctive value of *a* Recall that *ę, e, i* may result from *a* in the case of metaphony and that *ö* may result from *a* in case of u-umlaut. This means that we must suppose that the rule of cleaning up applies to a feature bundle like the following:

(8)
$$\begin{bmatrix} +hi \\ +lo \\ +ba \\ -tns \\ +rd \end{bmatrix}$$

Note that a feature bundle like (8) cannot be obtained by application of rule (18) sec. II.2 because filling [tns] with - would be blocked by the privative principle in interaction with filter (27) sect. II.2. Therefore we should suppose that the feature bundle is already specified before the application of metaphony or u-umlaut.

Let's hypothesize that the difference between the Akan and Hungarian vowel harmony systems and metaphony or u-umlaut is due to the fact that the phonological rule characterizing these vowel harmony systems applies before rule (18) sect. II.2, i.e., it applies to unspecified

segments, whereas the phonological rule characterizing metaphony or u-umlaut applies after rule (18) has applied, i.e. it applies to fully specified segments. We can interpret this difference as a difference between feature filling rules and feature changing rules. The former fill in the value of the unspecified features, whereas the latter change the values of features already specified.

Having stated this, we now propose a principle like (9):

(9) For a feature F, you cannot fill in the unspecified value of F with a value α blocked by a filter G.

Principle (9) is essentially a corollary of the Privative Principle, and produces the following effects: a feature filling rule, like that of the Akan and Hungarian vowel harmony systems is blocked by a filter. A feature changing rule like metaphony is instead allowed to apply even if the feature configuration that it produces is blocked by a filter - the cleaning up will fix it later. Principle (9) clearly distinguishes feature filling rules from feature changing rules: given a filter, only feature filling rules can be blocked and only feature changing rules can be applied, thereby producing a disallowed configuration which must be adjusted by the cleaning up rules.

Therefore, our system predicts that there should not be neutral and opaque vowels in a vowel harmony which is feature changing. This means that we can find neutral and opaque vowels only in feature filling vowel harmony systems. This is a very strong hypothesis which remains to be confirmed.

In the final part of this section, we shall consider two vowel harmony systems which, in contrast to those of Akan and Hungarian, seem to show the application of a feature changing phonological rule (in our sen-

se of the term). We shall treat the vowel harmony systems of Chukchee and Koryak, two paleosiberian languages. Unfortunately, we are unable to find evidence that the vocalic segments in these languages are fully specified at the moment in which they are the target of the harmony rule, as our approach would predict. However, we will see that these two harmony systems show clear applications of a clean up rule, i.e., negation of more than one feature, as well as a lack of opaque vowels. Our approach predicts that these two properties should be interdependent.

We will follow the descriptions of these vowel harmony systems given in Kenstowicz (1979) for Chukchee and Bogoraz (1922) for Koryak.

Chukchee vowel harmony is of the classic dominant - recessive variety. There are three dominant vowels [ä, a, ɔ] which do not alternate. The three recessive vowels [i, u, e] undergo the following mutations when they appear in a word containing a dominant vowel: i > e, u > o, e > ɛ[16].

The schwa vowel does not experience any harmonic mutations. It can be inserted by epenthesis.

The Chukchee vowel harmony is bidirectional: furthermore, affixes may assimilate to the root and the root may assimilate recessive vowels of affixes or other roots. Examples of some affixes assimilating to roots are given in (10)a):

(10)a)	abs.pl. /-ti/	verbalizing/ -tku/
	tintin -ti "ice"	rəpe-tku-k "to hammer"
	mukəl-ti "button"	(cf. rəpe-nə "hammer")
	ener-ti "star"	wil-ətku-k "to trade"
	mämə l-te "seal"	(cf. wilwil "price")
	q?awal-te "corner"	wəlpa-tko-k "to shovel"

ɔcɔc-te "leader"	(cf. wəlpa-t "shovels")
	panr-ətko-k "to attack"
	(cf. panr-ək "to fall on")

instr. /-te/	past II /ge-root-lin/
titi-te "neddle"	ge-nwit-lin "stop"
ekke-te "son"	ge-gnu-lin "be needless"
milute-te "hare"	ge-jne-lin "transport"
wəlpa-tɛ "shovel"	gɛ-panr-ələn "fall on"
qɔra-tɛ "reindeer"	gɛ-wjat-len "unharness"
	gɛ -jn -len "sniff"

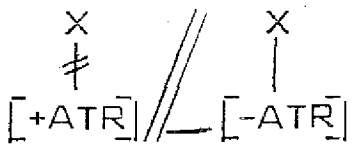
(10)b) illustrates a few cases where affixes contain dominant vowels, triggering harmony in the roots.

(10)b)	keli-k	"to write"	kɛle-jɔ	"written"
	ejp-əek	"to close"	ɛjp-əjɔ	"closed"
	tip-ək	"to poke through"	tep-jɔ	"poked through"

abs.sg.	comitative / ge-root-ma/
titi-nə	gɛ-tete-ma "needle"
r?ew	gɛ-r?ɛw-ma "whale
milut	gɛ-melotɛ -ma "hare"

As in Kenstowicz (1979), we hypothesize that [ATR] is the pertinent feature needed to explain the Chukchee vowel harmony system. (This feature is essentially equivalent to the feature [tense] which we used in our analysis of metaphony; however, we choose to use [ATR] for coherence with the current literature). The dominant vowels are associated with the feature [-ATR]. With Poser (1982), we assume that

feature changing harmony results from delinking followed by reassociation. Therefore, in the case of Chukchee vowel harmony, we assume that first the feature [+ATR] is delinked from a vocalic feature bundle, when it is adjacent to the feature [-ATR] on the pertinent tier, and then this feature [-ATR] is spread into the so created empty slot. So the crucial rule for the Chukchee vowel harmony is the rule of delinking in (11):

(11) 

(11) is iterative. The feature bundles in (11) are fully specified. After (11) is applied, [-ATR] spreads on the adjacent empty slot, filling in in.

Let's now consider the underlying vocalic system of Chukchee. We suppose that it is as follows:

(12)

i		u
e		ɔ
ä	a	

The vowels are fully specified as in (13):

(13)

	i	e	ä	a	ɔ	u
high	+	–	–	–	–	+
low	–	–	+	+	–	–
back	–	–	–	+	+	+
round	–	–	–	–	+	+
ATR	+	+	–	–	–	+

We assume that the crucial characteristic of this vocalic system is given by the presence of a filter like the following:

(14) $*\begin{bmatrix}+hi\\-ATR\end{bmatrix}$

(14) states that there are no [-ATR] high vowels in this language. We suppose then that the vowels *o* and ɛ are allowed as harmonic allophones even if not present in the underlying system. This means that there are no filters that block them. We are not interested in the other filters that we need to suppose in order to account for (12).

Let's now consider what happens when rule (1) and reassociation of [-ATR] apply. If the target of them is the vowel *e*, i.e.,

(15)

	e
[hi]	-
[lo]	-
[ba]	-
[ATR]	+

we will obtain the following configuration:

(16)

[hi]	-
[lo]	-
[ba]	-
[ATR]	-

This is the vowel ɛ which we have supposed was not blocked any filter.

If the target of (11) and reassociation of [-ATR] is the vowel i, i.e.,

[17]

	i
[hi]	+
[lo]	–
[ba]	–
[ATR]	+

we will obtain the configuration in [18]:

[18]

[hi]	+
[lo]	–
[ba]	–
[ATR]	–

In [18], we have a configuration blocked by filter [14]. Therefore, we have to clean it up. Suppose that the negation of more than one feature applies in this case as a clean up rule. The incompatible features in [18] are [+high] and [–ATR]. By applying the negation rule to them, we obtain the following feature bundle:

[19]

[hi]	–
[lo]	–
[ba]	–
[ATR]	+

But this is the feature bundle associated with the vowel *e*. Thus, we can understand why the vowel *i* in Chukchee is changed to *e* in a harmonic context.

The same process holds for the vowel *u*. When it is the target of the harmony rule, we obtain the following configuration:

(20)

[hi]	+
[lo]	–
[ba]	+
[rd]	+
[ATR]	–

We have two incompatible features in (20), [+hi] and [-ATR], which must be cleaned up. If we apply the negation rule, as we did for *i*, we will obtain the following configuration:

(21)

[hi]	–
[lo]	–
[ba]	+
[rd]	+
[ATR]	+

This is the feature bundle of the vowel *o*. Thus we can explain why *u* changes into *o* in a harmonic context. Note that the vowel *o* is not blocked by a filter, though it is not present in the underlying vocalic system of Chukchee. Thus, it can be an allophone of *u* in a harmonic context.

What about neutral and opaque vowels in the vowel harmony system of Chukchee? In Chukchee, there are no *opaque* vowels: no vocalic segment can block the application of the vowel harmony rule. Thus, vowel harmony always spread throughout the word. However, there is a vocalic segment that seems to be *neutral*: the schwa vowel ə. As mentioned, ə is the epenthetic vowel of Chukchee; we can see this in the following alternations:

(22)	abs.sg.	abs.pl.
	a) imət	b) imti-t "load"
	ekə k	ekke-t "son"
	lɔnə l	lənlɛ -t "warlrus fat"

There is a rule that deletes a final stem vowel in Chukchee. Therefore in the forms in (22)a), the vowels that we see in the coresponding forms of (22)b) have been deleted. Thus, in the forms in (22)a) we have a final consonantal cluster CC* that is impossible in Chukchee. Therefore, we must insert the epenthetic vowel ə (For a more thorough analysis of epenthesis in Chukchee cf. Kenstowicz (1979)). Epenthetic ə is not modified in a harmonic context as we can see in *lɔnə l* or in *tip-ək* where the ə is not affected by harmony in any way. This is expected, however, if we hypothesize that epenthesis applies after harmony.

There are, however, cases in which the schwa does not appear to be inserted by epenthesis. Consider the following pair, for example:

(23)	abs.sg.	abs.pl.
	a) mäm ə l	b) mäm ə l-te "seal"

(23)a) cannot be derived from a form like *mämlV*, because we would see this form in (23)b); thus, we must suppose that ə is not inserted by epenthesis. Now, ə in (23) is not affected by the presence of the dominant vowel *a*, and it does not interfere with the spreading of the harmonic feature to the suffixal vowel. It is possible to see that there is harmony in (23)b) from the following pairs in which the suffix *-te* of absolute plural is *-ti* in a non harmonic context:

(24)	abs.sg.	abs.pl.	
	tıntin	tintin-ti	"ice"
	ener	ener-ti	"star"
	ɔcɔc	ɔcɔc - te	"leader"
	q?awal	q?awal-te	"corner"

A case of non-inserted ə in a non harmonic context is presented in (25):

(25)	abs.sg.	abs.pl.	
	mukə l	mukə l-ti	"button"

Therefore, the vowel ə of (23) and (25) seems to behave like a neutral vowel. If this is true, we have a strong counterexample against our idea that we should not find neutral and opaque segments in a vowel harmony system where the harmony rule can produce configurations that violate filters and that must therefore be cleaned up.

However, non inserted schwa have strange properties. Kenstowicz (1979) observers the following fact: "[It is] *necessary to recognize a +/- ATR contrast for underlying schwa vowels in the roots of forms like /təlg/ "thaw" and /pəlm/ "dark": cf. təlgə təl "a thaw", təlg-et-ək "to get warm" versus pəlməpəl "darkness", pəlm-at-ək "to get dark". The schwa in these roots never alternates with zero and thus is most properly considered part of the underlying form. Nevertheless, /pəlm/ triggers the harmonic change of /-et/ to /-at/, while /təlg/ does not. Since, as far as I know, schwas do not exhibit any phonetic difference in təlgə təl versus pəlməpəl, a phonological rule neutralizing the underlying +/-ATR contrast will be required*" (Kenstowicz (1979) p. 410).

This means that non-epenthetic ə cannot be considered to be a neutral vowel. Given what Kenstowicz claims, the non - inserted ə seems to be the superficial merging of two vowels: one that belongs to the recessive class, i.e., the underlying vowel in /təlg/, and one that belongs to the dominant class, i.e. the underlying vowel in /pəlm/. We could hypothesize that non-epenthetic is the result of a rule of vowel reduction that merges two different vowels. However, we cannot provide data to argue this hypothesis here. As a final point, we want to suggest that the underlying vowel of the second syllable of the root in (23) is either a recessive vowel harmonized with the dominant vowel of the first syllable,

or simply a dominant vowel. Clearly, it is not a neutral vowel.

Koryak is another Siberian language closely related to Chukchee, with a vowel harmony system that seems to display the application of a feature changing rule (in our sense of the term).

Koryak vowel harmony is similar to the one that we find in Chukchee (the facts are from Bogoraz (1922), Comrie (1982), Anderson (1980), Kenstowicz (1976)). There are two vocalic series, a dominant one and a recessive, and a recessive vowel is changed when it occurs in the context of a dominant one. Koryak differs from Chukchee, however, in a very interesting way. The two vocalic series are [i, ə, u], the recessive series and [e, a, o], the dominant one. In the context of a dominant vowel, the recessive change in the following way: i > e, ə > a, u > o. So, differently from Chukchee, there is a biunivocal correspondence between the two vocalic series[17]. This means that the Koryak surface vocalic system can be represented as three pairs of vowels i/e, ə /a, u/o, where the first vowel in each pair is the recessive vowel corresponding to the dominant vowel after the oblique stroke.

We have indicated that the schwa ə is a part of the recessive vocalic series. In so doing, we follow Bogoraz's description of Koryak. Bogoraz represents the vowel corresponding to our schwa with the symbol *ä* that he defines in the following way: *"ä is a long obscure vowel, in rest position of all the muscles of the oral cavity, posterior nares closed, teeth and lips slightly opened* (Bogoraz (1922), p. 643). Bogoraz uses the same symbol to represent the epenthetic vowel of Chukchee that is treated as a schwa in Kenstowicz (1984). From this we are led to believe that the non high vowel of the recessive series is ə. However, other linguists like Kenstowicz and Anderson propose that the non high vowel of the recessive series is *e*. Further work is needed to resolve this very important issue.

Let us consider some of the data. We will present some cases of vowel harmony in suffixes. Recall, however, that, as in Chukchee, the harmony is bidirectional so when there is an affix (a suffix) with a dominant vowel the recessive vowels of the root change too. The data that we present are from Kenstowicz (1976):

(26) suffix -ti:	tiltil -ti	"wing"
	cotcot -te	"pillow"
	kejkej -te	"costume"
suffix -u:		
	tiltil -u	
	cotcot -o	
	kejkej -o	
	wəqwəq -u	"a step"
suffix -tə		
	wala -ta	"knife"
	titi -tə	"needle"
	muqə -tə	"rain"
	ujə tiki -tə	"sleigh"

Kenstowicz (1984) gives a beautiful example of vowel harmony in Koryak where the recessive vowels of a very long word are changed by the addition of a suffix with a dominant vowel:

(27) a) məl-inə -n- gəjul -əv-i "he taught"

b) mal -ena - n - gəjol -aw - la - i "they taught"

the addition of the suffix /-la/, used to mark the plural in various tenses, communicates its harmonic influence back over the six

preceding syllables.

We can now propose our analysis. We want to hypothesize that the underlying vocalic system of Koryak is the following:

(28) i u
a

The fully specified matrices of these segments are:

(29)

	i	a	u
high	+	−	+
low	−	+	−
back	−	+	+
round	−	−	+
ATR	+	−	+

We assume that the crucial characteristic of this vocalic system is given by filters like the following:

(30) * $\left[\begin{matrix}+\text{hi}\\ -\text{ATR}\end{matrix}\right]$

(31) * $\left[\begin{matrix}+\text{ATR}\\ +\text{lo}\end{matrix}\right]$

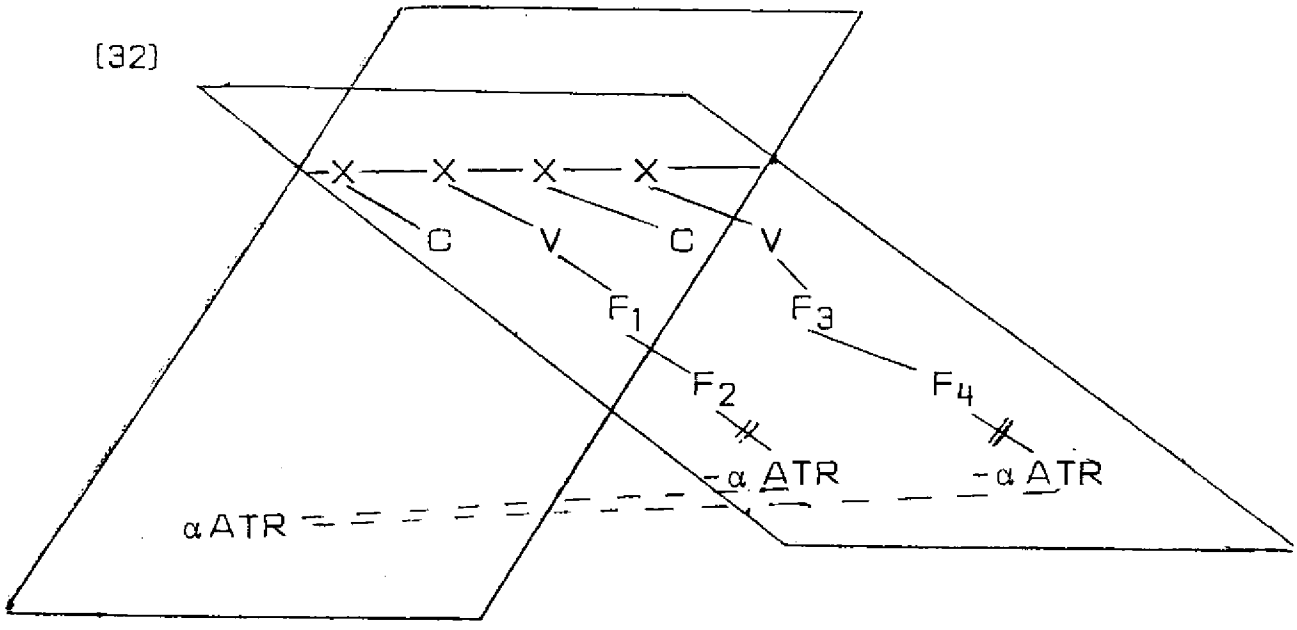
Here we are not interested in the other filters that are needed to describe the system.

We shall hypothesize that the feature [ATR] in Koryak can have its own tier like a tone in tonal languages. We want to suggest then that a certain class of morphemes is lexically associated with the feature

[-ATR]. Thus, the remaining morphemes of the language are [+ATR] by default.

We hypothesize that the feature [ATR] associated with the morphemes is spread to the vocalic segments of the morphemes after they are fully specified by application of rule [18] of sect. II.2. We can represent this in the following way:

[32]



Let's consider the three underlying vowels of Koryak *i, u, a*. They have the fully specified feature bundles given in [29]. If they are contained in a morpheme which is associated with [-ATR], the application of the spreading represented in [32] will produce the following changes:

[33]

	i	a	u
hi	+	no change	+
lo	–		–
ba	–		+
rd	–		+
ATR	–		–

Now in the case of *i* and *u*, we have configurations which are not allowed

by filter (30), and which must therefore be cleaned up. If we clean them up by applying the negation rule to the two incompatible features, we will obtain the following feature bundles:

(34)

	i	a	u
hi	-	no change	-
lo	-		-
ba	-		+
rd	-		+
ATR	+		+

Thus, the morphemes associated with [-ATR] will superficially contain only vowels like *e*, *a*, *o*.

If the underlying vowels are in a morpheme which is associated with [+ATR], the application of the spreading represented in (32) will produce the following changes:

(35)

	i	a	u
hi	no change	-	no change
lo		+	
ba		+	
rd		-	
ATR		+	

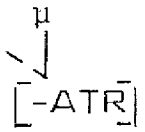
In (35), in the case of ther vowel a, there is a configuration blocked by filter (31). If we hypothesize that we clean it up by applying the negation rule to the two incompatible features, we will obtain the following feature bundle:

(36)

[-hi]
[-lo]
[+ba]
[-rd]
[-ATR]

This is the feature bundle that must be assigned to the vowel ə , the schwa. Therefore, a morpheme which is associated with [+ATR] can contain only the vowels *i*, ə , *u*.

Let's now consider the vowel harmony rule for Koryak. We would like to propose that this rule is different from the one we proposed for Chukchee, i.e., rule (11). The difference is that in Koryak, the harmony rule applies on the [ATR] tier and is formulated as a case of spreading of [-ATR]; [+ATR] is, in fact, assigned to the morphemes as the default case. We can formulate the rule as in (37):

(37) 

where μ = morpheme

If the vowel harmony rule is that of (37), we can state that the [-ATR] morphemes are the dominant ones. Therefore, we derive the fact that the dominant vocalic series is that one contained in [-ATR] morphemes, i.e., [e, a, o].

Now we can give an example of an application of rule (37). Let's consider example (27): we now hypothesize that its underlying form is the following:

(37) mal - ina - n - gjul - aw - i
∇ ∇ ∇ ∇ ∇
μ μ μ μ μ

In (38), there are no morphemes associated with [-ATR] ; thus all the morphemes are assigned [+ATR] by default. (38) will thus become (39), where all the association lines are connected to only one feature, [+ATR], because of OCP:

[39] mal - ina - n - gjul - aw - i

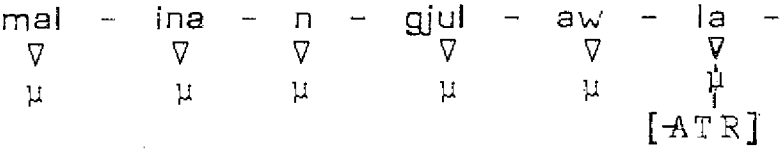
After there is spreading of [+ATR] on the vocalic segments and application of the negation rule, [39] will surface as [40] [=[27]a]]

[40] məl - inə - n - gə jul - ə v - i

In the case of the morpheme *gjul*, there was epenthesis of ə .

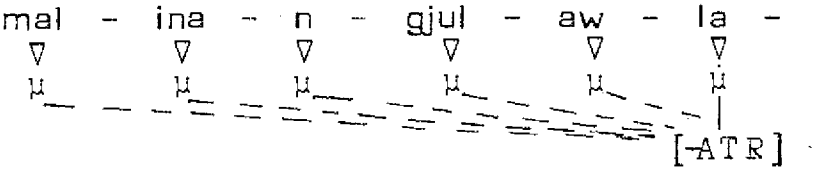
Now consider the case in which a morpheme associated with [-ATR] is added to [38]. We would obtain [41]:

[41] mal - ina - n - gjul - aw - la - i



In [41], rule [37] must apply. Thus, we will obtain [42]:

[42] mal - ina - n - gjul - aw - la - i



After spreading of [-ATR] on the vocalic segments and the application of the negation rule, [42] will surface as [43] [=[27]b]]:

[43] mal - ena - n - gəjol - aw - la - i

With our system, we can thus obtain the correct result.

It is interesting to observe that in Koryak the vowel *a* does not always surface as ə in the case of [+ATR] morphemes. Sometimes, actually often according to Bogoraz, it surfaces simply as *a*; we can see this in (44), for example:

(44) maniɣ ə t?ul "material, cloth"

In (44), the vowel *a* can coexist with *i* and *u* (the schwa in this case is epenthetic). Therefore it belongs to the recessive series. If we are correct, then we have a [+ATR] morpheme in (44), which means that the *a* of (44) was [+ATR] at a certain point. It is interesting to note here that a common property of +/-ATR vocalic systems is that the distinction in +/-ATR is neutralized in the case of low vowels (cf. Anderson (1980)). In a lot of African languages with +/-ATR vocalic systems, the low vowel *a* is always [-ATR]. We can suppose that this is an inherent property of the low vowels that shows up randomly in Koryak.

We wish to conclude this section by suggesting that the treatment which we proposed for Koryak vowel harmony can be extended to Nez Perce vowel harmony. Nez Perce is an American Indian language that has a vowel harmony system with two vocalic series, a dominant and a recessive, as in Koryak. The recessive series is [i, æ, u], the dominant [i, a, o]. We can hypothesize that Nez Perce has the same underlying vocalic system and the same vowel harmony system as Koryak. The only differences are the following:

(a) In the case of the low vowel in the recessive series, the negation also applies to [+back]. Both in the case of metaphony in the southern Italian dialects and in the case of u-umlaut, we supposed that [+low] and [+back] behave as if they were the same feature. This could also be the case for Nez Perce. However, we would obtain ɛ. In the current descriptions, this vowel is represented with æ. To solve this problem we have

two options: either the transcription æ is wrong and we really deal with ɛ , or there is a late rule in Nez Perce that lowers ɛ to æ.
(b) In the case of the high vowel of the dominant series, we can suppose either that the negation rule applies to only one feature in the case of the [-back] vowels, i.e., to [-ATR], so that from *[+hi] [-ATR] we get *[+hi] [+ATR], or that there is a late rule in Nez Perce that raises e to i.
If (a) and (b) hold, we can explain the Nez Perce vowel harmony.

IV. HISTORICAL EXCURSUS

The following rule is traditionally assumed to explain the evolution of the vocalic system of classical Latin in the vocalic system of the Romance languages.

(1) $\begin{bmatrix} +\text{ high} \\ -\text{ tense} \end{bmatrix} > \begin{bmatrix} -\text{ high} \\ +\text{ tense} \end{bmatrix}$

Rule (1) changes into /e/ the supposed lax high vowel /I/ that is produced by the interpretation of the opposition in quantity as opposition in tenseness that occurred in late Latin. Now, it is interesting to note that rule (1) looks terribly like the case of negation rule that we used to explain the alternation /e̞/ – /e/, /o̞/ – /o/ in a metaphonic context in southern Umbro. In this section we would like to consider this similarity and try a quite different analysis of the evolution of Latin into the Romance languages.

First of all, we want to propose that Latin had the following vocalic system (later we will propose arguments for this):

(2)
i u
e̞ o̞
a

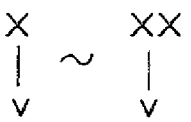
These vocalic segments had the following fully specified matrices:

[3]

	i	e̞	a	o̞	u
high	+	–	–	–	+
low	–	–	+	–	–
round	–	–	–	+	+
back	–	–	+	+	+
tense	+	–	–	–	+

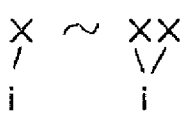
The peculiar characteristic of classical Latin is that we can have vowels associated with two timing slots, independently of the presence of another timing slot in the rime. So in the same syllabic context, there is an opposition between vowels associated with only one timing slot and vowels associated with two timing slots, i.e. the opposition in quantity of the traditional grammar:

[4]

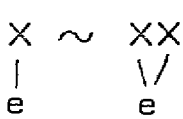


We, therefore, have the following oppositions:

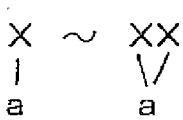
[5]



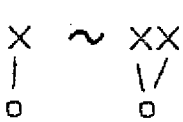
[= ĭ ~ ī]



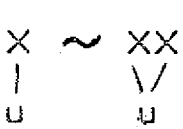
[= ĕ ~ ē]



[= ă ~ ā]



[= ŏ ~ ō]



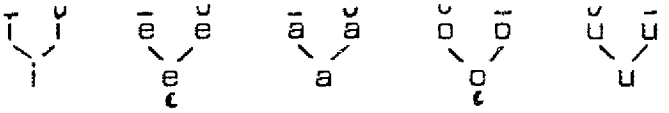
[= ŭ ~ ū]

We must now address a very important point, namely that the vocalic system that we assume for Latin in [2] is different from the one that traditional studies in the field propose. According to the traditional studies, tenseness in Latin doesn't play any role. Thus no one cares if the mid - vowels are lax or tense. According to us, on the contrary, it is very important to say that the mid vowels are lax. Only in this way, we believe, is it possible to reconstruct the evolution of the Latin vocalism correctly. Given that Latin is not longer spoken, we cannot, unfortunately, given solid arguments in favor of this proposal. What we can do, however, is to give a series of speculations that argue in favor of it.

Speculatio prima. In sect. II.2. we observed that the dialect of southern Lucania displays a peculiar evolution of the Latin vocalic system. In this dialect, short $\breve{\imath}$ and $\breve{u}$ of Latin did not become tense *e* and *o*, and thus merging with the result of long $\bar{e}$ and $\bar{o}$. In this dialect, short $\breve{\imath}$ and $\breve{u}$ became *i* and *u* and thereby merged with the result of $\bar{\imath}$ and $\bar{u}$. The same happened with the pairs $\breve{e}$ / $\bar{e}$, $\breve{a}$ / $\bar{a}$ and $\breve{o}$ / $\bar{o}$ that merged into $\underset{\subset}{e}$, *a*, $\underset{\subset}{o}$ respectively. Therefore, we can hypothesize that Latin evolved in this dialect by simply losing the distinction in length. This surely occurred in African Latin, if we believe saint Augustin [En. in Psalm. 138, 20]. In that passage, he claims that *"Afrae aures de correptione vocalium vel productione non iudicant"* and warns that the Africans easily confused '$\breve{o}$s' "bone" with '$\bar{o}$s' "mouth". Observe that if '$\breve{o}$s' and '$\bar{o}$s' were confused, $\breve{o}$ and $\bar{o}$ must have had the same vowel quality. Therefore '$\breve{o}$s' and '$\bar{o}$s' were both pronounced as 'Os', where O represents the vowel with the common vowel quality of $\breve{o}$ and $\bar{o}$. This means that there was no difference in tenseness as the one that we should suppose for the variety of Latin that evolved into Italian and northern Salentino. Therefore, we can believe that in the variety of Latin where the distinction in length was simply lost without resulting in a difference in tenseness, the resulting vowels show the quality of the Latin vowels [24]. If this is true, we can suppose that the vowels of southern Lucanian possess the

same quality as the vowels of Latin.

Now the southern Lucanian dialect displays the following vocalic correspondences with Latin (cf. pp. 42 - 43 and Rohlfs (1966), Lausberg (1939)):

(6) 

What is important to note in (6) is that the correspondents of the pairs $\bar{e}$ / $\breve{e}$ and $\bar{o}$ / $\breve{o}$ are $\underset{\subset}{e}$ and $\underset{\subset}{o}$ respectively. Therefore, we can suppose that the Latin vowels graphically represented as $\bar{e}$ / $\breve{e}$ and $\bar{o}$ / $\breve{o}$ were actually $\underset{\subset}{\bar{e}}$ / $\underset{\subset}{\breve{e}}$ and $\underset{\subset}{\bar{o}}$ / $\underset{\subset}{\breve{o}}$.

At this point, one could object that there is a rule in southern Lucanian which makes mid tense vowels lax, so that the underlying correspondent of Latin $\bar{e}$ / $\breve{e}$ and $\bar{o}$ / $\breve{o}$ would be *e* and *o*. It is difficult to counter this objection.

However, it is very important to note that we find the same evolution of the Latin vocalic system in a different Romance language, Sardinian, which is spoken on the island of Sardegna which is geographically very distant from Lucania. In Sardinian, Latin $\bar{\imath}$ / $\breve{\imath}$, $\bar{e}$ / $\breve{e}$, $\bar{a}$ / $\breve{a}$, $\breve{o}$ / $\bar{o}$, $\breve{u}$ / $\bar{u}$ became *i*, $\underset{\subset}{e}$, *a*, $\underset{\subset}{o}$, *u*, respectively, as we can see in the following words: *nive* < Lat. nĭves "snow", *filu* < Lat. fīlu "son", *cad*$\underset{\subset}{e}$*na* < Lat. catēna "chain", *f*$\underset{\subset}{e}$*le* < Lat. fĕle "gall", *s*$\underset{\subset}{o}$*le* < Lat. sōle "sun", *r*$\underset{\subset}{o}$*da* < Lat. rŏta "wheel", *ruke* < Lat. crŭce "cross", *muru* < Lat. mūru "wall". It cannot be accidental that we find the same evolution of Latin $\bar{e}$ / $\breve{e}$ and $\bar{o}$ / $\breve{o}$ into $\underset{\subset}{e}$ and $\underset{\subset}{o}$ in two vocalic systems that seem to be derived from the Latin vocalic system only by simple loss of the distinction in length. Therefore, we are lead to believe that the Latin vowels which were graphically presented as $\bar{e}$ / $\breve{e}$ and $\bar{o}$ / $\breve{o}$ were phonetically $\underset{\subset}{\bar{e}}$/$\underset{\subset}{\breve{e}}$, $\underset{\subset}{\bar{o}}$/$\underset{\subset}{\breve{o}}$.

Speculatio secunda. Latin ē is systematically transcribed into Greek by the letter η. For example, in Plutarcus (I c. A.D.), we find the following transcriptions of Latin words: ρῆγι (lat. *rēgi*), καρηρε (lat. *carēre*), Ρῆνοσ (lat. *Rhēnus*). And in other authors, we can find θησαυρόσ for lat. *thēsaurus*, Μαικηνασ for lat. *Maecēnas*, Ῥηγουλοσ for lat. *Rēgulus* (Data from Kühner & Holzweissig (1966)).

This means that the letters ē and η had to represent the same sound. We know that the Greek letter η represented a long lax *e*: Meillet & Vendryes (1966) claim that "*L'ionien-attique presénte ici encore une particularité caractéristique. Les voyelles longues* η *et* ω *y étaient plus ouvert que les anciennes brèves* ε *et* ο *. Aussi, quand il y a eu allongement, soit par suite de réduction de groupes de consonnes, soit par suite de contraction, l'* ε *et l'* ο *allongés (c'est-à-dire* e, o *fermés longs) ne se sont pas confondus avec* η *et* ω *(c'est-a-dire* e, o *ouverts longs). L'ancien attique emploie la même graphie* ε , ο *pour* e, o *fermés, qu'ils soient brefs ou longs (ce qui dans le dernier cas évitait une confusion avec* η , ω *); ainsi dans* ἐναι, ελθοσαν *(425 et 445 av.J.-C.). L'alphabet ionien distingue* ε *et* ο *longs de* ε *et* ο *brefs en employant pour les premieres la graphie des diphthongues* ει *et* ου [...]. *L'attique pratiqua de bonne heure cet usage de l'alphabet ionien, si bien qu'il eut comme l'ionien trois notations pour les voyelles de timbre e et o:*

e fermé bref, ε	*o fermé bref,* ο
e fermé long, ει	*o fermé long,* ου
e ouvert long, η	*o ouvert long,* ω

(Meillet & Vendryes (1966) p. 101)

At this point, we can ask ourselves the following question: Why was the letter η used to transcribe Latin ē when there was another graphe-

me, ει, that could represent a long tense *e*? The only possible answer is that Latin ē was a long lax ę̄. The same reasoning holds for ō. It is in fact transcribed into the Greek letter ω : Ρωμουλοσ for lat. Rōmulus. Κικέρων for lat. Cicerō. If what we said before holds, ω and ō had to have the same sound, i.e. ę̄, ǭ.

Speculatio tertia. This third argument is based on the variety of Latin which did not exhibit the evolution shown in the specul. I, i.e., it is based on the variety of Latin spoken in Roma and in most part of the Romania. In this variety of Latin, we hypothesize that ē and ō were at a certain point, during the III c. A.D., differentiated from ĕ and ŏ through a change in their vocalic quality: ē and ō became tense, so that the pairs ę̄/ę̆ and ǭ/ǫ̆ became ē/ę̆ and ō/ǫ̆ respectively (Later we will explain this fact). Our argument for this hypothesis is based on the result of the monophthongization of *ae (ai)*.

The diphthong *ae* which was originally ai, as we can see in Ennius (III -II c.B.C.) (e.g. *silvai frondosai*), was monophthongized at a certain point of the history of Latin. We can see this from the fact that it was often transcribed by ē. Kühner & Holzweissig ([1966] p. 26) observe: *"Schon früh aber trat in der vulgären Sprache monophthongische Aussprache des* ae *ein: demgemäss auch in der Schrift für ursprüngliches* ae ē. So in the inscriptions, we find ē instead of *ae*, e.g. *prētor, prēda, sēpe* instead of the correct *praetor, praeda, saepe* (cf. Grandgent (1962), Leumann - Hofmann - Szantyr (1977)). At the same time, we can have the opposite situation: *ae* is used instead of ē; so we can find *haeres, caeteri* instead of the correct *hēres, cēteri* (Kuhner & Holzweissig (1966)). We can find *scaena, scaeptrum* instead of *scēna, scēptrum*. Varron (Ling. 7, 96) expresses this instability in the transcription with the following words: *"obscaenum dictum ab scaena, eam, ut Greci, Accius scribit scena. In pluribus verbis a ante e alii ponunt, alii non, ut quod partim dicunt scaeptrum, partim sceptrum"* (quoted by Niedermann (1953)).

At a certain point, however, after the III c. A.D.,[25], *ae* begins to

be transcribed by ĕ: *quĕritur* is used instead of the correct *quaeritur*; Ausonius (IV c. A.D.) uses *Cithĕron* instead of *Cithaeron*. Prudentius (IV c. A.D.) *ĕnigmata, hĕresis, sphĕra* instead of *aenigmata, haeresis,sphaera* (Kühner & Holzweissig (1966)). This is very strange because the monophthong of *ae* must be long since it is produced by the coalescence of vocalic segments associated with two timing slots. However it does not seem so strange, if we consider that the Italian correspondent of Latin *ae* is a lax ę, i.e. the usual correspondent of Latin ĕ as we can see in the following diachronic correspondences: (recall that in Italian lax mid vowels in open syllables are diphthongized)

(7) lat. caelu > it. cielo
lat. caecu > it. cieco
lat. quaero > it. chiedo
lat. laetu > it. lieto

How can we explain this array of facts? Our hypothesis is that the monophthongization of *ae* in Latin produces a long lax mid vowel ę̄. Now *ae* was transcribed by ē only so long as there was no distinction in quality between ē/ĕ (they were both ę). If we are right, before the III century A.D., *ae* and ē were both the long lax vowel ę̄. At this time, Greek words with η were transcribed in Latin by both ē and *ae*: for Greek σκηνη , σκηπτρον , we have the Latin transcriptions *scaena / scēna, scaeptrum / scēptrum*. If our "second speculation" is correct, this is certainly a piece of evidence that *e* and *ae* represented the same sound ę̄.

When, after the III c., ę̄ was tensed in ē, it was not possible to transcribe *ae* by ē anymore, because they differed in quality. So ĕ was used, since it had the same vowel quality as *ae*: they were both ę. The difference in length was put aside in favor of the similarity in quality. Note, however, that in the majority of the cases in which *ae* is transcribed by ĕ, that vowel is in a open syllable. Later we will see that a rule

was introduced in late Latin which shortened long vowels in closed syllables and lengthened short vowels in open syllables. We thus know that at this time, there was a long lax mid vowel phonetically in all the cases in which the letter *ĕ* appeared graphically in an open syllable. If this is true, Latin writers of the period really had no way to distinguish the phonetic value of the letter *ae* from the phonetic value of the letter *ĕ* in the context of an open syllable: in this case, both represented long and lax mid vowels. It is interesting to point out that the grammarian Pompeius (V c. A.D.) blames the confusion of *aequus* and *equus* (quoted by Grandgent (1962)). This may be a piece of evidence for our idea.

If this explanation holds, we have an evidence for the idea that long *e* was actually *ĕ*, and that *e* was actually *ẹ̆*.

Observe that we have the same situation in the case of the monophthongization of the diphthong *au*. The diphthong *au* was often transcribed as *ō*. Festus (II c. A.D.) says *"Ōrata appellatur a colore auri, quod rustici ōrum dicebant, ut auriculas oricola"* (quoted by Kühner & Holzweissig (1966)). The evolution of *au* in Italian produces a lax *o̩*, which is the correspondent of Latin *ŏ*:

lat. tauru > it. toro
lat. auru > it. oro
lat. causa > it. cosa
lat. pauper > it. povero

We can explain this fact if we hypothesize as before that *ō* was actually *ō̩* and that the monopthongization of *au* produced the long lax vowel *ō̩*. When *ō̩* became *ō*, the *ō̩* that came from *au* converged with *ŏ*.

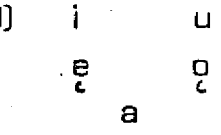
In conclusion it seems that we are correct in suggesting that Latin letters *ē/ĕ*, *ō/ŏ* originally actually represented *ē̩/ẹ̆*, *ō̩/ŏ̩*.

Speculatio quarta. In this paragraph, we shall propose a hypothesis so speculative that it might be called fantasy. If we consider the Sanskrit correspondents of Latin $\bar{e}/\breve{e}$ and $\bar{o}/\breve{o}$, we can see that all of them have the same vowel quality. In Sanskrit, they are merged with the original pair $\bar{a}/\breve{a}$ in $\bar{a}/\breve{a}$. We have correspondences like the following:

(8)	skt.	lat.	
	ăsti	ĕst	"is"
	prātas	plēnus	"full"
	patis	pŏtis	"powerfull"
	dānam	dōnum	"gift"
	apa	ăb	"from"
	mātar	māter	"mother"

We may hypothesize that this occurs because proto-Indo-european had the following vocalic system, with differentiation in length which will not be considered here:

(9)



We suppose that this vocalic system remained unchanged in the variety of Indo-european that developed into Latin, but was changed into (11) by the introduction of rule (10) in the variety of Indo-european that developed into Sanskrit:

(10) $[-\text{low}] > [+\text{low}] \;/\; \underline{\quad}\; \times [-\text{tns}]$

(11)

(We know that the sounds *e* and *o* in Sanskrit are a result of vowel coalescence of *ai* and *au*).

Rule (10) is not as farfetched as it may seem. Given that low vowels are usually [-tense], we can suppose that [-tense] was interpreted as connected to [+low] in the language that developed into Sanskrit.

If this analysis is correct, we have a very simple explanation of the vocalic correspondences between Sanskrit and Latin.

Observe that if we are right, we have yet another piece of evidence (however slight) that Latin letters $\bar{e}/\breve{e}$, $\bar{o}/\breve{o}$, actually represented the sounds $\underset{\subset}{\bar{e}}/\underset{\subset}{\breve{e}}$ and $\underset{\subset}{\bar{o}}/\underset{\subset}{\breve{o}}$, respectively.

If the speculations that we have made here are reasonable – and perhaps they are not – we may assume that the vocalic system that we proposed in (2) is the right one. The vocalic segments that compose it can be minimally specified as follows:

(12)

	i	$\underset{\subset}{e}$	a	$\underset{\subset}{o}$	u
high	+				+
low			+		
round				+	+
tense					
back					

In order to fill in (12) properly, we need a set of filters. Here we are interested in one filter only, i.e. (13):

(13) $* \begin{matrix} \alpha\,\text{hi} \\ -\alpha\,\text{tns} \end{matrix}$

(We will not consider other filters such as $*\begin{matrix}\alpha\ rd\\ -\alpha\ ba\end{matrix} \Big/ \underline{\begin{bmatrix}-lo\end{bmatrix}}$ which states that in Latin the values of the feature [back] match the values of the feature [rd] (cf. the discussion of the Salentino vocalic system which is similar to Latin in this respect).

Filter (13) states that in Latin the values of the feature [tense] match the values of the feature [high]. Therefore, configurations like the those in (14) are impossible:

(14) a) $*\begin{bmatrix}+hi\\ -tns\end{bmatrix}$ b) $*\begin{bmatrix}-hi\\ +tns\end{bmatrix}$

Now how can we explain the evolution of the Latin vocalic system? Let's suppose that very early in the hystory of Latin, a rule was introduced in the post-lexical component of the phonological derivation which tensed long vowels, i.e., rule (15):

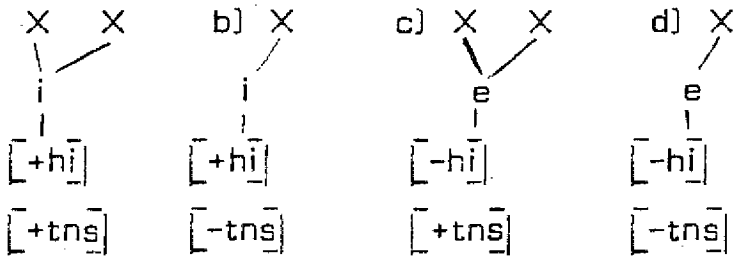
(15) $\begin{bmatrix}\ \end{bmatrix} > \begin{bmatrix}+tns\end{bmatrix} \Big/ \underline{\begin{matrix}X & X\\ \diagdown & \diagup\\ & V\end{matrix}}$

As the default case of (15), all short vowels were assigned [-tense]. Rule (15) applied when the feature bundle of the vowels were already fully specified. We can hypothesize that the feature assigned by (15) or by its default case affected the feature bundle of the vocalic segment, delinking the feature [tense] when it had a different value. Thus, post-lexically, we had the following four cases (we consider only the [-back] series):

a) $\begin{matrix}X & X\\ \diagdown & \diagup\\ & i\\ & |\\ & [+tns]\end{matrix}$ b) $\begin{matrix}X\\ |\\ i\\ |\\ [-tns]\end{matrix}$ c) $\begin{matrix}X & X\\ \diagdown & \diagup\\ & e\\ & |\\ & [+tns]\end{matrix}$ d) $\begin{matrix}X\\ |\\ e\\ |\\ [-tns]\end{matrix}$

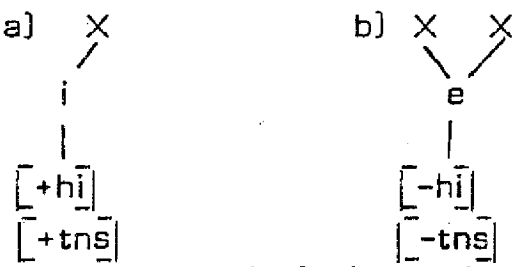
After that the feature assigned by (15) affects the feature bundles of the vowels, we obtain the following feature bundles (we consider only the features [high] and [tense]: the other features are not important):

(16) a) b) c) d)



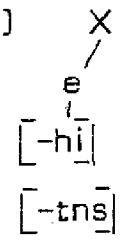
In (16)a) and (16)d), the values of [high] and [tense] match. Therefore, there is no violation of (13). There is violation of (13), however, in (16)b) and c): in fact, in both of these cases, the values of [high] and [tense] do not match. Therefore, we get a configuration which is not allowed and which must be fixed by the clean up rules. Let's suppose that the negation rule applied. Observe that the negation of more than one feature is not possible: in fact, by negating the two non-matching features, we would always obtain two non-matching features. Therefore the negation of only one feature must be applied. If the feature affected is [tense], the application of rule (15) is nullified. In fact, from (16)b) and c), we would obtain (17)a)-b):

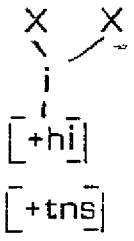
(17) a) b)



The vocalic segments that we see in (17) are simply the segments that were the target of (15). The application of (15) is vacuous in this case.

If the feature affected by the negation rule is [high], we do have a change: from (16)b)-c), we get (18)a)-b), respectively:

(18) a) 

b) 

As we can see in (18), short *ĭ* was changed into short *ĕ* and the long *ē* was changed into *ĭ*. In fact, we often find that this occurs in the Latin inscriptions as early as the II cent. B.C. (cf. Kühner & Holzweissig (1966) p. 19). For the case of *ē*: the Greek transcription Αυριλιος instead of Latin *Aurēlius*, *fīliciter* instead of *fēliciter*. For the case of *ĭ*: *tempestatĕbus* (II tab. Scip.) instead of *tempestatĭbus*, *tĭbĕ* (IV tab. Scip.) instead of *tibĭ*, *curĕa* instead of *curĭa*. Note that in the case of a short *ĭ*, we have a short *ĕ* and not, of course, a long *ē*. This means that this lowering of *ĭ* is different from the one that we will see later which leads to the Romance languages like Italian. In this second kind of lowering, *ĭ* converged with the result of *ē*. This is a late phenomenon in Latin and we believe, as we will see, that it must have occured after the III cent. A.D. The lowering of *ĭ* to *ĕ* is instead an old phenomenon as we can see from the fact that we can find it in the Tabulae Scipionis written during IV cent. B.C. - I cent. B.C.. This phenomenon seems to be present in the history of Latin for at least 4 centuries (from the II cent. B.C. to the III cent. A.D., when we begin to see a different phonological system).

It is important to assume, however, that this phenomenon belonged to the post-lexical component of the phonological derivation of Latin. It did not affect the underlying vocalic system of Classical Latin and was probably more a matter of phonetic implementation of speech (in the sense of Kiparsky (1985) than a proper phonological rule of classical Latin. In this way, we can explain the variability of the results. This phenomenon was only a superficial property of Latin speech.

Perhaps the most interesting question for us to consider is how we get from the classical Latin vocalic system to the Romance vocalic system. In order to explain this, we want to make the following hypothesis: *let's suppose that only the marked value of a rule can restructure a filter.* With this, we mean the following: assume a language L, with a filter like (19):

(19) $\begin{matrix} *\alpha F_1 \\ | \\ -\alpha F_2 \end{matrix}$

and a rule R like (20):

(20) $\begin{bmatrix} \ \end{bmatrix} > X$ in the context Z ___ W

$\begin{bmatrix} +F_2 \end{bmatrix}$

As default case of (20), X is assigned $\begin{bmatrix} -F_2 \end{bmatrix}$.
In the normal situation, cases in which we obtain a configuration $\begin{matrix} \alpha F_1 \\ | \\ \alpha F_2 \end{matrix}$ by (20) or its default case, are blocked by (19) and must be cleaned up.

Now we want to hypothesize that at a certain point in the history of the language L, a rule like (20) can affect the filter (19) and modify it. The hypothesis that we made claims that only (20) and not its default case can affect the filter. Therefore (19) can become $\begin{matrix} *F_1 \\ | \\ -F_2 \end{matrix}$, because of the influence of (20) and not $\begin{matrix} *-F_1 \\ | \\ +F_2 \end{matrix}$, as would be expected if the default case of (20) were prevalent. A further consequence of our hypothesis is that the filter (19) cannot be totally eliminated by the combined effect of (20) and its default case.

In other words, we want to say simply this: only rule (20) and not its default case can create a new segment of the underlying system. In the

language L. we would be able to have only a new segment which in $\begin{matrix}-F_1\\ |\\ +F_2\end{matrix}$, by application of rule [20], and not a new segment which is $\begin{matrix}+F_1\\ |\\ -F_2\end{matrix}$, by application of its default case. Only the first segment can be phonologized. not the second. Let's now consider Latin. We hypothesize that probably during the III cent. A.D., rule [15] was able to affect filter [13], thereby transforming it, as in [21]:

[21] * +hi
/
−tns

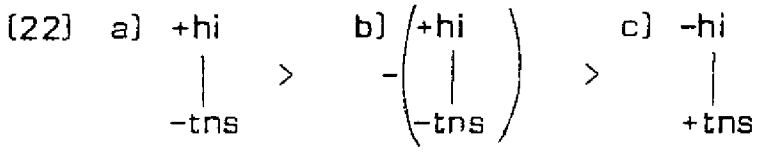
To put it in other words, [15] created two new segments, the tense mid vowels *e, o* which were included in the underlying vocalic inventory of Latin [-we would say - of Proto-romance]. In this vocalic system, segments -hi, +tns were now allowed. They were the long mid vowels $\bar{e}$, $\bar{o}$.

It was at this point that *ae* was no longer confused with *e*. In fact, at this point, $\bar{e}$ had become a tense vowel whereas *ae*, as we know, represented a lax vowel. Thus, Latin speakers began to confuse *ae* with $\breve{e}$, which was still a lax vowel.

Before this happened, rule [15] most probably became lexical from the post-lexical rule that it had been before.

Now, at the same time in which filter [13] was changed into [21], something happens to the short *i* and *u* which were assigned the feature [-tns] by the default case of [15]. Observe that now that filter [13] is changed into filter [21], the negation of the two incompatible features can be applied as the clean up rule. We can hypothesize that this kind of negation cleaned up the disallowed configurations which resulted from applying the default case of [15] to the high vowels. Therefore, we obtained [22]c] from the disallowed [22]a] through an intermediate stage

in which the negation rule is applied to the two incompatible features:



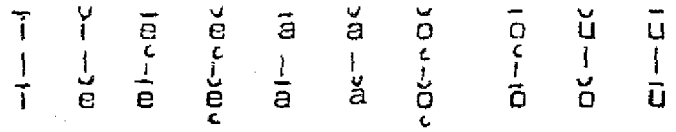
In this way, short high vowels became short tense mid vowels: *ĭ, ŭ,* became *ĕ, ŏ.*

Spence (1965) reaches a conclusion similar to ours. Studying the latin inscriptions of Pompei, he found that the Latin */ĭ, ŭ/* were often transcribed as */ĕ, ŏ/*. From this, he concludes that there was a stage of Latin in which the difference in quantity was not yet lost, but in which short high vowels were already pronounced as mid vowels. This fact would nicely be explained by our analysis. The problem is to decide whether the transcription of *ĭ, ŭ* as *ĕ, ŏ* was the result of applying the negation rule only to [−high] which we have seen in (18)a)b), so that *ĕ, ŏ* were actually lax *ę̆, ǫ̆*, or if it was the result of applying the negation rule to both incompatible features, as in (22), so that *ĕ, ŏ* were tense *ē, ō*. If the second option is correct, we are forced to say that the change from (13) to (21) had already occurred in the I cent. A.D., since Pompei was destroyed by the eruption in 79 A.D. We are inclined to say that this is not true because the transcription of *ae* by *ĕ* became common only much later, after the III cent. A.D.. The question, however, is still an open one and much more work is needed on the chronological issue.

We then suppose that Latin had the following pairs after the change of (13) into (21): *ī/ĕ, ē/ę̆, a/a, ǭ/ŏ, ō/ŭ̄*. We would like to comment briefly on the case of the vowel *a*. Rule (15) did not affect *a*, which therefore remained a lax vowel. This fact must be correlated to the fact that in many languages in which there is a difference between +/−ATR series, there is no +ATR correspondent of *a*: a common property of +/−

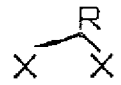
ATR vocalic system is that the distinction in +/-ATR is neutralized in the case of low vowels [cf. Anderson [1980]]. In a lot of African languages with +/-ATR vocalic systems, the low vowel *a* is always [-ATR]. We can suppose that this is an inherent property of the low vowels. We saw that this property shows up randomly also in Koryak. If we suppose that the feature [ATR] is essentially similar to [tense] , if not a notational variant of it, we can explain why *a* was not affected by [15]: simply *a* neutralized the feature [+tense] which [15] assigned to it. More work must be done on this topic.

Therefore, we hypothesize that the superficial vocalic system of the Latin of this stage differed from that of classical Latin in the following way:

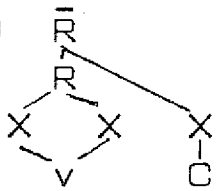
[23] 

Now, we must account for the loss of the opposition in quantity in Latin, so that the description of its diachronical evolution in the Romance languages is complete.

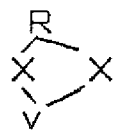
What essentially happened in Latin was that short vowels lengthened in open syllables and long vowels shortened in closed syllables. This is called the Ten Brink's law from the dutch linguist who proposed that this is a common property of Romance languages [cf. Ten Brink [1879]]. The grammarian Pompeus [V century] described the phenomenon in the following way: *"plerumque male pronuntiamus et facimus vitium, ut brevis syllabla longo tractu sonet aut iterum longa breviore sono"* [26]. We can explain this phenomenon in the following way: let's suppose that at a certain stage in the history of Latin, a constraint was introduced which says that in a syllable, the rime can contain two timing slots but no more and no less than that. This essentially means that we have a template for the rime like the following:[27]

(24) 

If we suppose (24), syllables like those in (25) are impossible:

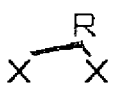
(25) a)  b) 

and they must be transformed in the following way: (25)a) becomes (26) by a rule of lengthening that adds a timing slot in the rime:

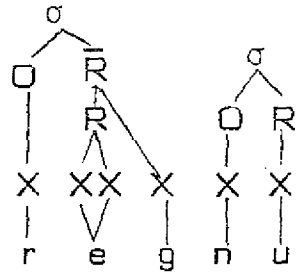
(26) 

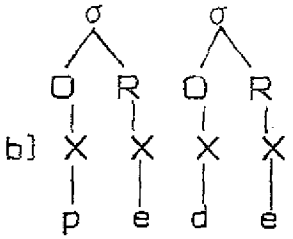
and (25)b) becomes (28) by a rule of shortening that deletes a recoverable timing slot, i.e. rule (27):

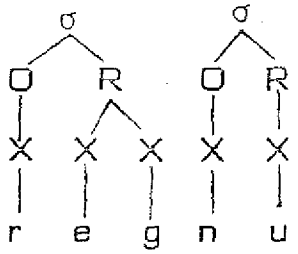
(27) a) X > Ø , if X is recoverable
b) X is recoverable if it is associated to a melodic segment associated to another timing slot.

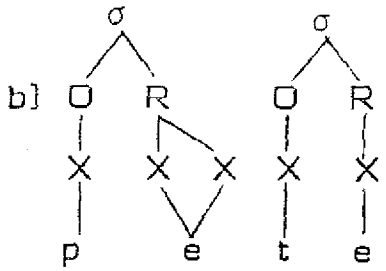
(28) 

This means that Latin words like *rēgnu, pĕde* that in classical Latin had syllabic structures like (29)a)-b) became (30)a)-b): (we have to suppose that there is an automatic application of (27) in unstressed syllables):

[29]a) 

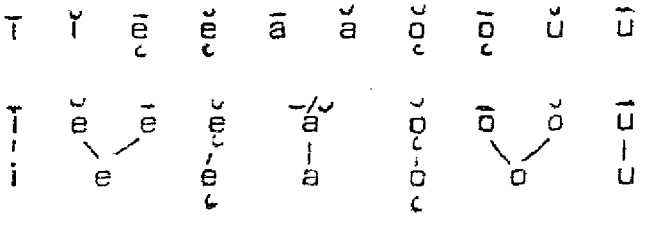
b) 

[30]a) 

b) 

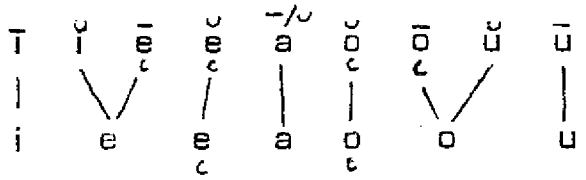
In this way the opposition in quantity is lost[28].

Let's suppose now that the constraint [24] was introduced in the grammar of Latin in a historical stage subsequent to the stage in which rule [15] was introduced - probably first post - lexically and then phonologized.if we are correct in supposing thet every phonological innovation enters the grammar through the post - lexical component. We can then hypothesize the following: the order of application of the phonological rules in a synchronic stage of a language tends to parallel the order of the introduction of those rules in the diachrony of that language [for the case in which this tendency is violated. see the discussion on opacity and reordering in Kiparsky [1982b]]. If this hypothesis is correct, when [24] was phonologized. it applied at a point in the derivation in which the vowels are like those of the bottom line of [23]. In this way. the vocalic system that surfaced without distinction in quality was identical in quality to that of the bottom line of [23]. Thus we have the following derivation:

[31] 

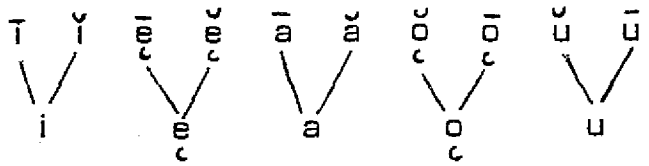
As a final point, we can suppose that the surface vocalic system of (31) was learned as the underlying vocalic system generation after generation. In this way, rule (15) and (24) were lost, leading us to the present situation of the Romance languages. Thus, we have the following correspondences between classical Latin and Italian:

(32)



The evolution that we show in (32) is the evolution characteristic of most Romance languages. The evolution of the Latin vocalic system into the vocalic system of southern Lucanian and Sardinian remains to be explained. Recall that in these vocalic systems we have the following correspondences with the Latin vocalic system:

(33)

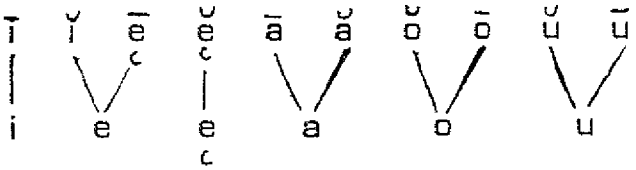


We want to hypothesize that in the variety of Latin that developed into these languages, filter (13) was not transformed into filter (21). In other words, no new segment was introduced into the underlying vocalic system. Therefore, the underlying vocalic system remained stable and was not modified.

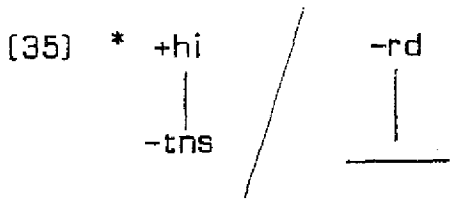
What this variety of Latin shared with the other variety of Latin was the adoption of the constraint (24). In this way, the distinction in length was lost and we thus have the system of the bottom line of (33).

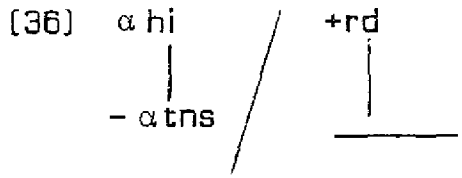
A final word must be said about the vocalic system of Rumanian and of a dialect spoken in Lucania. These vocalic systems display the follo-

wing correspondences with the Latin vocalic system:

[34] 

In order to explain this evolution from the Latin vocalic system, we must suppose that in the varieties of Latin that developed into these languages, the filter [13] was changed only in the case of the unrounded vowels and not in the case of rounded vowels. [- We will not account for this different treatment here. More work is needed. -] Filter [13] was therefore split into two different filters, i.e. [35] and [36]:

[35] 

[36] 

Therefore, in the case of the unrounded vowels, we have the evolution that we find in most Romance language; in the case of the rounded vowels, in contrast, we have the evolution that we find in Sardinian and southern Lucanian.

FOOTNOTES

*I wish to thank Donca Steriade, Morris Halle and Jim Harris for their invaluable suggestions and support in the development of my ideas. I also wish to thank Luigi Burzio and Pier Marco Bertinetto and Wayne O'Neil for their comments on an earlier draft of this paper.

1. Only southern Salentino and some of the Sicilian dialects don't have the phenomenon of metaphony.

2. In standard Italian, we find a phenomenon similar to the one of Salentino. While in stressed syllables, we have a seven vowel vocalic system identical to the one that we have in Salentino, in unstressed syllables this vocalic system is reduced to a five vowel vocalic system by application of the following rule:

$$\text{(i)} \quad [-\text{low}] \;>\; [+\text{tense}] \quad / \underset{-\text{stress}}{\_\_}$$

We can clearly see the effect of this rule in alternations in the italian verbal system where we have a shift of stress. In this case, in fact, we can see that mid-vowels that are always tense when unstressed can show up as lax or tense when they are stressed: therefore we have pairs like the following, where the first member of the pairs is an infinitive, and the second is the third person singular of the present:

(ii) a) voltáre - vǫ́lta "to turn" b) scopáre - scópa "to sweep"
a) portáre - pǫ́rta "to bring" b) compráre - cómpra "to buy"
a) accettáre - accétta "to accept" b) pescáre - pésca "to fish"
a) affettáre - affétta "to pretend" b) affettáre - affétta "to slice"

The preceding alternations demonstrate that the underlying vowel quality of the forms must be the one that shows up when the vowel is stressed. If not, we wouldn't understand the variation in tenseness. Therefore, we must suppose that the Italian speaker knows that an unstressed vowel can be either tense or lax, as he/she can deduce from alternations like those in (ii). A correct understanding of (ii) is possible only if the underlying difference in tenseness is blocked and merged in [+tense] in unstressed syllables, so that the difference shows up only in stressed syllables.

Let's consider now the following alternations:

(iii)	a)	trόvo	b)	sέnto
		trόvi		sέnti
		trόva		sέnte
		troviάmo		sentiάmo
		trovάte		sentίte
		trόvano		sέntono
	c)	conόsco	d)	crédo
		conόsci		crédi
		conόsce		créde
		conosciάmo		crediάmo
		conoscéte		credéte
		conόscono		crédono

Let's consider the underlying representations that we have to suppose for the forms in (iii), i.e., the underlying representations in (iv):

(iv)	a)	trɛvo	b)	sɛnto
		trɛvi		sɛnti
		trɛva		sɛnte
		trɛviamo		sɛntiamo
		trɛvate		sɛntite
		trɛvano		sɛntono

c)	conosco	d)	credo
	conosci		credi
	conosce		crede
	conosciamo		crediamo
	conoscete		credete
	conoscono		credono

It is interesting to observe that the underlying representations for northern Salentino that we hypothesize in (iv) are essentially identical to the underlying forms that we must assume for Italian, as far as the vocalic segments are concerned. Italian and Salentino appear to have similar underlying representations as we can see by comparing (iv) to (5). The explanation for this is simple: both Italian and Salentino are diachronically derived from the same Latin bases through tha application of a same set of diachronical rules. This similarity is obscured by the application of (1) in unstressed syllables in northern Salentino. It follows from this that we can intuit when we have an underlying mid vowel in northern Salentino by simply checking the correspondent forms of Italian and by considering the Latin bases. So we know that whenever we have /ī/, /ū/ in Latin, and therefore /i/, /u/ (/o/ in word-final position because of that lowered high rounded vowels in word final position in Italian)) in Italian, we have to have an underlying high vowel in Salentino. And we know that whenever we have /ĭ/, /ē/, /ĕ/, /ŏ/, /ō/, /ŭ/ in latin, and therefore /e/, /ę̣/, /ǫ̣/, /o/ (/e/, /o/ in unstressed syllable because of (i)) in Italian, we have to have an underlying mid vowel in northern Salentino. However we want to stress that this knowledge is not part of the competence of the speaker, but only a supposition of the linguist. What we mean is that the history of the language can give to the linguist useful hints about how to analyse the competence of the speaker.

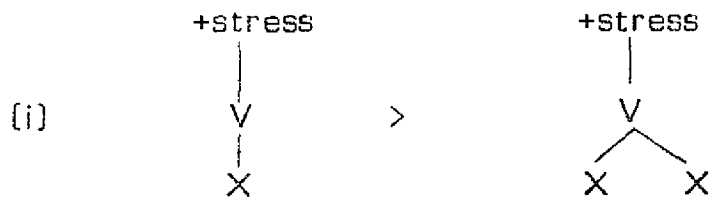
3. In other southern Italian dialects, e.g. in Abruzzese, metaphony can

occur also with the low /a/. See sect. II.2.

4. But we have a word like /uɛ̨kkʸu/ "eye". So the status of (30) as exception is uncertain.

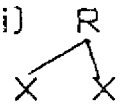
5. It is interesting to observe that his constraint strictly resembles the trysyllabic shortening of English. It would be important to study the connection between trysyllabic shortening in English and the impossibility of having lengthening in the antepenultimate stressed syllable in Italian. But we don't have time here.

6. Chierchia (1985) proposes the Strong Constituent Condition (i) in order to account for the lengthening of stressed vowels in open syllables; the SCC in the case of Italian has the following form:



By (i), the rime of a stressed syllable in Italian must always be branching. Therefore (i) explains the lengthening of a vowel in an open syllable. However, we have observed that this holds only in the case of a syllable in penultimate position; in the case of syllables in antepenultimate positions, there is no lengthening. This fact cannot be explained by (i).

In order to account for both facts, i.e., lengthening of a vowel in a penultimate syllable and lack of this lengthening in an antepenultimate syllable, we want to propose a slightly different approach. Let's assume that the constraint that holds in Italian does not concern the stressed syllable, but the last foot of the word. First of all, let's call the timing slots composing the rime of a syllable *moras*, as in Trubetzkoy (1969), Prince (1980). So given the syllables in (ii):

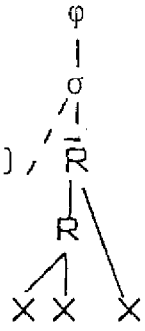
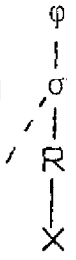
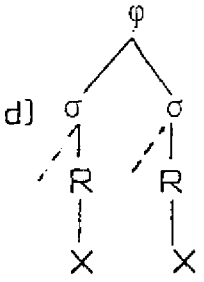
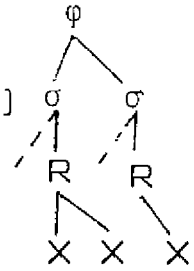
(ii)  b) 

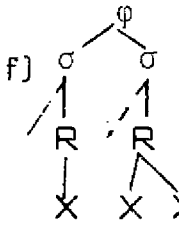
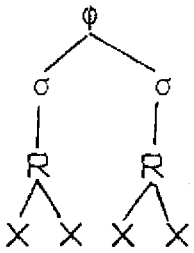
(ii)a) has two moras and (ii)b) only one.

Now we can hypothesize that the constraint that holds for Italian is the following.

(iii) The last foot of a word can contain only two moras, but no more or no less than that.

Therefore, given the feet in (iv):

(iv) a)  b)  c)  d)  e) 

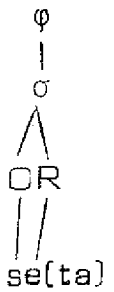
f)  g) 

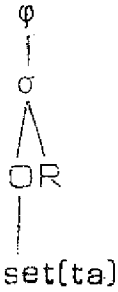
Only (iv)a) and d) are allowed by (iii). (iv)b), c), e), f), g) are all blocked by (iii).

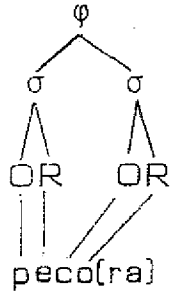
(iii) provides the correct result for Italian. In Italian, we must have lengthening in a penultimate syllable, but we may not have it in closed syllables or in antepenultimate syllables. Consider the following words in Italian where we assume that the last syllable is extrametrical:

(v) a) séta b) sétta c) pécora

The words in (v) have the following foot structure:

(VI) a) 

b) 

c) 

In (vi), (iii) forces lengthning in case a), but not in case b) and c). This is the right result: only the word in (vi)a) must have lengthning of the vowel: se:ta and not *seta; and in the words (vi)b) - c) we may not have lengthning: setta not *se:tta, pecora, not *pe:cora.

7. If they are actual exception, cf. note (5).

8. We can, also, assume that $\left[\begin{smallmatrix}-\\ba\end{smallmatrix}\right]$ is the default specification of the vowels,so that the $\left[\begin{smallmatrix}-\\ba\end{smallmatrix}\right]$ associated to the / k / functions only as a blocking element.

9. The compatible features are inserted in the following way: when clonation occurs, each of the conflicting features will dominate the unspecified correspondent of the other conflicting feature. Therefore, rule (8) must apply to fill in the unspecified value. The filling in will be correctly governed by the Privative Principle in conjunction with the pertinent filter.

10. We don't discuss here the problem of the order of the two linearized features. On this problem, see Andersen (1972).

11. But it is the correct form for a lot of other dialects in which there is the same rule of metaphony, e. g. Neapolitan or Pugliese.

12. In all the configurations concerning α as target of metaphony, we did not consider the feature [back] for reasons of semplicity. It is important to note, however, that the feature [+ back] must be present in the feature bundle of a, so to account for the result that we give where a becomes a [- back] vowels we have to suppose that in these dialects, the features [back] is in some sense interdependent with the feature [low], so that the negation of the feature [low] results also in the negation of the feature [+ back]. We could also say that they are strictly connected. Observe that we will have to suppose the same hypothesis in the case of u - umlaut of Icelandic of sect. 3.

13. In Romanian, given the presence of the unrounded back vowel *i*, we have to suppose a filter different from (60). We would suppose a filter like

$$* \begin{bmatrix} + \text{rd} \end{bmatrix} \Big| \begin{bmatrix} - \text{ba} \end{bmatrix}$$

This filter should give the correct results.

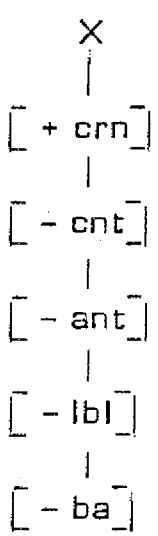
14. Thus far, in our research, we have found only applications of the rule of negation to more than one feature when the feature involved are features such as [high], [tense], [low] and [back], i.e., features connected to the height factor. We did not find any application of negation that changes the feature [+ round] and one of the preceding feature together. We don't understand if this is an accidental fact or if there is any meaning in it. Assuming Halle (1986)'s reformulation of Clements (1985), it could be that in case of vowels, the negation of more than one feature can affect only features connected with the same articulator, in our case the tongue body. Therefore [+ round] which is connected to a different articulator, i.e., the lips, cannot be affected by negation rule together with a feature of the preceding class.

15. It would be interesting to extend our treatment of disallowed configurations in the vocalic system to the consonantal system. It occurred to us that the affrication that we find in Italian in the case of palatalization of velars could be thought of as an application of the rule of linearization. In Italian, we have alternations like amik - o / amitš - i, grek - o / gretš - i. Let's suppose that in Italian, there is the following filter:

(i) $$* \begin{bmatrix} -\text{cnt} \\ | \\ -\text{ant} \end{bmatrix} \Big/ \begin{bmatrix} +\text{crn} \\ | \\ \_\_\_ \end{bmatrix}$$

(i) states that we don't have coronal segments in Italian which are [- continuant] and [- anterior] at the same time. This is, in fact, true.

Let's suppose then as in Clements (1983) that palatalization involves the spreading of the features [+ coronal], [- back] associated with a front vowel to the adjacent velar segment. This spreading will produce a configuration like the following:

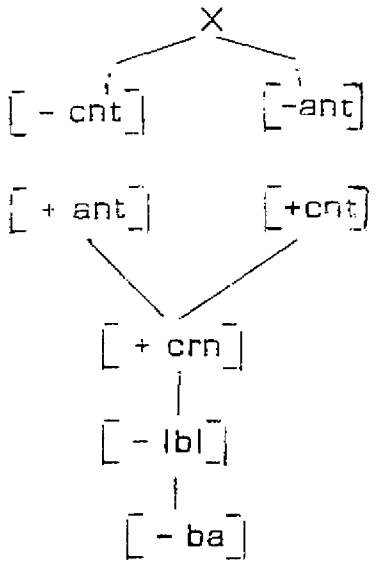
(ii)


In (ii), according to the filter (i), [- cnt] and [- ant] are incompatible

because they are in the context of [+ crn].

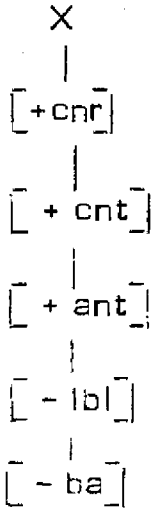
In applying the rule of linearization to clean up the disallowed configuration, we will obtain (iii)

(iii)



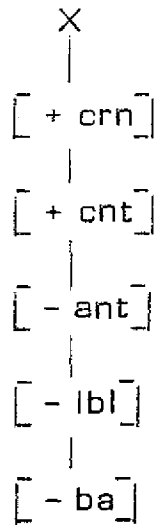
In (iii), we obtain the complex segment / tš / (or / dš /, if there is the feature [+ voice] in the feature bundle), the affricate that we actually find in the palatalization of velars. Observe that in (ii), we could have applied the rule of negation. If we had negated the two incompatible features, we would have gotten:

(iv)



The segment in (iv) is / s / (or / z / if there is [+ vc]). In fact, this is another of the possible results of palatalization of the velars. For example, in several northern Italian dialects we get alternations like the following: in Veneto, amiko / amisi. Similarly, in English we have alternations like the following: electrik / electrisity. If we had negated only [- cnt], we would have gotten:

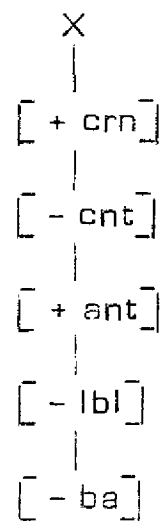
(v)



i.e., the segment / š /. In some languages, this is what we find as a result of the palatalization, e. g., in Chi - Mwi:ni (a Somali language studied by Kisseberth and Abasheik (1975) from *pik - i:t - e, we get piš - it - e.*

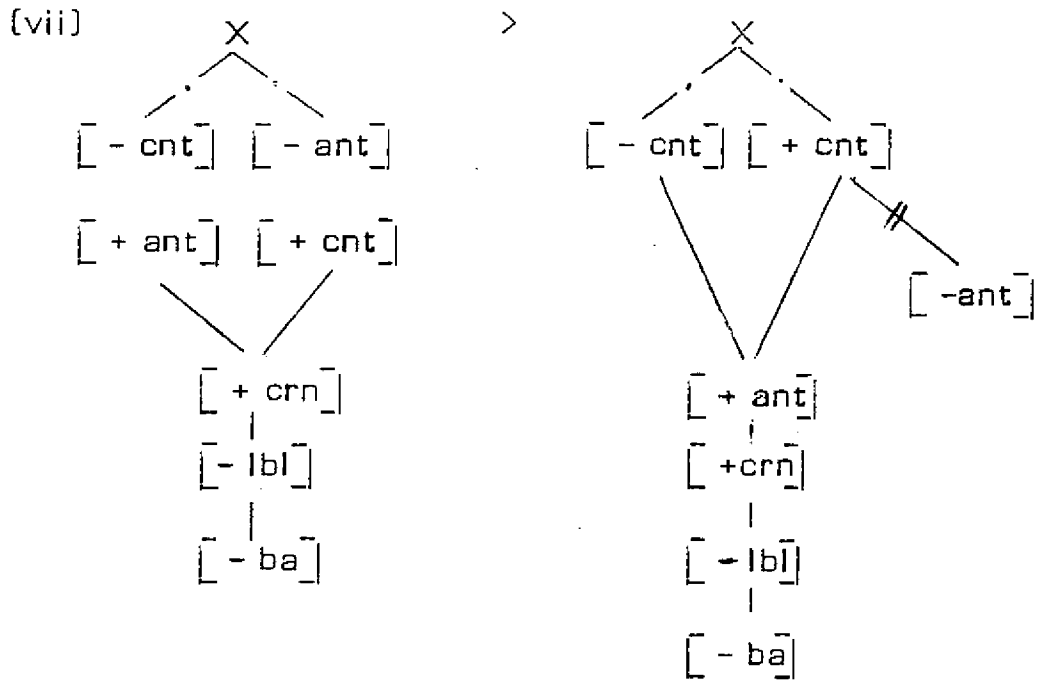
We should expect also the case in which only [- ant] is negated, i.e.:

(vi)



This is the segment / t /, which is not a possible outcome of the palatalization as far as we know. This poses a problem for our approach. More work is needed to rule out this possibility.

Finally, we have to observe that there is an outcome of the palatalization that is not directly accounted for by our rules. In several northern Italian dialects, we find / ts / from K in a palatalization context, e. g., ameku / ametsi in the dialect of Ligurian mountains. The complex segment / ts / cannot be directly derived from (ii) using our rules. However, we can suppose that / ts / is the result of a process of assimilation inside the complex segment: [+ anterior] is spread on the right component of the complex segment in (iii). We thus have the following derivation:



The process in (vii) is not an unexpected one. These issues, however, call for further work. We thus leave them to future research.

16. See Kenstowicz (1979) for argument to say that the harmonic correspondent of e is ɛ .

17. But it is possible to suppose that the Chukchee system is an evolution of the Koryak one with a laxing of the dominant series.

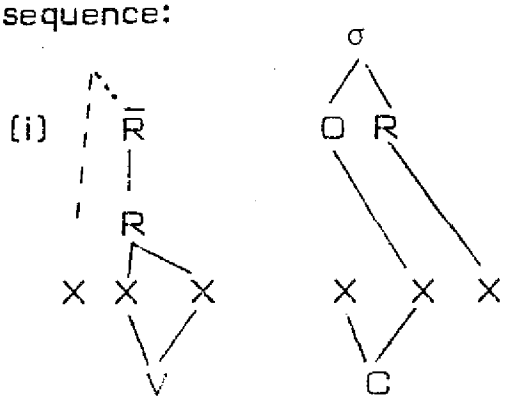
18. An evidence in favor of the fact that African Latin was similar to the Latin from which southern Lucanian is derived is the fact that Latin loanwords to Berber show *i, u* for *i̯, u̯*, e.g. Lat. *cĭcer* > Berb. *akiker*, Lat. *sĭlĭqua* > Berb. *γisliγua*, Lat. *fŭrca* > Berb. *afurk*, Lat. *ŭlmus* > Berb. *ulmu* (cf. Schuchardt (1918)).

19. We hypothesize this date because all the authors who use *ĕ* instead of *ae* lived after the III century A.D. Further research is needed on this topic.

20. Quoted by Weinrich (1958).

21. It would be interesting to correlate the constraint (24) of Latin to the constraint on the composition of the last foot in Italian which was proposed in the note .

22. Prunet & Tellier (1984) for a similar approach to shortening. D. Steriade pointed out (p.c.) that a problem to our approach arises when there is a long vowel before a geminate consonant, i.e. when we have the following sequence:



In a situation like that of (i), we cannot predict which timing slot will be deleted.

It seems that in situation like that of (i), the timing slot which is deleted is actually the vowel: e.g. Latin *stẽlla*, Italian *stella*. If this is true, we can propose that (27)a) applies following the costituent structure of the syllable from inside to outside. This means that the first timing slot to be deleted in (i) is the one associated with V, because it is attached lower in the syllabic tree than the one associated with C.

Postscriptum

Due to an unfortunate oversight in the text, the superficial vocalic system of Northern Salentino has been claimed to be a seven-vowel system like that in (1) with a distinction in tenseness in the case of mid-vowels:

(1)

i	u
e	o
ɛ	ɔ
a	

This is incorrect. The *superficial* vocalic system of Northern Salentino is a five-vowels system (cf. Mancarella 1975) with lax mid-vowels (cf. Sobrero & Romanello 1981):

(2)

i	u
e	o
ɛ	ɔ
a	

Therefore, there is no *superficial* distinction in tenseness in Northern Salentino.

Crucially, however, the vowel system in (1) must be hypothesized as the *underlying* vocalic system of Northern Salentino. It is obvious that

in Northern Salentino there are two series of mid-vowels, as is shown by the metaphony facts, even though there is no phonetic difference between the components of these two series. In fact, the alternation in (3) show that there are two sets of mid-vowels from a phonological point of view:

(3)

frę̣dda	friddu
rǫ̣ssa	russu
lę̣nta	lię̣ntu
bǫ̣na	buę̣nu

that is, a set composed of mid-vowels which alternate with their high counterparts in a metaphonic context, and a set composed of mid-vowels which alternate with a diphthong in that same context. The presence of these two sets is immediately accounted for if we hypothesize that the underlying vocalic system of Northern Salentino is the one in (1) with two series of mid-vowels. In a metaphonic context, the mid-vowels of one of these underlying series are raised: the mid-vowels of the other underlying series are diphthongized. As is shown in the text, this peculiar behavior of the mid-vowels in a metaphonic context can be explained if the mid-vowels that are raised are considered to be underlyingly tense, and if the mid-vowels that are diphthongized are considered to be underlyingly lax. Observe that the underlying forms that are hypothesized in this way are also justified on etymological and comparative grounds: whenever we suppose that a form has an underlyingly tense vowel in Northern Salentino, the Latin source of this form has ē, ō, or ī, ū, which as we know gives the tense vowels /e, o/ in other Romance varieties. The same occurs in the case of lax mid-vowels: wherever we suppose that a form has an underlying lax mid-vowel, the Latin source has ĕ, ŏ which evolved into lax /ę̣, ǫ̣/ in other Romance varieties.

The problem is then to explain how we get the five-vowel system in (2). My hypothesis is that there is the following rule:

$$[4] \quad +\text{tense} \longrightarrow -\text{tense} \; / \; \begin{bmatrix} -\text{high} \\ -\text{low} \end{bmatrix} \; \sim$$

Rule [4] changes all the tense mid-vowels that are underlyingly supposed into lax mid-vowels. Therefore, the effect of [4] is that of reducing the seven-vowel system in [1] into the five-vowel system in [2].

Rule [4] belongs to the last stages of the phonological derivation in Northern Salentino. Precisely, it applies after the metaphony rule, as is shown by the fact that the metaphony rule is sensitive to the distinction between tense and lax mid-vowels.

As a final point, it is important to note that all of the Northern Salentino forms considered in the text are representations belonging to stages preceding the stage where [4] applies. Therefore, they are all forms that show the underlying distinction between tense and lax mid-vowels.

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