

Phonological Levels and Assimilatory Processes*

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What we might term "the structuralist theme of segmentation" has prevailed in Generative Phonology until recently. Segmentation coupled with the use of features has as a consequence that phonological properties (features) are related to other ~~properties~~ ~~within a segment~~ (simultaneous properties), but are not related to the same property in other (adjacent) segments. Maybe one of the most interesting consequences of abandoning this theme in Generative Phonology has been, not the possibility of incorporating into the theory a range of prosodic phenomena whose nonsegmentality (cf. "suprasegmental") had been known long ago in descriptive linguistics, but the extension of autosegmental character to other phenomena traditionally not described as suprasegmental, i.e. the discovery of its autosegmental, prosodic character.

I will be dealing here with one of these phenomena, local (nonharmonic) assimilation, using data from Catalan consonantal assimilation, and I will propose a theory of the organization of phonological representations.

I will give an outline of the theory first, will then discuss consonantal assimilation in Central Catalan, and precise more in doing so the theory outlined before.

Once the segmentation theme is abandoned and the autonomy of features recognized, a number of questions arise. For example: a) which features are, or can be, autosegmental? b) are features autosegmental in the same way? (Where can be introduces the possibility of parametric variation.) In other words, we are asking how many levels of representation are there, and what is the relation among levels.

* This an unrevised version of the stricto sensu ms. with the same title presented to the 7th GLOW Colloquium, York.

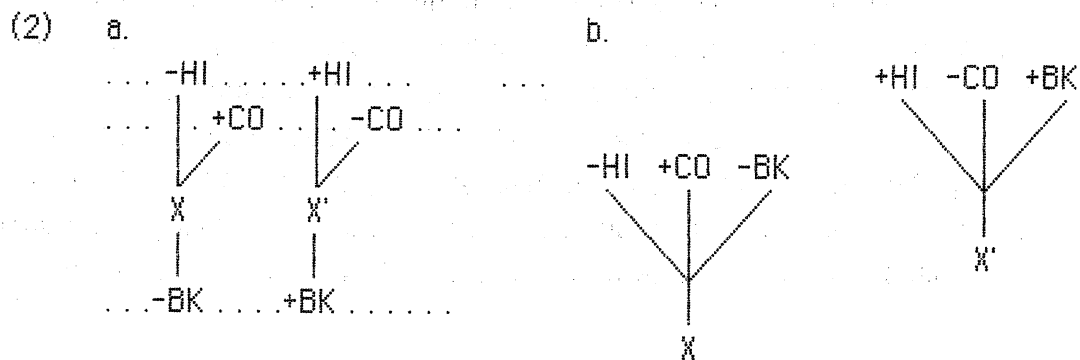
I will follow the standard assumption that there exists a designated tier (CV tier, skeleton, canonic tier) which determines the units of timing. I will assume that it determines only the units of timing, and hence not other properties (consonant/vowel distinction, etc.). Let's call it the "root" tier.

Looking at the rest of the tiers, it is evident that Autosegmental Phonology has concentrated on phenomena that involve a single property (tone, nasality, backness, roundness, ATR, etc.) and the designated or "root" tier (or a tier with all nonautosegmental features). It is therefore interesting to examine processes in which several features are involved at the same time.

The main difference between current approaches and the one outlined here is the following:

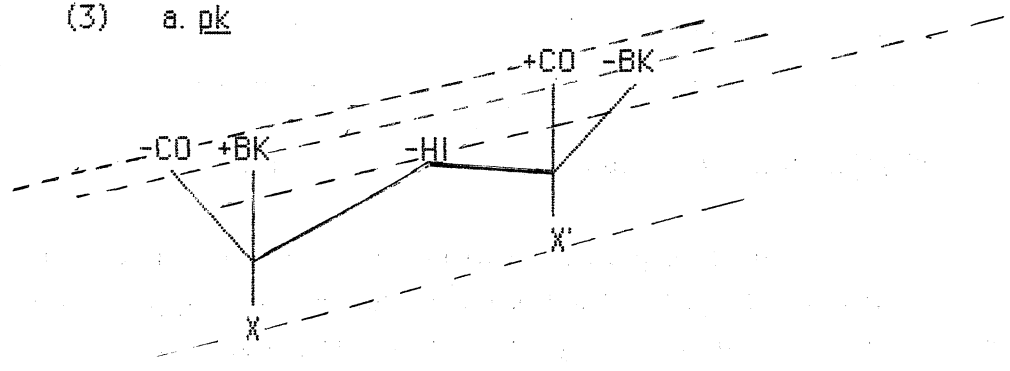
- (1) a) Features are not directly connected to the root tier.
- b) There are tiers (namely those intermediate between feature tiers and the root tier) that are not sequences of features, but sequences of sets of features.

Thus, in a very much simplified representation, the sequence tk has not the structure in (2a), but that in (2b)

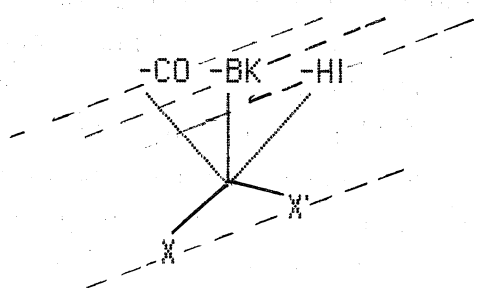


Multiple connections of one node to others are illustrated in the partial representations in (3) with pk, pm, and pf:

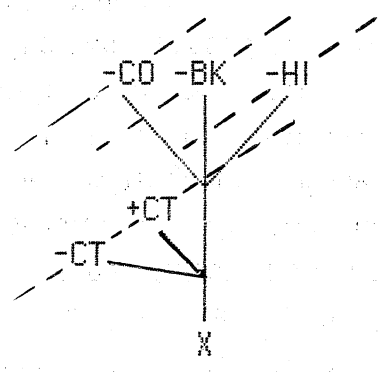
(3) a. pk



b. pm



c. pf

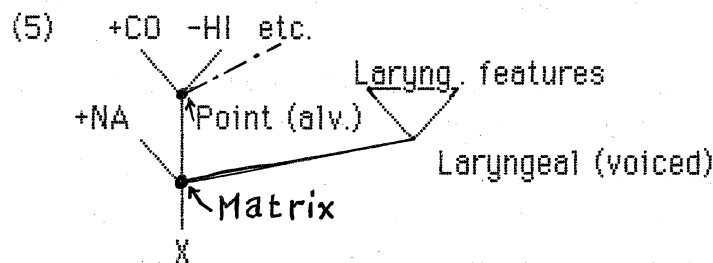


A phonological representation is a set of phonological properties organized in the following way:

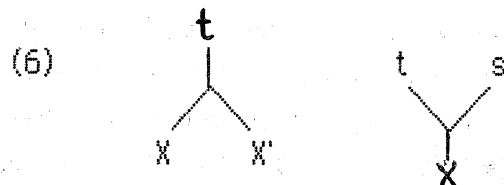
- (4) a. A tier is a sequence of binary properties or sets of binary properties.
- b. To every single property (feature) there can correspond one tier.
- c. There is a tier which represents the phonological property "unit of timing" (root tier).
- d. There is a tier which represents all the specified segmental properties connected to it (matrix tier).
- e. Between the single-feature tiers and the root there are intermediate tiers whose elements are connected to elements in specified tiers. They represent significant groupings of features (point of articulation, lip features, laryngeal features, vowel height, major classes, etc.).

We might distinguish therefore four levels: 1) feature tiers, 2) place of articulation, laryngeal, etc. tiers, 3) matrix tier, 4) root tier. We will

have, for example, in the case of n, the following (incomplete) representation:



We might assume that features are copied on every lower connected node, except for the root. Equivalently, a node has the property specified by $[+/-F]$ iff it dominates the feature $[±F]$. Connections between the root and the matrix specify the well-known timing-segmental situations of gemination (or long Vs) and contour:



Precedence relations can be visualized then in the matrix tier. More generally, a node X precedes a node Y iff X is connected to Z_1 and Y to Z_2 , and Z_1 precedes on the same tier Z_2 . Prohibition of crossing lines works as usual, and so does projection:

(7) If X_1 precedes X_2 , X_1 is connected to Y_1 and X_2 is connected to Y_2 , then Y_2 cannot precede Y_1 .

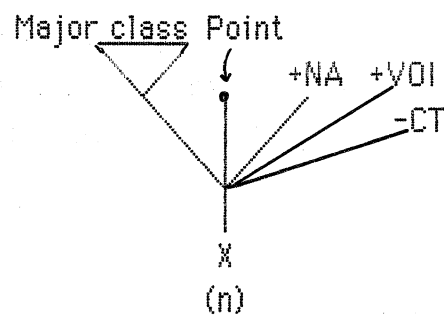
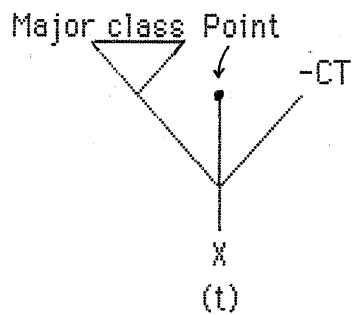
A traditional problem when dealing with assimilation within a standard distinctive feature based framework, has been the fact that assimilation of point of articulation involves naturally a set of features at the same time (cf. Harris (1969), where the problem is already recognized). Thus consider Catalan t and n in nonassimilatory (___#___, ___V) and assimilatory environments. I will refer to the pairs voiced-voiceless obstruent by the voiceless element ($t=t,d$; $p=p,b$; etc.). Both undergo regressive voicing assimilation also (t is dental, n is alveolar):

(8)	a.	b.	P. of A.
	tót 'all' <u>masc.</u>	tóm mór 'all dies'	bilabial
	tóta 'all' <u>fem.</u>	tóp fúfj 'all flies'	labiodental
	tót és 'all is'	tót súk 'all juice'	alveolar
		tón nórn 'all name'	" "
		tól líkit 'all liquid'	" "
		tóð rúk 'all donkey'	postalveolar
		tóð fáj 'all lamb'	prepalatal
		tól lúm 'all light'	palatal
		tón þápu 'all bump'	" "
		tók káw 'all falls'	velar
	c.	d.	
	kín 'which' <u>masc.</u>	kím més 'which month'	bilabial
	kína 'which' <u>fem.</u>	kím fúm 'which smoke'	labiodental
	kín amiík 'which friend'	kín díe 'which day'	alveolar/dental
		kíí líkit 'which liquid'	" "
		kín rúk 'which donkey'	postalveolar
		kín fáj 'which lamb'	prepalatal
		kín lúm 'which light'	palatal
		kín þápu 'which bump'	" "
		kín káp 'which head'	velar

The obvious generalization is that there is assimilation in point of articulation for both consonants, with total assimilation for t in some cases. The assimilation takes place when t, n are in the syllable rhyme and a consonant follows. Notice that there is only partial assimilation for t when the consonant that follows is a continuant. We can explain this fact if we assume that t does not assimilate the feature [+/-cont]. Similarly we can predict that n assimilates only place of articulation if we assume that it does not assimilate [+/-nas], [+/-cont] (and major class features). The standard approach attributes these effects to the operation of different rules of assimilation (Wheeler (1979), Mascaró (1978)).

Suppose that these facts are not attributed to the rule of assimilation, but to the representation at the time the rule applies. This would mean basically that at that point the following associations hold for t and n (I put the transcription of the segment in parenthesis for clarity):

(9)



The rule of Assimilation will take then following form:

(10) Spread any autosegment (node specification) regressively.

t cannot become continuant since [+CT] cannot spread to the left, the CT node being already occupied. Other nodes can be associated with the corresponding specified nodes of the following consonant, however. There will be thus total assimilation in cases where the CT specification of t and the following consonant coincide, otherwise only partial assimilation.

n is specified for [+nas] and other features that in fact are connected to nasality (voicedness, major class features, [-cont]). It will therefore assimilate only point of articulation. As can be seen in [kiĩlíkit] there is also assimilation of [+lat], a question to be examined below.

Before we justify the representation (9), let us see how assimilation works for other obstruent stops and nasals.

- (11) a. káp sák 'no bag'
 kám má 'no hand'
 káp patít 'no small'
 káp fósik 'no dark'
 káp tów 'no soft'

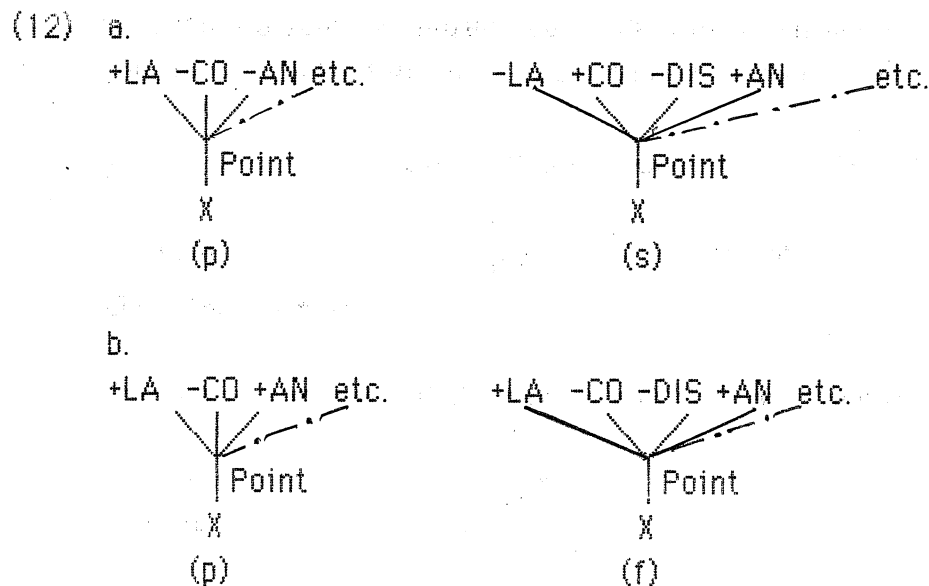
- b. sák patít 'small bag'
 sák fósik 'dark bag'
 sák tów 'soft bag'

- c. kulóm patít 'small pigeon'
 kulóm fáis 'false pigeon'
 kulóm tów 'soft pigeon'

- d. púp patít 's. fist'
 púp fáis 'f. fist'
 púp tów 's. fist'

- e. bánj patít
 'small bench'
 bánj fáis 'f. b.'
 bánj tów 's. b.'

Only labials assimilate, and only to a following labiodental, or to m. We could suppose, following our initial assumption, (9), that nonalveolars have all their point of articulation features specified, except for [+/-distributed] in the case of p, m. But this would amount to an increase of the ad hoc character of representations like those in (9), and it would not work for pm → bm. Instead, we will limit the process of assimilation to nodes connected with the matrix node, thus excluding features like [back], [cor], etc. from assimilating directly. The conditions under which spreading will take place are the same that would allow spreading of single features with the same result. That is, if a node N dominating the features $\alpha_1 F_1, \alpha_2 F_2, \dots$ is followed (or preceded) on the same tier by a node N' dominating $\alpha'_1 F_1, \alpha'_2 F_2, \dots$, the node specifications of N' will spread on N iff there is no $\alpha_i F_i$ specified differently than the corresponding $\alpha'_i F_i$. Given (12),



we only have to assume that [+/-distr] is unspecified in the second segment in (12b) to allow its point of articulation node to spread over p, whereas p. (12a) will have to have some specified features ([lab], [cor]) to distinguish it from t, s, and therefore the point of articulation node of s cannot spread over p in (12a).

The main consequence of this is that assimilation will take place when the assimilated element and the assimilating element are different, but the former has, for some reason, deassociated some specifications, or when they are similar: in the case of nl (phonetically [ɲ]), which came up before, and similarly in the case of ln (phonetically [ɲn]), the fact that they are homorganic is crucial. But unlike bm → mm, for nl, ln

there is in each case a specified feature in the assimilated element that differs from its corresponding specification in the assimilating element; this accounts for the fact that there is no total assimilation. In this special case then, assimilation disregards the specification of [lat] and [nas]; or [lat] and [nas] are not projected in the representation to which assimilation applies.

Another instance in which assimilation operates on a specific projection is the case of fricatives. Fricatives assimilate only to fricatives. The result is not transparent due to other processes, mainly Contraction.

The only case of assimilation involves ɹ, ʂ and ʃ, three coronals with a close point of articulation. ʃ and ɹ are not affected for the same reason ɸ and k aren't, ʃ being labial and ɹ [+high]. We would expect ʂ to assimilate, parallelly to t, to all points of articulation, which is not the case. If ʂ is [-ant] as has been assumed sometimes (Wheeler (1979), it will have the feature [-ANT] specified before the rule of Assimilation applies, and it will assimilate only to [-ANT] fricatives, hence only to ʃ and ɹ. Fricatives assimilate only to fricatives just because there are no stops with the appropriate specification for there to be assimilation.

l assimilates point of articulation (and nasality, as already noted), but stays as lateral, i.e. it cannot assimilate manner. Following our initial assumptions, the representation to which assimilation applies will have [+LAT] specified. If assimilation, as formulated, is allowed to apply freely, it will spread the point of articulation node. In cases like lt, lj, lk, the result will be the correct [lt], [lj], [lk]. In other cases we will get, e.g., from lp, lk a combination in the matrix tier with [+lat, +lab +cor], [+lat, +back, +cor], respectively, which will be ill-formed. (or interpreted as coarticulation. I will leave this possibility open for lack of sufficiently clear data).

(13) a. lt, lj, lk → [lt], [lj], [lk]

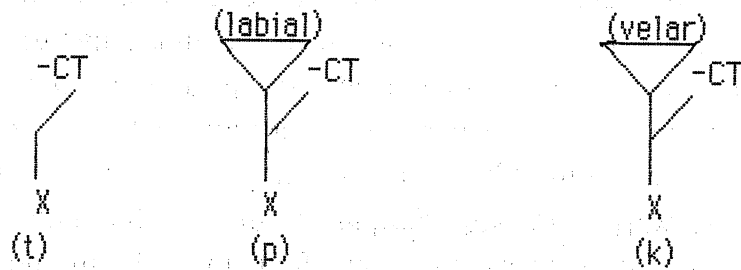
b.

lp	lk
$\begin{bmatrix} +lat \\ +lab \\ +cor \end{bmatrix}$	$\begin{bmatrix} +lat \\ +back \\ +cor \end{bmatrix}$

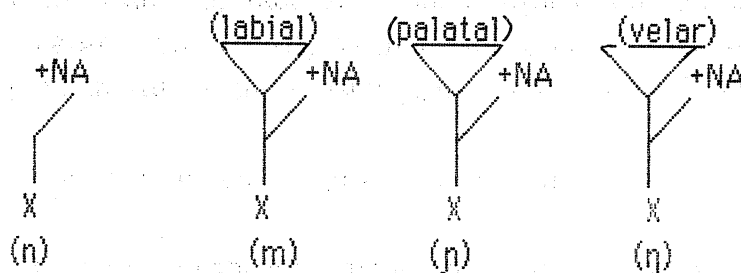
Let's now return to our initial assumption (4). We have simplified the rule of assimilation at the cost of positing particular representations

for each consonant with features partly specified at the time the rule applied. Let us summarize these representations in (14); I project only the point of articulation tier and the root tier.

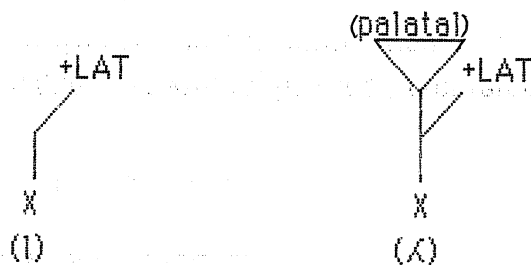
(14) a.



b.



c.



d.



The careful reader will have noticed the non ad hoc, non language particular character of the specified/unspecified distribution in (14). It coincides with the marked/unmarked distinction, except for the feature [cont]. Assume that fricatives are marked (specified [+CT]), and stops are left unmarked. This would predict [CT] assimilation also, which doesn't occur. But there is a general process in Catalan which assigns [-CT] to voiced obstruents b, d, g in the syllable rhyme; this process can be extended to voiceless p, t, k.

We can thus eliminate particular statements about when assimilation takes place for any given consonant. Since the assimilated segment is always in the syllable rhyme, we might propose the following rule, that operates before assimilatory spreading:

(15) Deassociate unmarked values for consonants in the syllable rhyme.

(15) is a process that can be generalized to other cases we have not examined here like voicing assimilation ("deassociate the laryngeal node"), stop formation ("assign [-CT] to CT-unmarked obstruents"). After (15) the rule of assimilation spreads nodes in the manner described before.

I will now examine some consequences of this treatment of Catalan assimilation and of the framework proposed.

An interesting outcome of this analysis is that the regressive character of Catalan assimilation (including voicing assimilation, that I have omitted) is not parametric, but derivative from the independently needed "syllable-final" character of the phenomenon. Catalan syllables having the general structure $(C_1(C_2))V(C_3(C_4))$, Deassociation occurs only in C_3 and C_4 . In $(C_1(C_2))VC_3$ if C_3 is followed by a consonant, spreading takes place regressively and deassociated nodes delete. In $(C_1(C_2))VC_3C_4$ both C_3 and C_4 deassociate nodes. In any event those of C_4 spread to C_3 ; if C_4 is followed by a consonant spreading takes place. In both cases spreading is regressive. Unassociated material deletes.

REFERENCES

- Harris, J. (1969) Spanish Phonology, MIT Press, Cambridge.
 Mascaró, J. (1978) Catalan Phonology and the Phonological Cycle, IULC.
 Wheeler, M. (1979) Phonology of Catalan, Blackwell, Oxford.