

Subsegmentals in Spanish Phonology:
An Autosegmental Approach

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§1 One of the more interesting questions being asked in phonology today goes back directly to the questions being asked in the 1940's by Bernard Bloch, Zellig Harris, and J.R. Firth.¹ Is phonology concerned with simple strings of segments, with a geometry like a picket fence, albeit a fence made out of a hodge-podge of pickets of varying width? Or is the phonologist's sound-stream more like a Mondrian, a brick wall made from bricks with everywhere the same height -- so there are clear rows -- but varying width to each brick? In what ways is the phonological segment atomic and indivisible?

Within the framework created by the introduction of distinctive features, it was clear that the segment was divisible in at least a classificatory sense. One could say of a 'p' that it was voiceless, for example, and one could break it down into various specifications which, taken all together, fully characterized the segment for the purposes of the language at hand.

Still, within the general context of American structuralism, and, until recently, of generative phonology, the phonological segment was viewed as 'divisible' only in this limited sense. Feature specifications could not be 'added' or 'taken away' from a segment; all that could happen, it was supposed, was that feature specifications could be modified by the effects of phonological rules.

One generativist who raised doubts about this easy assumption in the generative model was Cressey (1974), who himself noted James Harris' (1969) earlier discussion of the problem. The problem, as Cressey formulated it, was this:

- (1) Certain subsets of features (tend to, may) cluster together in rules involving the Greek variable notation, that is, assimilation and dissimilation rules.

Cressey notes, for example, that a rule like (2), involving total assimilation of point of articulation, is more natural than (3), whose point is difficult to imagine.

- (2) $[+nasal] \rightarrow \left[\begin{array}{l} \alpha \text{coronal} \\ \beta \text{anterior} \\ \gamma \text{back} \\ \delta \text{distributed} \end{array} \right] / - (\#) \left[\begin{array}{l} + \text{obstruent} \\ \alpha \text{coronal} \\ \beta \text{anterior} \\ \gamma \text{back} \\ \delta \text{distributed} \end{array} \right]$
- (3) $[+nasal] \rightarrow \left[\begin{array}{l} \alpha \text{anterior} \\ \beta \text{coronal} \\ \gamma \text{voice} \\ \delta \text{continuant} \end{array} \right] / - (\#) \left[\begin{array}{l} + \text{obstruent} \\ \alpha \text{anterior} \\ \beta \text{coronal} \\ \gamma \text{voice} \\ \delta \text{continuant} \end{array} \right]$

The evaluation metric proposed in Sound Pattern of English fails to achieve this result; Cressey proposed to elaborate the notational system by introducing a single 'quasi-feature' to be used in writing rules, called 'PA' for 'point of articulation'. Thus ' α PA' would mean α high, β back, γ coronal, δ anterior, and ϵ distributed.

Such a notation is quite evidently in order for any language

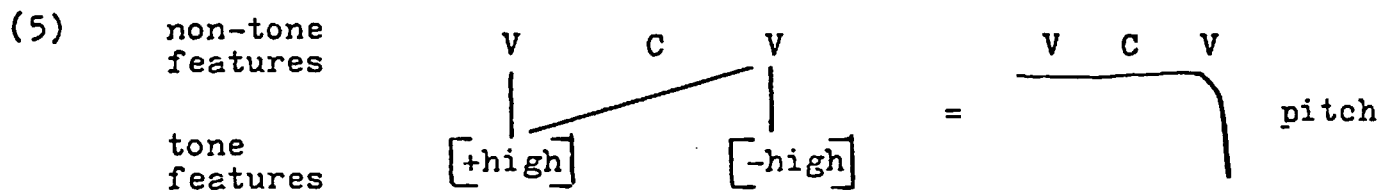
which, like Spanish, has a rule assimilating nasals to the point of articulation of a following obstruent. Instead of (2), the language would have the formally simple rule (4).

$$(4) \quad [+nasal] \rightarrow [\alpha PA] / - \left[\begin{array}{c} +obstruent \\ \alpha PA \end{array} \right]$$

By incorporating Cressey's proposal for the αPA notation in the theory, we achieve a certain level of explanation, in that total assimilations of point of articulation are explicitly claimed, by the notation, to be simple, and simpler than such arbitrary assimilations as that of (3). We have 'captured' the phenomenon, in the sense that we have isolated it, and provided a place for it in the theory. Another level of explanation can be reached, however, if the αPA notation can be removed from its theoretical isolation -- if it can be linked, that is, to a wider range of otherwise peculiar phenomena. That is the aim of this paper: to suggest a theoretical basis for the existence of subsegmental units, like Cressey's point of articulation complex, and to look at various related phonological phenomena in Spanish. I shall argue that by simplifying the rule of point of articulation assimilation in Spanish, we arrive at an account of the stop/spirant alternation which is simpler and more revealing than those proposed to date.

§2 Autosegmental Phonology: The starting point of our discussion is a view of suprasegmental tone that I have suggested

in a number of papers (see especially Goldsmith (1975, 1976a, b and 1979)). Although I originally considered only tonal phenomena within this framework, which I called 'autosegmental phonology', convincing proposals along similar autosegmental lines have been advanced for the treatment of vowel harmony (by Clements (1976) and Chinchor (1978)) and nasal harmony (Goldsmith (1976), Hart (1978)). By considering a phonological representation as a multi-tiered structure, as in (5), a number of recalcitrant properties of tonal systems could be accounted for for the first time.



First, one could account for single segments (e.g., the second vowel in (5)) which had consecutive internal components, such as a vowel with a falling tone which was composed of a High tone plus a Low tone. The problem was serious, it was clear, because it was often easy to show that the vowel was a single segment, not a long vowel composed of two short vowels, and the falling tone was actually composed of two parts, an initial High and a final Low. By postulating structures where different features were present on parallel, but co-equal, rows, this lack of one-to-one correspondence between vowel specification and tone-specification turned from being anomalous to being expected.

Similarly, the phenomenon of 'tone stability' became transparent. Phonological rules affecting vowels in most tone languages fail to affect the tone of the vowel, even when the rule deletes the entire vowel segment. This follows naturally if the tone composes a separate segment itself. By the same token (and this foreshadows the case from Spanish), total assimilation of two consecutive vowels virtually never is so 'total' that the tones of the two vowels are changed. Rather, the oral gesture features of one of the vowels totally assimilates to the other, leaving the tonal segment to which it was associated unchanged.

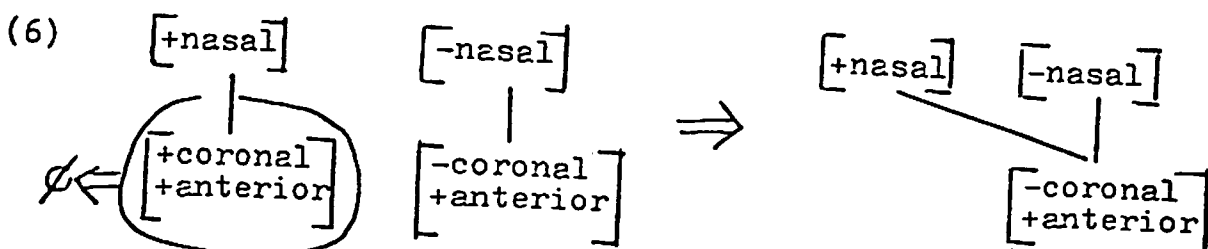
§3 Nasal Point-of-Articulation Assimilation. Rather than proceeding with the account of autosegmental

analysis of African tone languages, let us return to the matter at hand, Spanish phonology. There are parallels here, I would like to suggest, to these two common tono-phonological processes in African tone languages:

1. The spreading of a tonal 'autosegment' to neighboring tone-bearing units (generally, vowels). This assimilation may be so 'overwhelming' that the original tonal specification of the assimilating segment is lost; or it may be partial, in that a level tone becomes a contour tone by assimilation. A Low-toned vowel may become Falling-toned by assimilation in this sense to a High-toned vowel on its left, as in (5). This phenomenon gives the effect of all the tonal features on one vowel assimilating en bloc to those of another vowel, the kind of en bloc assimilation that Cressey's notation addressed itself to.

2. In the case mentioned above, it is possible that the tone derived from the assimilation is a contour tone, as noted, and this in itself is a peculiarity to be noted.

Now both of these phenomena are matched in the behavior of nasal segments in Spanish. The spreading of tonal autosegments is parallel to the spreading of a segment specifying the oral point of articulation. We illustrate this in (6), where only the features of nasality and point of articulation are indicated.



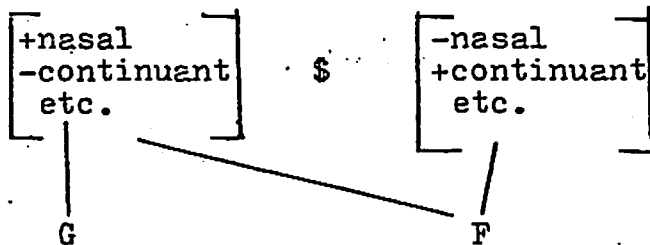
Is there a parallel to the contour-specified segments as in (5)? That the answer is yes is, in fact, well-known. Harris, for example, notes (1969, 15-16):

...(M)any Cubans pronounce enfermo as [e^hŋfermo], where the first nasal, presumably systematic phonemic n, is realized with no alveolar contact at all, but rather with a labio-dental articulation superimposed on a dorso-velar articulation. Current phonological theory includes no device for assigning a feature specification that would reflect the auditory and articulatory properties of the segment represented as [ŋ̃] and capture in some way the phonological process involved, namely, the [ŋ] component as a prejunctural phenomenon and the [ŋ̃] component as an assimilation to the following [f]. It must be left to future research to explore the significance of such data.

The problem Harris noted in the segmental representation of the then-current generative theory is precisely the parallel we are looking for, a parallel to the contour-toned vowels of tone languages. Thus, Harris' example is ultimately to be represented as in (7), with the velar segment specified by a syllable-sensitive rule, to which we return, and an autosegmental assimilation rule, spreading the oral gesture of any consonant leftward onto a nasal segment. (The velar-insertion rule must

apply first, which follows from the natural assumption that rules whose domain is the syllable apply before rules applying across syllables.)

(7)

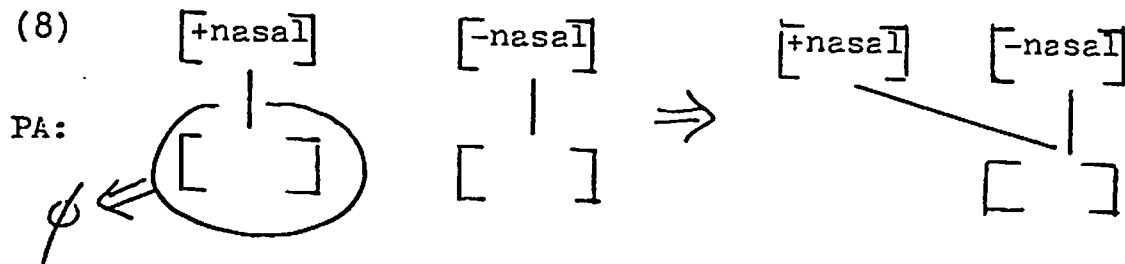


PA:

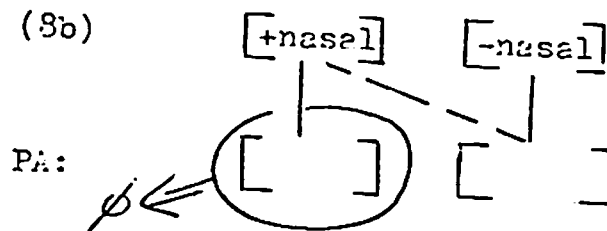
where "G" and "F" are cover symbols for velar and labio-dental segments, respectively

I use the symbols 'G' and 'F' as cover symbols for the velar and labio-dental point-of-articulation complexes, respectively. I shall henceforth assume that the oral point-of-articulation autosegments are specified for all and only the 'PA' features: anterior, coronal, high, back, and distributed.

The rule of nasal assimilation is, then, (8).²



or,



Since vowels, presumably, do not have point of articulation autosegments associated with them, the question in fact arises how to insure that the n of nuevo, for example, does not assimilate to the following point-of-articulation segment, a bilabial, turning nuevo wrongly into muevo. The correct answer, I believe, is that (as Hooper and others have suggested, for radically different reasons) (8) nasal assimilation, like other assimilation processes in Spanish, operates across syllable boundary, which should be indicated in the rule.

The rule creating syllable-final velar nasals is as in (9).

$$(9) \quad \begin{array}{c} \left[\begin{array}{c} \\ \end{array} \right] \Rightarrow \left[\begin{array}{c} -\text{coronal} \\ -\text{anterior} \end{array} \right] \\ | \\ \left[\begin{array}{c} +\text{nasal} \end{array} \right] \quad \S \end{array}$$

(That I indicate syllable boundaries with the symbol '\$' should be taken to indicate a theoretical commitment to this notation rather than that of Kahn (1975) or other notations assigning constituency to syllables and their subparts; on this, more directly below.)

54 S→h: 'Aspiration' Let us summarize where we are at this point. So far I have simply tried to show that there are a certain number of suggestive parallels between the anomalous behavior of the oral-gesture features, on the one hand, and autosegmental tone units, on the other. I have also suggested that Cressey's notational proposal would follow from a treatment of segmental phonology in which, at the appropriate stage in the derivation, the oral-gesture features actually formed an independent (autosegmental) tier or row. This proposal seems not only desirable, in the sense of providing a more satisfying explanation of Cressey's proposal, but it seems to be necessary, in order to merely represent the contour-valued nasal segments Harris refers to.

One aspect of anomalous phonological behavior in tone languages was mentioned above: recurring processes that delete only part of a segment. It is frequently found that a vowel deletes under certain conditions -- before another vowel, for example -- though the vowel's tone specification does not delete. The imperviousness of tone to vowel deletion is, as noted above,

directly accounted for in a model in which the tonal autosegment is distinct from the vowel autosegment. This leads to an additional test for autosegmental status, in addition to the two tests considered above, which were contour-specification and simultaneous assimilation of more than one feature. This third test for autosegmental status is deletion: if a set of features can undergo deletion as a unit, it must form a segment on a separate tier.

In fact, there is clear evidence of this sort for a separate oral tier in Spanish phonology. As suggested in Goldsmith (1977), the wide-spread rule of 'aspiration' of s to h is an example of a rule deleting the oral-gesture autosegment, but leaving behind untouched the laryngeal gesture of voicelessness. For purposes of concreteness, I shall consider primarily the aspiration process in educated Porteno (Buenos Aires) speech.

/s/, in this dialect, appears as h in the environment V—C. (we shall improve upon this formulation shortly). Word boundaries play no role in this rule, but I will overlook the formal nicety of including word-boundaries in what follows.

(10) $s \rightarrow h$ / V — C (obligatory)

$$\begin{bmatrix} +\text{coronal} \\ -\text{voice} \\ +\text{continuant} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{coronal} \\ -\text{anterior} \\ +\text{low} \end{bmatrix}$$

This rule gives rise to such allophony as that seen in (11).

(11) a. mas [mas] 'more'

b. mas tonto [mahtonto] 'more stupid'

c. mas inteligente [masintelixente] 'more intelligent'

That the left-environment is a vowel is illustrated by the interaction of (10) with the optional fast-speech rule of vowel-nasalization, as in (12).

$$(12) \quad V \ N \ C \rightarrow \tilde{V} \ C$$

(12) deletes a post-vocalic nasal and nasalizes the preceding vowel. Forms like conspiración can be derived either as in (13a) or (13b), depending on whether (12) applies or not.

(13a) konspirasion	(13b) konspiracion
k ^h spirasion (12)	--
k ^h hpirasion (10)	not applicable

In the formulation of (10) in terms of features, there is no clue as to why the change is from s to h rather than z, say, or t or any relatively common segment. I should like to say that the element which the underlying s becomes is not one specifically marked as having a wide-open oral gesture; rather, to use Y.-R. Chao's words, we should say that the '[h] is simply the feature of voiceless glottal friction and [we should] leave the other non-significant features unspecified' -- even in derived contexts, I would add. This is achieved autosegmentally by deleting the oral-gesture tier autosegment of the underlying /s/, leaving only the voiceless laryngeal gesture.

There is, in fact, additional evidence for this treatment of aspiration. There are other allophones of /s/ that appear in the context V--C. After the high front vowel i, two allophones are possible, one which would be transcribed as [h], and one which would be transcribed as [ç]. We might account for this allophony

of a word like mismo [mIhmo / micmo] by means of an optional rule (14), making what was orally unspecified once again specified, following this with the obligatory rule (15).

(14) $h \rightarrow c / i \text{ —}$ (optional)

(15) $i \rightarrow I / \text{ — } h$ (obligatory)

(where I represents a slightly laxer version of i).

But such a pair of rules misses the point, clearly. The palatal fricative [ç] occurs after the normal, tense allophone of the vowel i. In fact, the oral gesture made to produce the [c] is nothing more than a continuation, during a period of non-voicing, of the gesture making the vowel i. The only way than an h-type sound can be produced after an i in this dialect, in fact, is if the i is produced in a more lax position, which is possible, as noted in (15). But the important point to note is that the variation in the allophone of s produced is not only determined by the tenseness of the preceding i, it is directly determined by it. The oral gesture of the preceding vowel extends through the period of time of the laryngeal voicelessness left from the underlying s.

Let us consider how these various rules actually should be formulated. I must emphasize that this is the most tentative part of my suggestion; once we begin to consider the role that the structure of the syllable may place in the formulation of phonological rules, we come to terrain that is not well-charted.

All we can try to do, at this point, is to see if minimal assumptions about structure will lead to maximally simple rule formulations.

Let us observe, as is well-known, that all s's that delete³ are syllable-final, and all n's that are syllable-final are subject to deletion (bear in mind that in both cases, when I speak of 'delection', I mean only deletion of oral-autosegment). As a crude approximation, then, we might suggest that the rule involved in both cases is in fact (16).

(16) oral tier: [+coronal] \$



Clearly, we couldn't hope to find a simpler formulation of the rule or rules involved, and (16) has the curious property of handling some cases of both s and n deletion.

It is, however, not entirely adequate in several respects. First, it fails to note that, in the Porteno dialect, the (s and n) deletion must not only be syllable-final, but it may not be pre-pausal. Second, the n which 'deletes' need not be syllable-final; as we saw in (13), it may precede a tantosyllabic s. Third, the rule, as it stands, does not express the fact that⁴ s-deletion is essentially obligatory, while n-deletion is optional. Finally, the s must not be immediately preceded by a consonant. We return to these questions in a moment.

On the other hand, (16) as it stands predicts that the

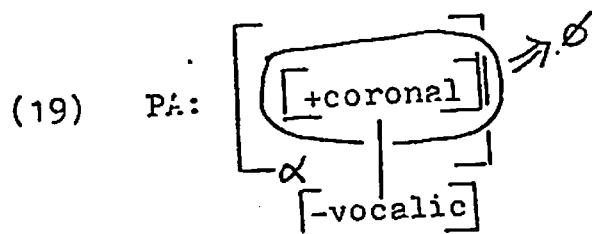
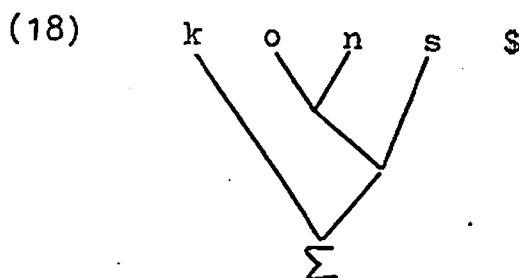
other syllable-final coronals will delete. This is partially true: d/θ does delete, as we see in alternations like ver θ a / ver θ a θ es 'truth/truths'. but l and r do not (as in carcel 'jail'). (16) must minimally be revised, then, to indicate that the coronal is an obstruent:

(17) oral: $\begin{array}{c} \text{[+coronal]} \\ | \\ \text{[-vocalic]} \end{array} \Rightarrow \emptyset \quad \$$

Returning to the initial problems noted, we might observe that the failure of rule (16) or (17) to indicate that it should not apply to pre-pausal syllables is a step backwards, it seems, from the early formulation of this rule as (10), which did not mention syllable boundaries. In this case, however, I think that it is probably correct that the Porteno grammar is more complicated than one in which the deletion rules apply to pre-pausal syllables as well; again, as is well-known, most other Latin American dialects with such aspiration rules do generalize them to pre-pausal position as well.

Second, the fact that n-deletion applies to a structure like (18) as well as one where the n is in fact syllable-final

suggests that syllable-governed rules should not be formalized in terms of symbols such as '\$', but should, instead, refer to internal constituency. Borrowing certain apparatus from the recent work of Liberman, Kiparsky, Halle, and McCarthy, we might note that the condition for coronal-deletion is quite generally 'constituent-final', and then rewrite (17) as (19).



where α is a metric constituent.

This extends the rule to all the correct environments, it will be noted, and, of course, blocks the rule from applying to syllable-initial consonants. If we assume that at the point of the derivation where (19) applies, vowels are not associated with an 'oral' autosegment (not a necessary assumption), then the bracketing indicated in (19) will insure that no consonant precedes the deleting element. (A single segment will not be interpreted as forming a constituent.)

I have not gone into this extended but tentative discussion of 'metrical phonology' simply in the hopes of simplifying the rules of Spanish phonology. Actually, whether the specific formulation in (19) is correct or not as it stands is less important than the fact that formulations of s-deletion and n-deletion stated in terms of syllable and sub-syllable structure lead us closer to an account of why the nasal autosegment left by n-deletion, and (though here the facts are less clear) the h-autosegment left by s-deletion are both reassociated with the preceding vowel. On a structural account such as the one we have been considering, this would follow from the natural assumption that reassociation takes place within the domain in which a rule applies. Such statements are simply not available within a segmental framework as that presupposed by rule-formulation (10).

§5 Stop/spirant allophony. Let us turn now to another,

rather different problem in Spanish phonology in which the alpha-point-of-articulation notation has been employed -- the formulation of the phonological rule responsible for the stop/spirant alternation. There are, of course, three voiced obstruents in Spanish which are traditionally said to have a stop and a spirant allophone, as illustrated in (20). The stop allophone -- [b,d,g] -- appears after a nasal; the [d], furthermore, appears after an l, though the spirant allophones [β,ɣ] appear after l as well. In short, one may say that the stop versions appear after 'homorganic nasals and liquids', or 'homorganic non-continuant sonorants'.

(20) <u>after</u>	β/b	ð/d	ɣ/g
m	ambos	--	--
n	--	mandar	--
ɲ	--	--	tengo
l	alpa	maldito	alɣo
ʎ	a er	deɣo	aɣo

There has been extended discussion at various points in the literature as to whether these segments should be considered stops underlyingly; as Harris proposed, for example; under such an assumption, a rule of spirantization much as in (21) would be necessary. Alternatively, the spirants, or continuants, could be considered basic, and a rule of stop-formation as in (22) would be posited to account for the allophony.

- (21) $\begin{bmatrix} -\text{son} \\ +\text{voice} \end{bmatrix} \rightarrow [+cont] \quad / \quad \left\{ \begin{bmatrix} -\text{son} \\ +\text{cont} \end{bmatrix} \right\} \quad \begin{bmatrix} <-\text{acor}> \end{bmatrix}$
- (22) $\begin{bmatrix} -\text{son} \\ +\text{voice} \end{bmatrix} \rightarrow [-cont] \quad / \quad \begin{bmatrix} -\text{cont} \\ \text{acor} \end{bmatrix} \quad \begin{bmatrix} --- \\ \text{acor} \end{bmatrix}$
- (23) $\begin{bmatrix} -\text{son} \\ +\text{voice} \end{bmatrix} \rightarrow [-cont] \quad / \quad \begin{bmatrix} -\text{cont} \\ \alpha\text{PA} \end{bmatrix} \quad \begin{bmatrix} --- \\ \alpha\text{PA} \end{bmatrix}$

As Cressey (1974) notes, (22) can be stated using the αPA notation, as in (23), although in the particular case we are considering, this introduction of ' αPA ' is not necessary -- in a sense for accidental reasons, on a segmental view. The only nasals that could precede the spirants would already be homorganic by the earlier effects of the rule making nasals homorganic to a following consonant. The only remaining restriction that needs to be stated along these lines is that the presence of an l will trigger the stop-formation only of a d, not of a b or g. But that can be stated with reference simply to the feature coronal, as in (22), rather than PA as in (23).

I shall not argue here that stop-formation is in fact a more adequate treatment of the phenomenon than spirantization; a thorough account of various theoretical and empirical (both synchronic and diachronic) factors all indicating a stop-formation rule is found in Lozano (1978). For our purposes, then, I shall take rule (22), or a slight modification of it, to be the most adequate segmental account of the process, and one which we shall see if we can improve upon.

Before leaving the domain of the facts to be accounted for, we should note that it is generally said that the stop allophones occur initially -- that is, after pause. To the extent that this is true, it requires a separate environment of rule (22) to account for this. In any event, the occurrence of a stop in this position is more optional, I believe, than some of the literature might lead one to believe, and contrasts with the obligatory character of the stops after the nasals, as Lozano points out.

$$(24) \begin{bmatrix} -\text{son} \\ +\text{voice} \end{bmatrix} \rightarrow [-\text{cont}] \quad / \quad \begin{bmatrix} -\text{cont} \\ \alpha\text{PA} \end{bmatrix} \quad \begin{bmatrix} \text{---} \\ \alpha\text{PA} \end{bmatrix}$$

As noted earlier, the sense in which the rule of stop-formation is conditioned by the 'homorganicity' of the preceding non-continuant is somewhat elusive. Since l triggers stop-formation only of d, not b or g, it is clear that some mention of homorganicity of the non-continuant and the spirant-turned-stop must be made in the rule. On the other hand, since nasal assimilation precedes stop-formation, and insures that all nasals preceding consonants are homorganic to what follows, it then should not be necessary to state explicitly, and redundantly, in the stop-formation rule that the preceding nasal be homorganic -- the condition that the nasal be already homorganic is implicitly guaranteed by an earlier rule in the derivation.

What I would like to suggest is that the alternative autosegmental account of nasal assimilation can also be extended

to a revised account of stop-formation which explicitly accounts for the relationship between nasal-assimilation and stop-formation, and which, in a sense, allows for a grammar of Spanish which has no explicit rule of stop-formation at all -- the effects of the former rule of stop-formation would all result from the structure created by nasal-assimilation, under certain conditions, to which we turn now.

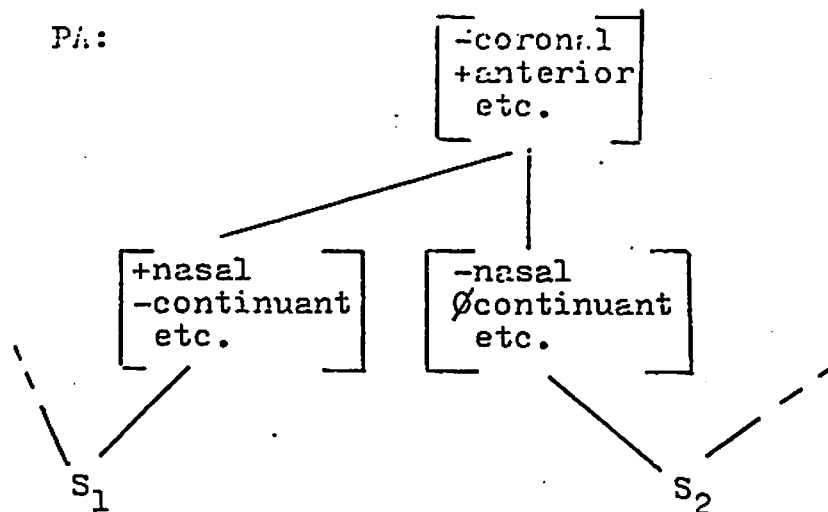
The most important conclusion in the study cited above by Lozano (1978) is that segments such as b,d,g do not, strictly speaking, derive from underlying spirants; she argues rather that the stop-formation rule (24) applies (in the cases we are looking at here) to segments underlying unspecified for the feature continuant. (24) is, then, supplemented by an 'elsewhere' process, given here as (25).

$$(25) \quad \begin{bmatrix} -\text{son} \\ +\text{voice} \end{bmatrix} \rightarrow \begin{cases} [-\text{cont}] / \left\{ \begin{array}{c} \parallel \\ [-\text{cont}] \\ \alpha\text{PA} \end{array} \right\} & \begin{bmatrix} - \\ \alpha\text{PA} \end{bmatrix} \\ [+cont] & (\text{elsewhere}) \end{cases}$$

I will not review the evidence Lozano adduces, but the argument for this position, within a segmental framework, I find convincing. I might add that the arguments that have been put forward to date against segments underlyingly unspecified for certain features I find totally unconvincing; they are almost without exception non-empirical, and rest on additional assumptions which are surely false.

Accepting Lozano's conclusion regarding the underlyingly unspecified status of the feature continuant in the voiced non-strident obstruents, and assuming the account of nasal assimilation suggested earlier, the 'input' stage to 'stop-formation' will look roughly like (26).

(26) Ph:

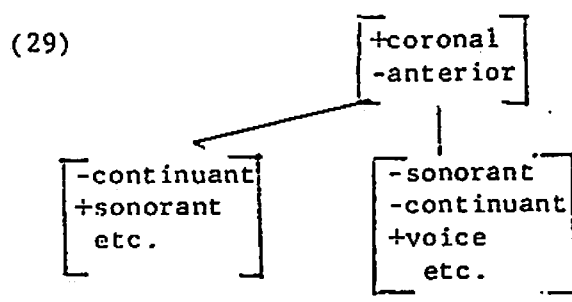


Now holding aside the case of the phrase-initial stops, (see footnote 4) (26) illustrates an interesting fact: all the voiced obstruent stops are found in precisely a structure like (26), where a [-continuant] segment (here, a nasal) and a non-specified segment are associated with the same point-of-articulation autosegment. That this holds for the case of the post-nasal obstruents should be clear; let us review for a moment the reasons that make clear that the d following an l appears as well in a structure like (26).

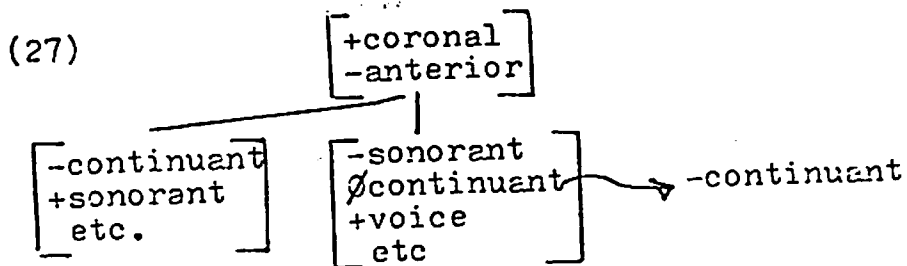
As Harris (1969) observes, l is underlyingly alveolar, but before dental (t,d) and alveopalatal (ç) segments, l assimilates in point of articulation. Harris in fact suggests that this assimilation is in some sense closely related to the process of nasal assimilation. 'Clearly,' he says, 'there is a significant linguistic generalization here: noncontinuant sonorants become homorganic with a following obstruent, within the limits set by certain constraints (there are no labial, labio-dental, or velar ls).' Whether the limitation of l-assimilation to only following coronals is in fact predictable on theoretical grounds must remain an open question; what is important for our purposes, however, is that the l participates in a point-of-articulation process in precisely that case where it induces the stop d; or, to put the matter in terms of our theory, the structure ld appears, parallel to nd, as in (27).

The obligatory environment for stop-formation, then, is precisely that seen in (26) or (27); in all other position, the equivalent of Lozano's 'elsewhere' rule in (25) inserts a '-continuant' specification (e.g., intervocalically).

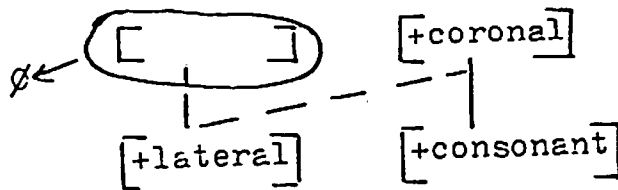
The process of stop-formation, then, is one that turns (27), e.g., into (29). What mechanism could be responsible for this?



We may assume a rule of l-assimilation as in (28). Recall that although it is only the feature specification '+coronal' that triggers l-assimilation (28), it is the other feature-specifications in the oral-autosegment that will actually affect the l.



(28) l-assimilation



This mechanism is one by which the [-continuant] specification of the preceding segment will be 'contributed' to the segment which itself is not specified for the feature continuant. However, it is not sufficient that there simply be a non-continuant segment to the left; [futbol] 'football/soccer', for example, will not contain a stop [futbol] in normal speech.

I would like to suggest that features underlyingly unspecified, other things permitting, receive their specification by a 'minimum distance principle' of a rather natural sort. In the case of structures (26)/(27)/(29), the unspecified feature continuant is found in a segment which itself forms a complex unit with the preceding nasal/liquid. The specification [-continuant] in the preceding nasal/liquid is structurally closest to the unspecified continuant feature in that they are each associated with the same subsegmental autosegment. Under these conditions, then, (27), we shall suggest, becomes (29). It follows, too, that when nasal or lateral assimilation has not applied, the unspecified segment is structurally 'closest' to the vowel which follows (or, more rarely, precedes) it in the syllable, which is [+continuant]; hence, the unspecified segment will become [+continuant] in this 'elsewhere' case. This renders the 'elsewhere' subpart of the segmental rule (25) unnecessary.

The principle involved here is, in fact, a special case of a more general principle suggested in a paper cited above

by Hart (1978), in which several languages displaying nasal harmony are investigated. What is of particular interest to us here is that, on quite independent grounds, Hart concludes that segments alternating in harmony specifications are underlyingly unspecified for the feature 'nasal', and he argues that the ultimate nasal specification of these segments is derived or 'inherited' from a more abstract nasalization specification of a larger unit -- the syllable, the foot, or the word -- in which the unspecified segment is found. Hart's principle, then, says that a segment unspecified for a feature receives the specification of a larger unit in which the segment is found -- and in particular, the specification of the 'smallest' larger unit in which the segment is found (thus, an unspecified segment may become [-nasal] in a syllable which itself is marked [-nasal], even though it is in a [+nasal] word).

The result noted in (29) from Spanish appears to be a special case of this more general result, though apparently the sonorant+stop elements do not form a phonological or metrical constituent. If they did, then the application of Hart's principle would be immediate. In fact, such an assumption is not unreasonable, but must be left for future research. In the meantime, we may assume that Hart's principle is itself a subcase of a minimum distance principle which fills in unspecified features.

56 Conclusion: In the three cases we have looked at from

Spanish phonology -- nasal assimilation, s-aspiration, and stop-formation -- the notion of 'point of articulation' has played a crucial role, though in quite different ways. I have suggested several reasons for thinking that the autosegmental approach may allow us to achieve a deeper understanding of the processes involved, processes which to date have not been adequately described, I believe, within the more traditional segmental framework. One direction for future research that is suggested here is the study of processes that fill in underlyingly unspecified features, a question which has generally not been addressed in the recent phonological literature.

Footnotes

¹This paper would not have been possible without the lengthy and frequent discussions of Spanish phonology I have had with Carmen Lozano, whose dialect (Porteño) is the one studied here (described in her dissertation, Lozano (1978), as well). I am also grateful for the comments of Jim Harris, which occasioned most of the footnotes in the present version.

²In the 'standard' dialects that do not have 'contour-valued' nasals. In those dialects with a structure like (7), the nasal assimilation will not, clearly, delete the nasal's original point-of-articulation autosegment.

³There is perhaps some variability in the n-deletion process related to the character of the following consonant, but the n can delete not only before s but before a voiced stop/spirant (as in tengo, ambos, e.g.), occasioning a spirant allophone (see below). There certainly is cross-dialectal variability regarding the frequency of this process, whose range I have not looked into.

⁴The rule applies in all normal speech situations, but may be 'over-ridden' in hyper-correct styles, such as when one is speaking to someone who does not speak the language well.

⁵James Harris has brought two interesting observations to my attention regarding this point. He notes, first, that in very careful speech one may pronounce invitar 'In-bi-tar', where the n is presumably in some sense a spelling pronunciation.

Nonetheless, although the b is not homorganic to the nasal, it is realized as a stop.

I believe that the stop character of the b here is not due to the effect of the preceding nasal, but is rather due to the inter-syllabic pause at this slow speech rate. I would expect, then, that at a rate slow enough to produce the pronunciation in-bi-tar, one would also find e-bi-tar.

I assume that a rule exists essentially as in (i), which is in some measure optional in normal speech.

$$(i) \quad \left[\begin{array}{l} +\text{voice} \\ -\text{sonorant} \\ -\text{strident} \end{array} \right] \rightarrow [-\text{continuant}] / \parallel -$$

Harris also notes that in some dialects, otherwise similar to the Porteno described here, one finds such forms as ane[kd]ota rather than the Porteño ane[kʃ]ota, and such forms as fu[tb]ol. I have not worked with such dialects, and leave to future work precisely in what ways dialects may vary with respect to the rules we are discussing here.

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