A MINIMALIST APPROACH TO PHONOLOGY

David Michaels
University of Connecticut

ABSTRACT

This paper explores a minimalist approach to consonant cluster phenomena in phonology. The approach avoids language particular devices such as context sensitive rules and rule ordering. Instead a single universal operation *Attract F*(eature) is used to relate surface to lexical representations.

INTRODUCTION

The minimalist program [1] assumes that there is a language faculty. The initial state of this faculty is Universal Grammar (UG) which maps data into a Grammar, its final state. Early generative approaches to both syntax and phonology carried a heavy descriptive burden in the form of a grammar with complex rules. In the minimalist program the burden is shifted to UG with a single rule that can relate any two items at any stage of a derivation. Work along these lines is proceeding in syntax with some success. For phonology, however, it has been argued that the minimalist approach is inappropriate [2], that in phonology explicit rule ordering and the intermediate structures they specify are necessary.

In this paper, I investigate how the minimalist program can work in phonology. In the phonological literature there are many examples of deep ordering relations that hold among phonological rules. For example, in the analysis of Southern Paiute (SP) [3,4], there is rule ordering that is seven rules deep: C-deletion, Gemination, Spirantization, Stress, Degemination, V-devoicing, Sonorant devoicing. I show that in a system with X-bar projections of syllable structure, the setting of coda and stress parameters, a theory of markedness and the principle *Attract F(eature)*, the various combinations of Gemination, Spirantization and Devoicing can be accounted for without context sensitive rules and rule ordering. For example, a morpheme final abstract consonant is posited in SP. C-deletion deletes this final abstract consonant in word final position, while in nonfinal position Gemination causes that consonant to take on the features of a following consonant. Where the abstract consonant is deleted, the preceding vowel devoices (V-devoicing). The problem is how to account for such phenomena without context sensitive rules.

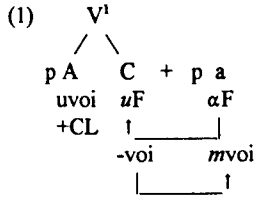
THE THEORY

I assume a lexicon that contains array of morphemes with phonological representations in which segments that alternate for some feature *F* are represented as unmarked for that *F* (*uF*). Otherwise segments are +/-*F* as appropriate. I also assume X-bar projection of syllable structures: where every vowel (V^0) projects a Rhyme (V^1) which optionally licenses a coda, and V^1 projects a Syllable (V^2) which obligatorily licenses an onset. The single operation is *Attract F* which can relate any two nondistinct *F*s in a phonological representation subject to certain universal constraints. First, the two *F*s cannot be related across a syllable head (a locality constraint). Second, unmarked or marked (*u/m*) *F*s are nondistinct from +/- *F*s. Thus, only the *u/m F*s of a consonant (or syllable head) can be related to the +/- *F*s of an adjacent consonant (or head of an adjacent syllable). The attraction between *u/m F*s and +/- *F*s is motivated by the requirement that all *F*s be phonetically interpretable, a requirement of the phonetic interface with phonology. Thus, *u/m* values for *F*s are motivated by learnability considerations since these *F*s vary in the data, and *Attract F* is motivated by phonetic interpretation which requires that *u/m* values have +/- interpretations.

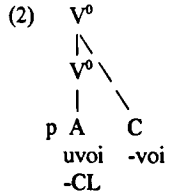
SOUTHERN PAIUTE

To return to gemination and deletion in SP, let us say that *Attract F* creates a chain of *F*s between two adjacent consonants (...C_1+C_2...), where C_1 is the morpheme final abstract consonant, abstract since it alternates as a copy of whatever C_2 follows it. Thus, C_1 is *u/m* for all its place *F*s and is interpreted by *Attract F* for those *F*s specified in C_2 (Gemination). C_1 is always [-voice]. C_2, however, alternates for voice. In particular, it is [+voice] between vowels. I assume it is lexically [*m*voice]. In word final position, there is no local consonant to chain with the final abstract consonant, however, its [-voice] can interpret the [*u*voice] of the preceding vowel. These derivations are illustrated in (1) and (2) respectively.

(1)



(2)



SP places stress on alternate Vs, but never on a final V. (1) illustrates a sequence of a stressed syllable followed by an unstressed syllable. Here, the stressed syllable licenses a coda position which is filled by the abstract C. The unmarked place *F*s of C attract the specified place *F*s (αF = +ant, +cor, -high, -back) of *p*. Since no syllable head intervenes, interpretation by attraction of features is possible. In (2), a final unstressed syllable, there is no licensed coda position and no segment to the right of C, and the consonant to the left is too far away (across a syllable head) to interpret C. Thus, C adjoins to the preceding V. C's [-voice] percolates to the adjunction node where it merges with A's [*u*voice] to yield a voiceless vowel. In this way we get both C-deletion and V-devoicing to follow automatically from the syllabification algorithm. Thus, in this account there no separate gemination, devoicing and deletion rules and hence no ordering between them.

In order to get this account to work under minimalist assumptions, UG is assumed to provide a syllabification algorithm, a theory of markedness, feature percolation and the operation *Attract F*, subject to locality constraints. In addition, I assume that stressed syllables license coda positions while unstressed syllable do not. Let me formulate this last condition on codas as the result of a coda licensing feature *CL* already illustrated in (1, 2). Thus, instead of assigning stress by rule, vowels that alternate for stress are [*u*CL], stressed vowels are [+CL], unstressed vowels are [-CL]. Languages that are stressed from the right have a suffixed [+CL] affix. Those that are stressed from the left have a prefixed [+CL] morpheme. In either case, [*u*CL] vowels attract [+CL] subject to the usual locality constraint. However, [+CL] requires an available segment to be licensed in coda to be realized on a particular syllable. Thus in (1), [+CL] falls on the first syllable to license the coda position. Once C is licensed as coda, it cannot adjoin to V^0, hence the contrast with (2).

JAPANESE

Let us turn now to a similar phenomena in Japanese. Here the initial consonant of the past tense suffix assimilates for voice to the final consonant of the verb stem, and

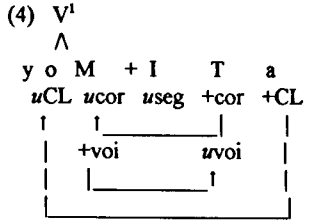
the final consonant of the verb stem assimilates for place to the initial consonant of the past tense suffix. Where the stem is vowel final, a voiceless *t* emerges. When the stem ends in *s*, an *i* emerges between the stem final *s* and the suffix *t* and palatalizes the *s* to *š*. I assume that the lexical representation of the past suffix is *-ITa*, where *I*, which alternates with Ø, is unmarked for the feature [segment] and *T* which alternates for voice is unmarked for that feature. Thus, we get examples as in (3).

(3)

	Past	*UR*	*Gloss*
a.	mita	mi+ ITa	look at
b.	yonda	yoM+ITa	read
c.	kašita	kaS+ITa	lend

In the case of (3a) *mita*, the suffix *I* adjoins to the stem *i* and *T* gets its unmarked interpretation via universal marking conventions [3]. In the case of (3b) *yonda*, the stem final nasal alternates with *m* and is unmarked for [coronal] (compare *yomu* (nonpast)). The derivation of *yonda* from lexical *yoM+ITa* is illustrated in (4).

(4)



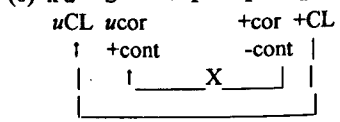
Thus, the coronal value of *T* interprets *M* giving *n* and the voice value of *M* interprets *T* giving *d*.

However, in both instances *Attract F*, in the preceding derivation, applies across lexical *I*, apparently violating the locality constraint prohibiting attraction of *F*s across a syllable head. Also, we must explain why *I* does not take *M* as its onset and form a syllable. In the latter case, I assume that the past tense suffix *ITa* is specified [+CL] in Japanese. Thus the preceding vowel with [*u*CL] can attract [+CL] if it can license a coda. The stem vowel is followed by a consonant *M* which can satisfy the coda condition. Therefore, *M* is licensed in coda position. *I*, unmarked for [segment], must be invisible for the purposes of *Attract F*. Since *Attract F* has applied, *I* cannot be a syllable head. Under the assumptions of the X-bar account of syllable structure, a well-formed syllable must have an onset. Since *M* is licensed in coda position by the preceding syllable, it cannot be onset to *I*. *I*, therefore, being [*u*seg] and without an onset cannot project a syllable. Assuming that only segments in syllable structure constituents can be phonetically interpreted, the noninterpretation of *I* here is accounted for. This analysis is consistent with the derivation of (3a) *mita*, since the *I* of the suffix surfaces there only through adjunction to the adjacent stem vowel which has on onset and can therefore project a well formed syllable, as illustrated in (5), to yield *i*.

(5) $m[i,I]_i$ ta

But what then of (3c) *kašita*. Here, under the analysis in (4), we would expect *s* to be licensed in the coda of the first syllable which is [+CL] by attraction from *ITa*, and *I* to receive no phonetic interpretation yielding **kasta*, instead of *kašta*. Let us assume that *Attract F* in Japanese must also satisfy an identity condition on codas. That is, the *Attract F* chain must link to the feature [continuant] as well as the place features. In that case the derivation would look as follows for *kas+ITa*.

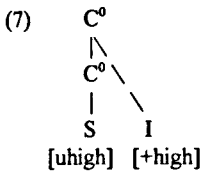
(6)



Here the mismatch in identity for the

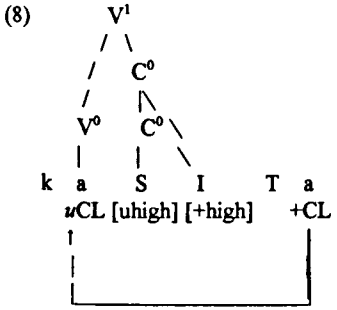
feature [continuant] blocks *Affect F* from interpreting the coda position. Instead *S* and *I* adjoin and the [*u*high] of *S* and the [+high] of *I* merge at the dominating C^0 adjunction node as illustrated in (7).

(7)



Notice, so far, *I* does not block the movement of consonantal features across it and can move features from itself to an adjacent consonant. Since it behaves in all respects like a consonant, let us assume that is what it is. Thus, the resulting cluster *ši* is interpreted as a voiceless consonant plus a voiceless vowel (or consonant) and can be interpreted in the licensed coda position of the preceding syllable, as illustrated in the derivation of (8).

(8)



CONCLUSION

An interesting result of this approach to consonant cluster phenomena is that Southern Paiute and Japanese look the same with respect to gemination. In each case, it is the [+CL] feature on the vowel of one syllable that licenses a coda position. This position is filled by a variable segment, one with unmarked features, that results in the attraction of features from the following onset. There are differences, of course, between Southern Paiute and Japanese. In the former the [+CL] property is affixed to every word, and because of the lengthy strings of affixes, is propagated across alternate syllables. In Japanese, [+CL] is a property of a small class of affixes, all of which have the property of licensing a coda in a preceding stem. Also, Japanese has an intervening abstract vowel *I* which emerges only if *Affect F* cannot related the consonants which surround it.

REFERENCES

[1] Chomsky, N. (1993), "A Minimalist Program." In K. Hale & S. Keyser (eds.), *The View from Building 20*. Cambridge: MIT Press.

[2] Bromberger, S. & M. Halle (1991), "Why Phonology is Different." In A. Kasher (ed.), *The Chomskyan Turn*. Oxford: Blackwell.

[3] Chomsky, N. & M. Halle (1968), *The Sound Pattern of English*. New York: Harper & Row.

[4] Sapir, E. (1933), "The Psychological Reality of Phonemes." In D. Mandelbaum (ed., 1949) *Selected Writings of Edward Sapir*. Berkeley: U of California Press.