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Maximal and Minimal Rules: Effects of Tier Scansion

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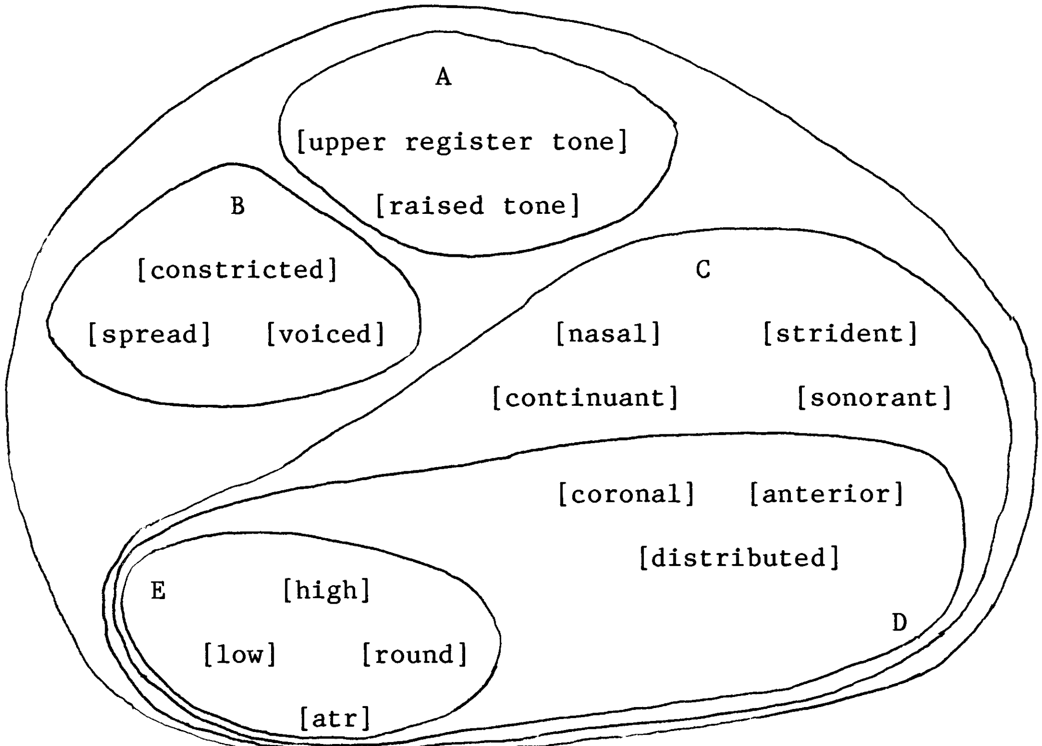
1. Introduction

This paper argues for a particular parameter of phonological rule variation, the "maximal/minimal" parameter. We propose that rules act upon hierarchical representations of distinctive features in a highly constrained set of ways. With respect to their structural changes, rules cannot manipulate the feature hierarchy at all; features, nodes and association lines may be inserted or deleted, but hierarchical relations established by Universal Grammar (UG) are not amenable to manipulation. As regards structural descriptions, we propose a strictly binary choice to be available for selection of tiers of scansion. Either a rule scans the immediately dominating tier in the feature hierarchy ("minimal" scansion) or a rule scans the level of syllabic structure ("maximal" scansion).

Universal Grammar provides a finite set of distinctive features. Each feature may individually participate in phonological processes. For example, the individual assimilation of [voiced], [nasality], [continuant], etc. are possible rules. In addition, sets of distinctive features may function as a unit for the purposes of a rule. That is, a particular set of features may delete, assimilate, etc. as a single class. Two extreme positions may be taken as regards the types of feature sets that form possible phonological classes. The first possibility is that _any_ combination of two or more features forms a possible set; the second is that the range of possible sets is predetermined and invariable.[1] The attractiveness of the second approach is that the class of possible deletion, insertion, assimilation, etc. rules is limited by the universally established set of feature classes, classes such as those represented in (1) below.

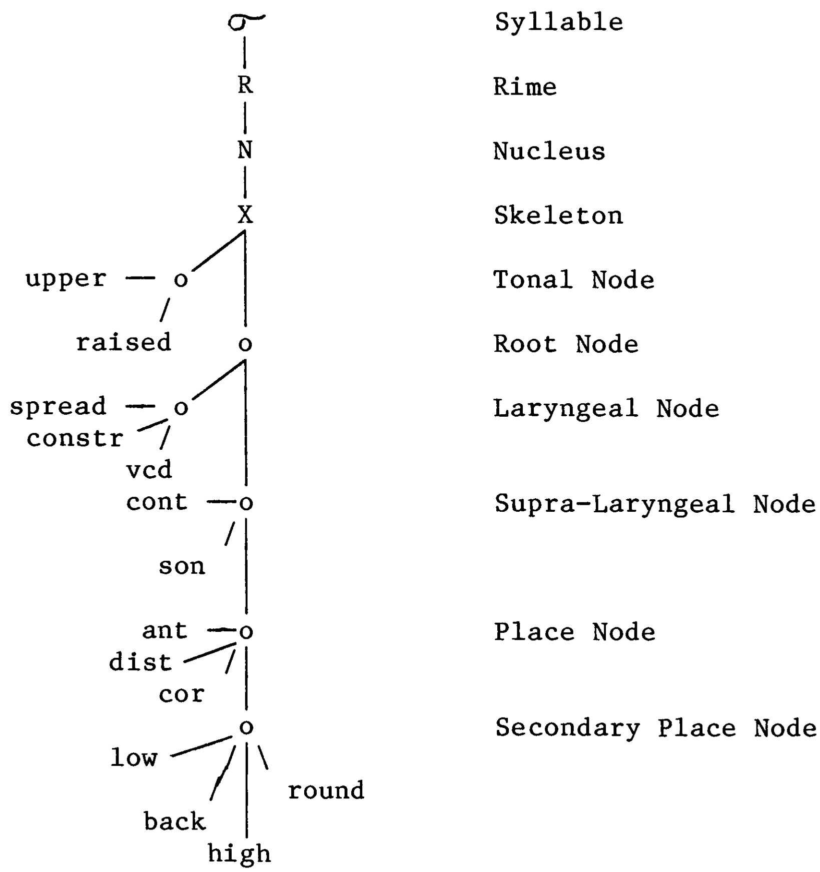
(1)



In this paper, we adopt the representation for such feature classes proposed in Clements (1985), where classes are represented by nodes within a tree structure whose terminal elements are individual distinctive features. Under such an approach, the classes of (1) can be represented as in (2) on the next page.[2]

Work on the nature of the feature hierarchy has shown that a number of problems concerning the distribution of features in rules and in segments can be solved straightforwardly by the hierarchy's organization of features into classes. Notably, Clements (1985) shows how rules refer to particular class nodes, Sagey (1986) discusses implications of the hierarchy for the internal organization of segments, Schein and Steriade (1986) explores consequences for geminate inalterability, and Archangeli and Pulleyblank (1986) considers a number of ways in which the hierarchy interacts with underspecification theory, particularly examining implications for locality and formal rule properties. In this paper, we extend certain proposals made in Archangeli and Pulleyblank concerning the interaction of parametrized rules with such representations. We propose that a number of apparently unrelated problems can be given a unified solution by combining minimal assumptions about a variety of phenomena with a single binary rule parameter, a parameter determining whether the class of targets of a phonological rule are hierarchically or syllabically defined.

(2)



Central to our proposal is the claim that several properties cluster around the setting of a single parameter. In this paper, we exemplify three such properties, namely asymmetries in blocking effects, neutral vowel effects and edge effects. We also identify three additional properties related to the same parameter, long distance effects, Obligatory Contour Principle effects and inalterability effects, referring the reader to Archangeli and Pulleyblank (1986, in prep) for detailed discussion.

2. Asymmetries in blocking effects: maximal scansion

The first phenomenon that we discuss is an asymmetry in the blocking effects imposed by differing segment types. In general, it appears that consonants are typically transparent to rules affecting vowels, while vowels are typically opaque to rules affecting consonants. To illustrate, compare the behavior of Nasal Assimilation in English (3) with that of Back Harmony and Round Harmony in Turkish (4). In the case of Nasal Assimilation, the target and trigger must be strictly adjacent -- that is two adjacent skeletal slots are involved in the rule application. Within a standard SPE-style notation, this adjacency requirement is accounted for by choosing the formulation of Nasal Assimilation given in (3a) over that in (3b).

(3) Nasal Assimilation

a. [+nas] --> [α"place"] / ___ [α"place"]

b. [+nas] --> [α"place"] / ___ V_o [α"place"]

c. i[m]proper
i[n]transitive
i[ɲ]judicious
i[ŋ]compatible
i[n]appropriate
i[n]active

d. *i[m]appropriate
*i[ŋ]active

In cases such as i[n]appropriate and i[n]active, where a vowel intervenes between the target of Nasal Assimilation and its trigger, the rule is blocked from applying, as shown in (3d).

In Turkish, on the other hand, harmony processes involving both [back] and [round] affect vowels without regard for the fact that a consonant or consonants intervene between target and trigger. The transparent property of intervening consonants -- an effect just the opposite of the opaque vowel effect in English Nasal Assimilation -- is accounted for in an SPE type notation by choosing the rules in (4a) over those in (4b).

(4) Turkish Back and Round Harmony (Clements and Sezer 1982)

a. V --> [αback] / [αback] C_o ___

V --> [αround] / [αround] C_o ___
[+high]

b. V --> [αback] / [αback] ___

V --> [αround] / [αround] ___
[+high]

c.

	possessed	dative	
	koyunu	koyuna	\`sheep´
	kadɨnɨ	kadɨna	\`woman´
	denizi	denize	\`sea´
	ütüsü	ütüye	\`iron´

As both a) the blocking property of a vowel for a rule of consonantal place assimilation, and b) the transparent property of a consonant for a rule of vowel assimilation, appear to be typical properties of such rules cross-linguistically, an immediate problem results. Why should a rule affecting consonants require adjacency along the skeletal tier for the rule´s application to be legitimate? And why should a rule affecting only vowels be able to skip over consonants, applying in an apparently non-local manner?

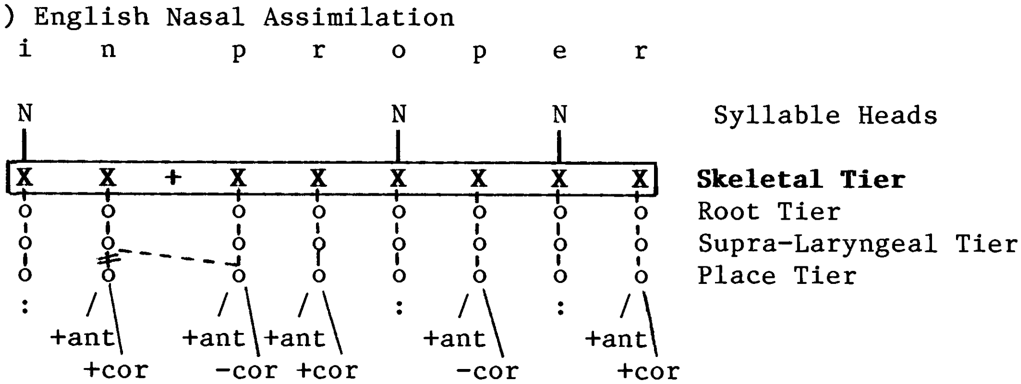
The required difference can be straightforwardly accounted for by the combination of a general Locality Condition (5) with a consideration of the level in the feature hierarchy that is scanned to determine whether the structural description of a given rule is met.[3]

(5) Locality Condition:

> A rule can apply only if a specified target is adjacent to a specified trigger.

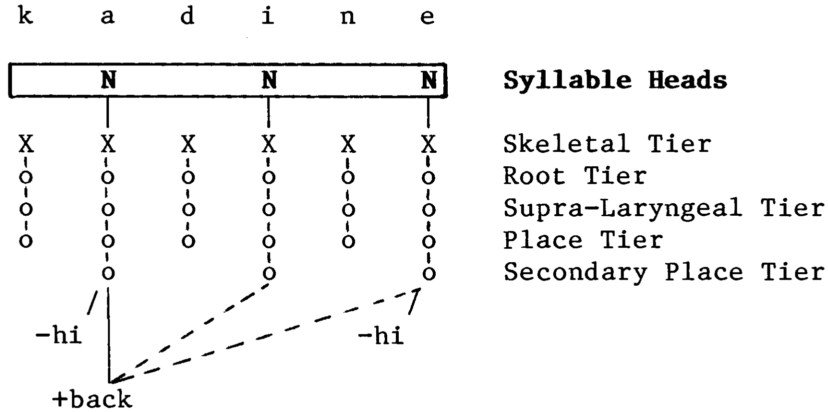
Some version of the condition in (5) provides the implicit or explicit rationale for much of the work done in autosegmental theory. Such a locality condition is crucial in ruling out numerous unattested rule types, with the place assimilation example illustrated in (3d) being just one example. For the present, note the effect of such a condition on the consonant/vowel asymmetries under discussion. In the English example, scansion must clearly be at the skeletal level and not at the level of syllable heads because syllable heads are not involved in the rule. Scanning of the skeletal tier correctly predicts that only two adjacent segments can be involved in the rule. See (6) below. With respect to Turkish, scanning at the skeletal level would require a non-local formulation of the harmony rules since the skeletal slots affected by harmony are not adjacent at that level. Since non-local rules have been ruled out, this requires that scansion be at the level of syllable heads, where the elements affected by harmony are indeed adjacent. See (7).

(6) English Nasal Assimilation



i.e. /in+proper/ --> [improper]

(7) Turkish Back Harmony



i.e. /kadine/ --> [kadɨna]

Having determined the appropriate level of scansion, we note that both examples just cited share the following property, a property we refer to as maximal scansion:

(8) Maximal Scansion

A rule whose target is node or feature α scans the highest level of syllabic structure providing access to α.

A syllable node provides "access" to all nodes and features dominated by its head; a terminal syllabic element provides "access" to all dominated nodes and features. Hence in the case of English Nasal Assimilation, the highest level of syllabic structure providing access to features such as [anterior], [coronal] and [nasal] is the level of syllabic terminal elements (skeletal slots) since syllable heads do not contrastively bear such features in English; in the case of Turkish Back and Round Harmony, the highest level of structure providing access to [back], [round] and [high] is the level of the syllable since syllable heads are indeed the bearers of the features concerned.[4] Hence despite the fact that the two rules concerned so far scan different tiers, it is possible to analyse both types of cases as involving a single type of scansion, namely maximal scansion.

To summarize the proposal so far, we suggest that the general asymmetry between the blocking effect/transparency of consonants and vowels derives from the different levels of syllabic structure that determine their level of maximal scansion. Features associated to vowel positions (syllable heads) are dominated by nodes that are adjacent at the level of syllable scansion. Consequently such features may spread from vowel to vowel, ignoring consonants, while maintaining strict formal locality. Features associated to consonant positions, on the other hand, can be accessed only by scanning the terminal nodes of syllables, i.e. skeletal slots. At the skeletal level, no slot may be skipped if locality is to be preserved. Hence a rule of maximal scansion affecting consonants cannot skip an intervening vowel.

3. Neutral vowels: minimal scansion

The restrictive nature of the above proposal manifests itself immediately in the variety of types of problems that present themselves. First, it is clearly false that rules affecting consonants only can never skip vowels. For example, a rule like Dahl's Law in Kikuyu (Davy and Nurse 1982, Pulleyblank 1986) dissimilates the value of [voiced] on a velar stop from the value of [voiced] on a following voiceless obstruent -- without regard for the presence of one or more intervening vowels. A second type of problem concerns cases where consonants do indeed interact with vowels, even though the level of scansion defined above would establish syllable heads as the relevant level. For example, certain consonants play a non-transparent role in Turkish harmony (Clements and Sezer 1982), just as certain consonants can play non-transparent roles in processes such as tone (Hyman and Schuh 1974). Finally, certain subsets of the classes of consonants or vowels may be transparent for the purposes of particular processes. For example, a rule affecting coronal consonants might skip over other consonants -- in spite of the fact that such skipping seems to result in a non-local rule application. For a detailed discussion of these problems, see Archangeli and Pulleyblank (1986, in prep) and Pulleyblank (in prep). We discuss here the third problem, specifically examining the representation of neutral vowels in harmony systems.

In a system of vowel harmony, it is sometimes the case that a particular vowel (labeled here "neutral vowel") may occur in the midst of a harmony domain and yet be completely ignored by the harmony process. We propose here that such neutrality is accounted for by contrasting the syllable-based type of maximal scansion discussed above with an alternative type of hierarchy-based scansion, that we refer to as minimal scansion. Compare the properties of harmony seen above for Turkish with those observed below for Khalkha Mongolian. In Khalkha, non-high vowels harmonize for roundness and all vowels harmonize for backness, with the exception for both harmonic processes of /i/, which is ignored, as seen when (9c, d) are compared with (9e).

(9) Khalkha Mongolian (Anderson 1980)

a. Round Harmony: $V \rightarrow [\alpha\text{round}] \: / \begin{bmatrix}\alpha\text{round} \\ -\text{high}\end{bmatrix} C_o \: \underline{\quad\quad} \: [-\text{high}]$

b. Back Harmony: $V \rightarrow [\alpha\text{back}] \: / \: [\alpha\text{back}] \: C_o \: \underline{\quad\quad}$

c. garaar 'by hand'
tergeer 'by car'
modoor 'by stick'
xöl̈öör 'by foot'

d. suxeer 'by axe'
düügees 'from the younger brother'

e. morinoos 'from the horse'
döčiööd 'by forties'

Unlike Turkish where all vowels are affected by Back Harmony and all high vowels are affected by Round Harmony, the vowel /i/ in Khalkha is neutral, allowing harmonic processes to skip over it. It might appear therefore that harmony in Khalkha applies in a non-local manner.

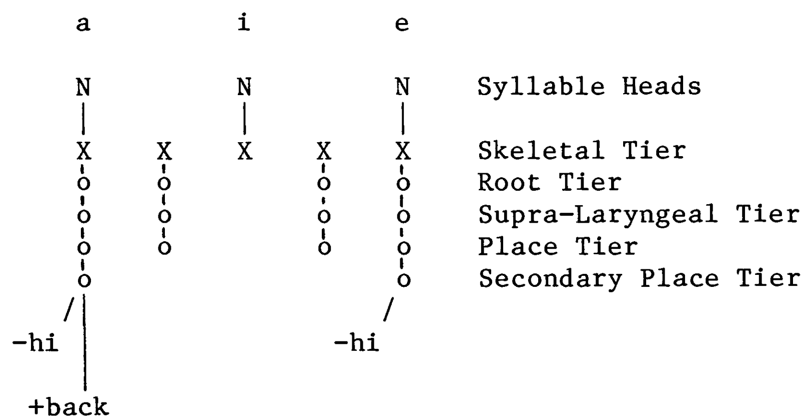
Our account of the contrast between Turkish and Mongolian combines underspecification theory with minimal scansion of the feature hierarchy. In (10) below, we give the vowel systems of Turkish and Mongolian, along with the minimally redundant feature specifications that we assume:

(10)

	Khalkha							Turkish							
	i	e	a	ü	ö	u	o	i	e	ɨ	a	ü	ö	u	o
high		–	–		–		–		–		–		–		–
back			+			+	+			+	+			+	+
round				+	+		+					+	+	+	+

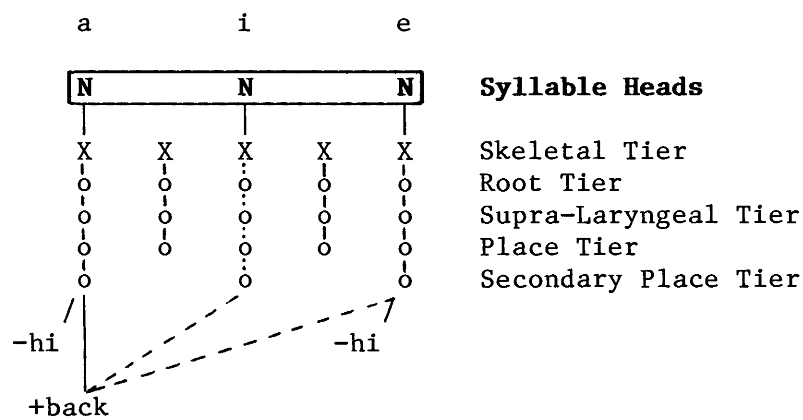
In both languages the rule of Back Harmony affects all vowels except the Khalkha /i/. Consider the hierarchical input representation of segments that is appropriate for a sequence /...a C i C e.../ in both languages given the underlying feature representations of (10):

(11)



If a rule spreading [back] rightwards scans the level of syllable heads for targets (maximal scansion), then the correct result is derived for Turkish. Since the rime of i is adjacent to that of the trigger a, and since rimes are eligible bearers of [+back], i undergoes the rule, changing into ɨ. Such an example, already seen above in (7), is represented schematically here, where the representation in (12) is derived from (11) by Back Harmony.[5]

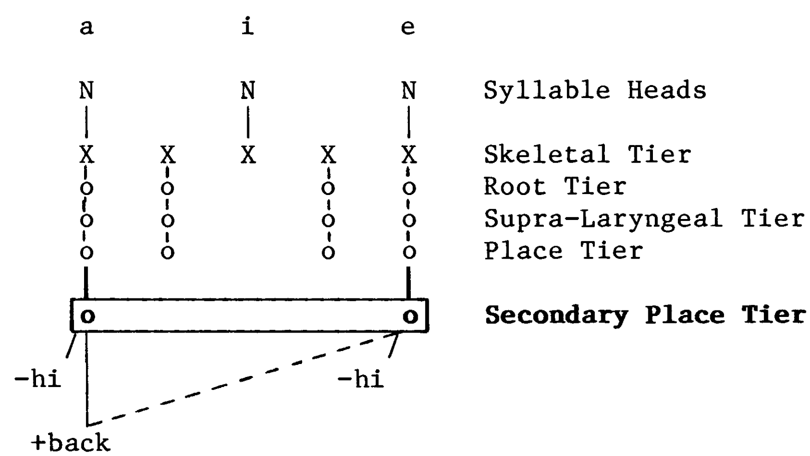
(12)



e.g. /kadine/ --> [kadɨna]

In constrast to the rule application obtaining in (12), consider the results of scanning the tier that immediately dominates the feature being spread by Back Harmony, that is, the Secondary Place Tier. In the representation in (11), there are only two Secondary Place Nodes present, namely nodes for the vowels a and e; the vowel i has no Secondary Place Node because it is completely unspecified. Since the two Secondary Place Nodes are adjacent on their tier, the neutrality of the Mongolian i is derived by having the relevant harmony rules scan the Secondary Place Tier in that language, as illustrated schematically in (13) for an example like zaxirax "to direct":

(13)



e.g. /zaxir+ex/ --> [zaxirax]

In such a case, the [back] feature of the Secondary Place Node of the first vowel spreads to the Secondary Place Node of the third vowel. Although a vowel (skeletal position) is being skipped by such application, no Secondary Place Node is being skipped -- because of the choice of tier being scanned. Hence, by incorporating underspecification into a hierarchical representation of features, the strict condition on locality given above in (5) is maintained, provided that maximal scansion (8) is supplemented by minimal scansion:

(14) Minimal Scansion

> A rule whose target is node or feature α scans the tier containing α.

Thus the rule of Back Harmony in Mongolian (targeting Secondary Place nodes) passes over the vowel i without affecting it because Back Harmony is minimal; the comparable rule applying in Turkish (targeting syllable heads) affects i because the Turkish rule is maximal. The observed properties for the rules of Round Harmony are derived in an entirely analogous manner.

To summarize, we propose that the properties of neutral segments are derived by having rules scan the tier in the feature hierarchy that immediately dominates the feature affected by the rule, that is, minimal scansion. Because feature representations are incompletely specified, resulting in incomplete node structures, only those nodes of some tier r that dominate feature specifications are visible when tier r is scanned.[6] In addition, the different properties of consonants and vowels with respect to maximal scansion account for the attested asymmetry in blocking effects. The maximal scanning of a consonant feature is at the skeletal tier, while the maximal scanning of a vowel feature is at the level of syllable heads; since syllable heads can be adjacent, rules affecting vowels can skip consonants, but since the skeletal tier includes both consonants and vowels, a rule affecting consonants cannot skip vowels.[7] A central aspect of the claim that we make in this paper is that there is a clustering of properties around the distinction between minimal and maximal scansion. In the remainder of this paper, we discuss one such property and outline three others.

4. Edge Effects

The phenomenon of edge effects is discussed at some length in Sagey (1986). The basic idea is that contour segments such as rising and falling tones, affricates and prenasalized segments (represented schematically in (15)) are interpreted as having one specification for the contour feature with respect to elements on the right and having the opposite specification with respect to elements on the left. Thus, an affricate, for example, behaves as [+continuant] from the right and as [-continuant] from the left.

(15)

```
       X
      / \
  [αF]   [-αF]
```

Consider the case of Nahuatl aspiration (Budway 1986), a rule that exhibits the standard type of edge effects. In Nahuatl, stops are aspirated syllable-finally. Because affricates are [+continuant] at the right edge, the rule does not apply to such segments. That is, a right-edge rule treats an affricate like a fricative.

(16) Nahuatl Aspiration (Budway 1986)

a. [-cont] --> [+spread] / ___ $_{\sigma}$]

b.

?ihkop^{h}ki?	`he blinked´
pet^{h}koh	`type of tree´
po:k^{h}ƛi?	`smoke´
?osto:ƛ	`hole/cave´
wicƛi?	`thorn´
ƛa:ŋkočƛi?	`tooth´

The mirror image case is a left-edge rule such as Non-continuant Voicing in Zoque -- a rule that treats an affricate like a stop. Sagey (1986), citing Kenstowicz and Kisseberth (1979) and Wonderly (1951), shows that a rule voicing a non-continuant after a nasal applies to both stops and affricates (17b) but does not affect fricatives (17c).

(17) Zoque Non-continuant Voicing (Sagey 1986)

a. [-cont] --> [+voiced] / [+nasal] ___

b.

/N - pama/	[mbama]	`my clothing´
/N - tatah/	[ndatah]	`my father´
/N - čo?ngoya/	[ňǰo?ngoya]	`my rabbit´
/N - kayu/	[ŋgayu]	`my horse´

c.

/N - sʌk/	[sʌk]	`my beans´
/N - šapun/	[šapun]	`my soap´

Such cases are straightforwardly interpreted as involving linear sequences of [continuant] specifications, and rules can be considered applicable if a rule template matches up with the appropriate linear sequence, the "edge-effect" hypothesis. A second class of cases, however, does not exhibit edge effects. For example, Turkish Devoicing (cf. Clements and Keyser 1983) affects stops, but not fricatives, in syllable final position. Since this is a right-edge effect, one would expect affricates (ending with a [+cont] specification) not to be affected by the rule. Such a prediction is false, however, as shown by the following data:

(18) Turkish Devoicing (Clements and Keyser 1983)

a. [-cont, -son] --> [-voice] / ___ $]_\sigma$

b.

nominative	plural	possessed	
ip	ipler	ipi	\`rope´
sebep	sebepler	sebebi	\`reason´
bit	bitler	biti	\`louse´
kanat	kanatlar	kanadɨ	\`wing´

c.

kɨč	kɨčlar	kɨčɨ	\`rump´
pabuč	pabučlar	pabuǰu	\`slipper´
*pabuǰ	*pabuǰlar		

d.

kɨsɨm	kɨsɨmlar	kɨsmɨ	\`part´
čezir	čezirler	čezri, *česri	\`root´
deniz	denizler	denizi	\`see´
*denis	*denisler		

A comparable problem is shown by Hualde (1987) to arise in Basque. A rule of stop deletion deletes obstruent stops when immediately preceding another stop. Since this rule deals with a right-edge context, it would not be expected to apply to affricates, and yet it does:

(19) Basque (z = [s]; s = [ś]; x = [š]; tz = [c]; ts = [ć]; tx = [č])

a. Stop Deletion: [-cont, -son] --> ∅ / ___ [-cont]

b.

/bait naiz/	[bai naiz]	\`since I am´
/oroit+men/	[oroimen]	\`remembrance´
/guk piztu/	[gu piztu]	\`we light´
/ardiek nituen/	[ardie nituen]	\`I had sheep´

c.

/ipin+tzen/	[ipintzen]	\`put (imperfective)´
/eska+tzen/	[eskatzen]	\`ask (imperfective)´
/ikas+tzen/	[ikasten]	\`learn (imperfective)´
/az+tzen/	[azten]	\`grow (imperfective)´

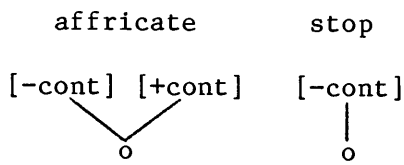
d.

/itx+tzen/	[ixten]	\`open (imperfective)´
/hitz+tegi/	[hiztegi]	\`dictionary (word+place)´
/hitz+keta/	[kizketa]	\`conversation´
/haritz+mendi/	[harizmendi]	\`oak mountain´

Several points are worth remarking on. First, note that affricates can occur both in onset and coda position in Basque (e.g. <u>txori</u> "bird", <u>dolatx</u> "a name", <u>beltx</u> "black"), showing that the simplification of affricates is not simply conditioned by syllable structure. Second, note that the deletion rule deletes an entire segment if the segment is a (non-affricate) stop, but deletes only the stop component of an affricate. This demonstrates that the distinction between stops and affricates must exist prior to the application of Stop Deletion; were the applicability of Stop Deletion to affricates to be derived by analysing affricates as [-cont, +F] (with F = [strident] or some such feature), then the incorrect prediction would be made that the entire affricate should delete by the rule -- in a manner analogous to regular stops. Finally, note that an example like eskatzen (19c) -- where deletion is inapplicable -- shows that adjacency is a requirement for the application of this rule. If the stop or affricate sequence that meets the structural description of Stop Deletion is broken up by a vowel, then the rule is blocked from applying.

Examples like those just cited from Turkish and Basque show that edge effects do not always obtain. Comparing the schematic representation of an affricate-stop sequence given in (20) with the rule of Stop Deletion given in (19a), we see that the rule is applicable in spite of the [-cont] feature of the affricate being on the wrong "edge".

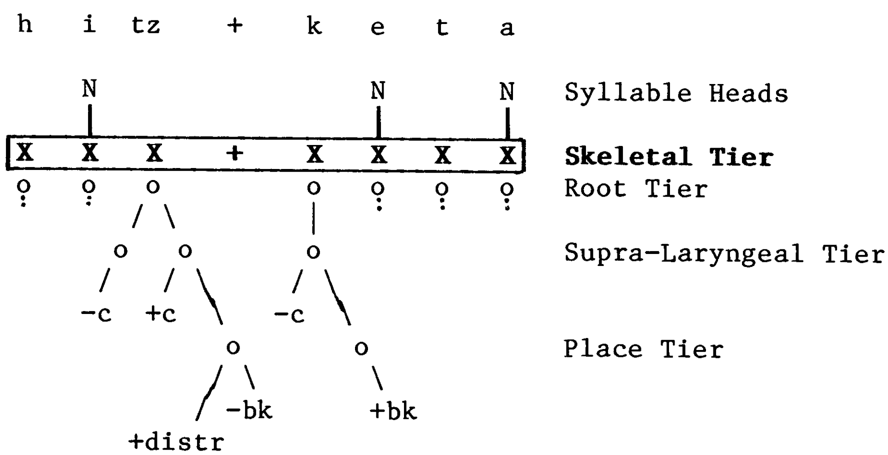
(20)



The difference between cases such as Nahuatl and Zoque, on the one hand, and Turkish and Basque, on the other, can be straightforwardly derived by analysing the rules exhibiting edge effects as involving minimal scansion (Nahuatl, Zoque), and analysing the rules exhibiting no edge effects as involving maximal scansion (Turkish, Basque[8]).

Consider the appropriate configuration for a representative affricate-stop sequence in Basque (c = [cont]):

(21)



If scansion in such a case is maximal, then the appropriate tier is the skeleton. The rule of Stop Deletion is therefore applicable if a skeletal slot characterized by the features [-cont, -son] is immediately followed by a skeletal slot characterized by the feature [-cont]. When such conditions are met, the Supra-Laryngeal node of the first segment is deleted, resulting in the loss of all features of that segment if the segment is a stop, but leaving the features appropriate for a fricative in the case of an affricate. If scansion in such a case were to be minimal, then the fact that the targeted [-cont] specification is not adjacent to the [-cont] trigger would block the rule from applying.

5. The clustering of properties

It is not within the scope of this paper to go into detail concerning all the ways in which the maximal/minimal distinction manifests itself. Before concluding, however, we indicate here some of the additional properties that correlate with the proposed scansion parameter.

5.1. Long distance effects

In certain cases involving multiply-associated autosegments, a process will affect a string of segments even though only one member of the string is in the environment for the rule. Cases can be cited that involve a variety of phenomena, for example, umlaut in Rotuman (McCarthy 1986) and tone raising in Etsako (Leben 1978). The autosegmental explanation for such cases is that such a rule directly affects p in a representation such as the following, the change in node p then reflecting itself on all nodes q.

(22)

```
      p
     / \
    /   \
  qi....qj
```

But while such autosegmental behavior is common, it is not the only possibility. Hence a language like Kwara?ae, spoken on an island not far from where Rotuman is spoken, has a comparable rule to that of umlaut in Rotuman but that affects the single vowel position meeting the structural description of the relevant rule. Hyman and Pulleyblank (in prep) also discuss several such cases for tonal phenomena. Our proposal here is that the relevant distinction follows again from the maximal/minimal parameter. Rules scanning the level of syllabic representation affect only those syllabic elements, head/non-head skeletal positions, that meet the structural description of the rule (maximal scansion); rules scanning a hierarchical tier, however, are oblivious to syllabic considerations, applying without regard to the autosegmental linkings of that element (minimal scansion) and thereby producing long distance effects.

5.2. Inalterability

Closely related to the point just made is the fact that branching autosegmental structures often resist the application of rules that would otherwise be expected to apply to them (Hayes 1986, Schein and Steriade 1986). For example, a rule of Tigrinya that spirantizes [+back] obstruents post-vocalically (as in (23)a) fails to apply to the geminate in (23b):

(23)

a. /?akalɨb/ --> [?axalɨb] `dogs´

b. /fäkkärä/ --> [fäkkärä] `he boasted´
*[fäxxärä]

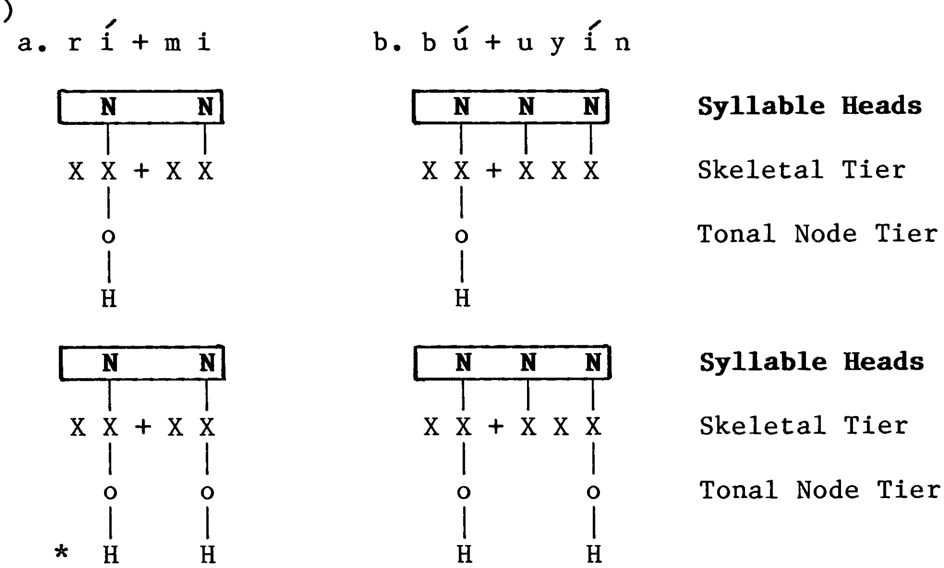
It has been observed (Hayes 1986) that rules that crucially refer to the skeleton observe inalterability effects, unlike rules that make reference only to autosegmental tiers. The indication is that maximal rules, those scanning the skeletal tier, obey inalterability while minimal rules, those scanning hierarchical tiers, do not. The maximal/minimal distinction, therefore, provides a characterization of processes that parallels to a considerable extent the division made in the literature on inalterability. Such a characterization would be particularly close if one were to impose the plausible requirement that any rule referring to the skeleton receive automatically the rule setting maximal.[9]

5.3. OCP effects - antigemination

The final property related to the maximal/minimal distinction that we mention here is that of anti-gemination. McCarthy (1986) argues that the Obligatory Contour Principle (OCP), a condition prohibiting the presence of two adjacent, identically specified autosegments on the same tier, acts as an active constraint on phonological derivations.[10] If the operation of a phonological rule were to bring about an OCP violation, then the rule is blocked from applying. Hence in a language like Afar (McCarthy 1986), the stress-sensitive rule of syncope that applies in pairs like xamíla/xaml-í `swampgrass (Acc./Nom.-Gen.)´ and darágu/darg-í `watered milk´ is blocked from applying in words like xarar-é `he burned´ and miḍaḍí `fruit´ because its application would give rise to a configuration in which two identical segments would be adjacent.

Archangeli (1986) and Pulleyblank (to appear), however, argue that the antigemination effect just described must be qualified in certain cases. For some rules to be blocked from applying, it is not sufficient that their output would be a configuration with adjacent identical autosegments; in addition, the identical autosegments must be linked to adjacent syllabic elements. For example in Yoruba (Pulleyblank to appear), a rule that inserts a H-tone on underlyingly toneless object clitics (lù mí `beat me´, pā mí `kill me´, etc.) is blocked from applying in a case like (24a) but not in one like (24b):

(24)



The insertion of a H-tone in (24a) would create a sequence of two adjacent H-toned vowels while the insertion of a H-tone in (24b) does not. The antigemination effect in Yoruba is therefore sensitive to whether particular <u>syllabic positions</u> are identically specified.

Our proposal distinguishes between syllabically sensitive OCP effects (e.g. Yoruba) and hierarchically sensitive OCP effects (e.g. Afar)[11]. If a rule is <u>maximal</u> then an OCP violation results only if the syllabic elements being scanned give rise to adjacent identical specifications; if a rule is <u>minimal</u> then any two elements adjacent on an autosegmental tier would constitute an OCP violation if identical.

6. Summary

We give our overall results in table form below:

(25)

	Maximal	Minimal
Consonant process:		
-skip vowels	no	yes
-skip consonants	no	yes
Vowel process:		
-skip consonants	yes	yes
-skip vowels	no	yes
Edge effects:	no	yes
Long distance effects:	no	yes
OCP effects:	skeleton sensitive	general
Inalterability:	yes	no

The hypothesis advanced in this paper is that a significant clustering of properties results from the single decision of whether the phonological representation is scanned for rule applicability at the syllabic level (maximal scansion) or at the level of the appropriate hierarchical tier (minimal scansion). If this hypothesis is correct, its implications for learnability are obvious. For example, simply establishing that a rule exhibits edge effects would be sufficient to determine that it would exhibit inalterability effects, that it could not ignore vowels and could ignore consonants only if dealing solely with vocalic features, the rule would not exhibit long-distance effects, etc.

To conclude, we touch briefly on two points raised by the above proposal. First, we have spoken throughout this paper of "parameters". This is because conventional non-parametric theories of phonological rule application are inadequate for both conceptual and empirical reasons. Conceptually, standard autosegmental approaches to rules fail because they allow too many unattested rule types. Empirically, they fail in cases like the rule of Basque Stop Deletion discussed above: standard formalisms cannot explain why (19a) applies to affricates as well as to stops, and how it distinguishes between stops and affricates as to whether the entire segment or only a portion of it deletes. We propose to solve both problems within a constrained parametric approach to rules (Archangeli and Pulleyblank 1986, in prep). Core rule formulations consist of the setting of a small number of binary rule parameters, one of which is the maximal/minimal parameter. Because of the constraints on rules inherent in such a parametric system, the class of possible phonological rules is narrowly constrained. And for a specific case such as Basque, the problem encountered in a standard framework disappears because of the difference in the conception of rules. Rather than determining whether a particular rule template fits some particular phonological sequence (the standard approach), a rule's applicability is determined by considering whether a finite number of semi-independent parametric conditions are met.

FOOTNOTES

[1]The first position is represented by Chomsky and Halle (1968) (henceforth SPE) (as well as much subsequent work) while the second position is found in Mohanan (1983), Clements (1985), Archangeli and Pulleyblank (1986), Sagey (1986), Schein and Steriade (1986), etc.

[2]The approach outlined here differs in certain respects from the proposal in Clements (1985). For a discussion of the relevant differences, see Archangeli and Pulleyblank (1986).

[3]Note that the inclusion of irrelevant elements as `trigger´ conditions must be excluded in order to prevent such a constraint from being rendered vacuous. For some discussion, see Pulleyblank (in prep).

[4]The analogy with a version of X-bar theory in which only terminal elements and maximal projections can be referred to is worth noting. Perhaps some principle holding of (at least) syntax and

phonology is relevant. Thanks to Mike Lee for discussion of this point.

[5]Note that the nodes intervening between the targeted syllable head and the [back] feature being spread are generated by a general, automatic convention. For discussion, see Archangeli and Pulleyblank (1986) and Sagey (1986).

[6]This proposal predicts that no language could have two neutral vowels, and yet languages like Finnish and Hungarian do. Such cases require either particular underspecified feature/node configurations or a weakening of the Locality Condition. We leave this problem for further investigation.

[7]The predictions are actually slightly more subtle than this. For example, the approach argued for here predicts that a consonant could indeed spread across a vowel if the vowel in question were completely unspecified -- and such cases do indeed occur. See Archangeli (1987).

[8]For a more detailed discussion of such an approach to Basque, see Hualde (1987).

[9]While plausible, there are a number of problems with such a suggestion. For some discussion, and for some general problems related to inalterability, see Archangeli and Pulleyblank (in prep) and Hyman and Pulleyblank (in prep).

[10]For our purposes here it does not matter whether the OCP is universally applicable or not (cf. Odden 1986). The contrast we discuss need simply be considered with respect to the class of languages exhibiting OCP effects -- whatever that class is.

[11]Actually there is nothing here that would prevent Afar from being syllabically sensitive. Relevant cases clearly exist however, for example, Rendaku in Japanese (Ito and Mester 1986, Archangeli and Pulleyblank in prep).

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