SYLLABLES, SEGMENTS AND THE NORTHWEST CAUCASIAN LANGUAGES

Stephen R. Anderson

University of California, Los Angeles

1. Phonological Characteristics

Virtually any linguist’s list of candidates for the status of “exotic languages” would include the members of the Northwest Caucasian family, of which Kabardian and Abaza are probably the most familiar. One can not fail to be struck by languages described as having such huge inventories of consonants, for one thing: Kabardian (with at least 48 in the literary language) is comparatively modest by comparison with Ubykh (with at least 80), Eshkudeh Circassian (with 67), or some forms of Abaza (with upwards of 70). Most discussion, however, has centered on the fact that as a concomitant of these large consonant systems, the languages have highly reduced vowel systems. Trubetzkoy, for example, cites Northwest Caucasian examples as virtually the only instances of vowel systems in which only a single dimension of contrast (relative height) is relevant, and Jacobson later made use of the (presumed) properties of such minimal systems in constructing his theory of the distinctive features and their development.

The most dramatic single issue in connection with these languages, however, has been the claim that in some cases they can be analyzed as having vowel systems even smaller than those posited by Trubetzkoy: only one phonological vowel (as argued by Allen, 1956, 1965) for Abaza, or none at all (as argued by Kulpers, 1956) for Kabardian. The existence of one-vowel systems as in Abaza has been an issue in the reconstruction of Indo-European (Stevenson, 1967), and as might be expected, the question of vowelless languages has generated a certain amount of heat in phonological theory (Kulpers, 1956, 1976; Halle, 1970).

These claims concerning Northwest Caucasian vowel systems are certainly dramatic: so much so that when a phonologist who has been made aware of them first has an opportunity to hear the languages themselves, one of the most striking things about them is how ordinary and undramatic they sound in this regard. While it is certainly difficult, say, to learn to distinguish among the 14 different strident coronal continuants of Eshkudeh Circassian, one hears in general a full range of vowel qualities, few grotesque clusters (certainly nothing on the order of Georgian khvvet ‘you peel it’, monosyllabic, or Bella Cola g’parik ‘taste it!’). Indeed, in phonetic terms, the set of vowels and of syllable structures in Kabardian or Abaza is quite pedestrian.

The problem, however, has not been taken to lie in the phonetic structure of words, but rather in the domain of phonology.
arriving at a representation of utterances in which only the distinctive sound properties of linguistic elements are contrasted, one of course eliminates a number of differences present in phonetic structure. It is as a result of this reduction that one-vowel or vowelless analyses of the languages arise. It is not claimed, that is, that Kabardian has no vowels in surface forms of words, as is in fact true of some words in Bella Coola, for example (see Haard below). The claim is rather that these are positions in which a distinct and construtive vocalic element occurs in phonological structures.

The argument which leads to this analysis is of considerable interest, and I believe, it has important consequences for the roles of segments and syllables in phonological theory. I assume that the details and history of the controversy are not familiar to many readers. Halle's (1976) contribution is fairly frequently cited, but since it appears that his treatment is somewhat misleading as to the impetus of the Kabardian facts, it seems worthwhile to review the line of reasoning here. In so doing, I am simply paraphrasing papers of Kuipers, particularly Kuipers (1976), which gives a particularly lucid presentation. Readers already familiar with this literature may skip to the conclusion of Section 3.

2. Vowel Systems of Kabardian and Abaza

We can begin by observing that in Kabardian and Abaza there are two fairly distinguishable degrees of length. Confining our attention to the short vowels for the moment, we can note further that while the total set of these covers nearly the whole of the traditional vowel triangle, their distribution is severely limited in terms of the surrounding consonants: in any given consonantal environment, only two possible qualities can occur. As we might expect, rounded vowel qualities appear adjacent to rounded consonants, higher and front qualities adjacent to palatal and velar consonants. Kuipers (1960) describes the distribution in some detail. As shown in Figure 1, the two possible qualities found in any given environment differ only one another only in relative height, with other features of their articulations determined in a patently assimilatory fashion by the surrounding consonants.

Figure 1. Kabardian vowel space.

In phonological terms, then, we would wish to recognize only two contrasting short vowel elements in such a language: a relatively lower one, conventionally written /a/, and a relatively higher one normally written as /a/. In discussing these facts, after a survey of the relevant literature and available instrumental data, Colarussu (1975) gives a characterization of these phonological elements which reveals their fundamental nature: "The sequence /i a/ means 'go from 1 to 2, letting your tongue follow the shortest path that permits an interval of sonorant voicing.' /i a/ means 'go from 1 to 2, permitting an interval of sonorant voicing, but at the same time imposing upon this trajectory an articulatory gesture which pulls the tongue body down and back.'"

The reduction of the short vowel system to two elements, /a/ and /a/ defined essentially as by Colarussu, is agreed on by virtually all investigators. When we consider the long vowel system (disregarding synchronically unassimilated tones, primarily from Russian) there is similar agreement on the fact that the vowels /a, a, a, a/ are to be analyzed as sequences of short vowel plus semivowel phonologically: /a/, /aw, a, aw, aw, aw/ respectively. Given the extremely simple root structure of the Northwest Caucasian languages (most roots consist of little more than a single consonant or cluster), the overwhelming majority of occurrences of these long vowel qualities can be shown to alternate with other qualities or with simple semivowels in such a way as to make their treatment as phonological sequences quite clear. There is thus no need to posit independent vocalic elements for the non-low long vowels that occur phonetically.

There is less general agreement on the analysis of the remaining long vowel, /a/. Trubetzkoy treated it simply as a third term (the lowest) on the dimension of relative height, disregarding its distinctive quantity. Subsequent investigators have usually taken /e/ rather to be a long counterpart of /a/, but Kuipers shows that (at least in Kabardian) a "diphongal" analysis of this element similar to that for the other long vowels is indicated. He presents several arguments (accepted and repeated by Halle, 1970) to the effect that this element is phonologically the result of a sequence /aw/ (alternating with /aw/ by a rule which also relates /ali/ and /ali/, etc.).

We will not further rehearse the arguments for the elimination of the long vowels as distinct elements here, but rather assume as the "state of the art" an analysis of Kabardian, as well as Abaza and the other languages, will need to posit at most the two vowels /a/ and /a/. We can now pass on to the heart of the matter, the arguments for eliminating one or both of these. Consider first the facts concerning the distribution of the vowel /a/.

3. Kuipers' Vowelless Analysis

We note initially that there are some environments in which neither vowel can occur. In addition to the independent repertoire of 48 consonantal elements found in the language, special reduced forms of eight of these occur. These are distinct from...
the other consonants in being substantially "weaker" in articulation, and in having no distinct laryngeal articulation associated with them. One might say that in a cluster such as the initial of t'ip 'our educating it' the first member has assimilated to the glottalized character of the second, but this would not be strictly accurate. The first consonant is not independently glottalized, and has in fact no release (ejective or otherwise): rather, the ejective laryngeal articulation associated with the /p/ is initiated at the beginning of the cluster and extends over the whole of it. It would thus be more accurate to treat such a cluster, from the point of view of its articulatory properties at least, not as a sequence of two independent segments but rather as a single complex segment consisting of a sequence of two (or in some cases three) oral articulations during a single laryngeal gesture. We will provisionally assume this treatment of "complex segments" in Khabard (essentially Kupfers' analysis), and where we refer below to "consonants," it should be assumed this includes also such clusters, considered as single units.

We next consider the distribution of phonetic stress in the language. This can be assigned by rule, on the basis of a distinction between stress-relevant and stress-irrelevant affixes. These are units that have the property that they cannot be assigned stress, and are disregarded in determining where stress should be assigned. The significance of this property is thus with pre- or post-stress structure. Perhaps the stress-irrelevant affixes should be separated from the rest of a phonological word by some designated boundary element, but this issue is irrelevant here. Disregarding the stress-irrelevant affixes, then, stress is assigned to the syllable immediately preceding the last consonant of the word. Thus, if the final syllable is open, stress is penultimate; if it is closed, stress is final.

Having assigned the stress, we can now distinguish three classes of environment: pre-stress, post-stress, and the stressed syllable. The distribution of /a/ is given in each of these. Consider first the post-stress environment. Given the location of an environment in which /a/ is to occur in a stress-irrelevant affix. Further, it is possible to state a general rule for the entire sequence of pre-stress material: given a consonant not followed by /a/ which is a step, fricative, /, m, n, o, r/ this will be followed by /a/ if and only if it is followed by one of /, n, o, w, /.

An immediate consequence of this is that there is no instance of /a/ in absolute final position, but more importantly, the predictability of this distribution (confirmed as a rule of Khabard phonology by numerous autosegments and absolutes) /a/ in a given morpheme depending on its following environment) implies that in post-stress position there is no contrast between syllables with /a/ and the same material without /a/. Since the difference between schwa-less sequences and the same sequences with schwa is detectable, a phonological transcription need not to indicate any occurrences of schwa in post-stress positions.

We turn now to the distribution of /a/ in pre-stress syllables. Here again, it is possible to state a simple rule: in general, any consonant in the sense defined above which is not followed by /a/ will be followed by /a/ in pre-stress position. There is one major exception to this principle, for which Kupfers formulates a rather elegant rule. At the boundary between two immediate constituents of a form, no schwa appears precisely if each is complex (in the sense of containing two or more consonantal units). This results in a situation in which the same morphemes, combined in the same order, can give rise to apparent minimal pairs of forms with and without /a/ depending on their immediate constituent structure. Kupfers cites, for example, the pair has /hədədər 'that has' / very /nədəd slow 3 man 3 a's (abs. -r)/ with schwa after the third consonantal unit, opposed to has /hədədər 'that very /nədəd slow 3 man/. The two are composed of the same morphological units, and differ only in internal bracketing: in the first, the structure ('s)-('ba-

In his autonomous phonemic representation, Kupfers proposes to represent the positions in which no schwa appears pursuant to the above rule by an element he calls "non-syllabic juncture." At first glance, it would appear that this is a purely notation-al trick to eliminate some instances of schwa from the transcription. If we simply write /a/ "non-syllabic juncture" in each position where schwa could appear but does not, we can of course trivially eliminate all of the actually appearing schwas from our representation, and Halie (1970) rightly criticizes such a step. The essential point of Kupfers' analysis, however, is that the occurrence of schwa is predictable from the independent syntactically motivated constituent structure of an item: all occurrences of non-syllabic juncture are syntactically determinable, and therefore all occurrences of pre-stress schwa as well. Kupfers needs such an element in his transcription because he adheres to a notion of phonology which does not allow "mixing of levels" in representation, and thus does not admit such structure into phonological form. But in a conception of phonology which does not conform to this constraint, no "non-syllabic juncture" element is necessary, and the occurrence of pre-stress schwa is completely predictable in a non-trivial fashion not subject to Halie's criticism.

We have now followed the argument that schwa is never distinctively present (as opposed to its absence) in either pre-stress or post-stress syllables, and hence should be eliminated from phonological transcription in both of those environments. We now turn briefly to another matter, the distinction between the two vowels /a/ and /a/. Kupfers observes that in Khabard, unlike, e.g. Abaza, the vowel /a/ always follows a consonant phonological transcription need not to indicate any occurrences of schwa in post-stress positions.

Northwest Caucasian Languages
ology and potentially the basis for eliminating /a/ as a distinct vocalic unit in the transcription of Kabardian. Recall that the vowel /a/ was defined above as a simple vocalic transition with a superimposed deflection of the tongue body downward. Kuipers suggests that this is in fact quite parallel to the features of palatalization and rounding, necessary independent in Kabardian: palatalization consists in a raising and fronting tongue body gesture, while rounding consists in a gesture of labialization. Together, the three (/a/, palataliza-
tion, and rounding) could be seen as forming a unitary system parallel to the usual vowel triangle of /a,i,u/. Each of these gestures has an effect on following vowels, but at least in the case of palatalization and rounding, it is necessary to mark these features on the consonant since they can occur in final and preconsonantal position, where no following vowel exists to carry the effect. Kuipers proposes, then, to treat the /a/ feature as parallel, to mark it on the consonant, and thus to create a symmetrical system of /a/-quality, /i/-quality, and /u/-quality consonants. The consonants are parallel in their effects except for the restriction that /a/-quality consonants are always followed by a (phonetic) vowel while /i/- and /u/-quality consonants need not be. If we accept this line of argu-
ment, we have a distinctive element (since it appears as a distinctive property of certain consonants), but we have eliminated it as a distinct vowel. The essence of this analysis is to treat /a/ not as a segment, but rather as a sort of syllable property of consonants which always implies syllac-
omic character (hence a following phonetic vowel) for consonants with which it appears.

We have now arrived at a characterization of syllables containing the vowel /a/ as consisting phonologically simply of an /a/-
cluded consonant. But when we now return to a consideration of representations of this structure, we see that the stress is eliminable from the representation of these as well. Assuming that stress is a syllable property, then it is a vocalic property of its segmental content, it is clear that there are only two phonetic possibilities: either such a syllable will contain the vowel /a/, or it will contain /a/, since there are no pho-
netically vowelless stressed syllables in Kabardian. But we already have a feature or a word tonic which is a syllable property of only of consonants together with the /a/-quality feature, and it is the case that syllables with stressed /a/ are precisely those stressed syllables without this feature. Thus there is no need to represent the /a/ as a distinct unit in these sylla-
les either.

Of course, if one believes that stress is fundamentally a prop-
erty associated with vowels, the whole train of thought above will seem silly and artificial. It relies on the assignment of stress to differentiate these three classes of environments, and then proceeds to eliminate from underlying representations all of the vowel elements to which this stress could have been assigned. If one believes that stress is associated not with vowel ele-
ments, however, but rather with a larger structural unit such as the syllable (independent of its phonetic segmental consis-
ency), this objection vanishes. Given the phonetic properties of stress (cf. Lohne, 1978b), such an assignment would appear to be more reasonable, and in fact many recent writers have made just that assumption. It clears the way for the analysis of Kabardian just reviewed, and makes coherent the statement that in phonological representations these are in fact no vowel seg-
ments in the language. By separating the question of what prop-
erties of a syllable are distinctive from the description of its purely phonetic content, it becomes clear that the presence of a /a/ in a Kabardian syllable is no more phonologically mo-
tivated than would be a phonetic transcription in which all (otherwise) initial vowels in English were preceded by a glotta-
stop.

We conclude, then, that Kuipers' vowelless analysis of Kabardian is indeed a coherent and interesting one. The absence of a con-
trast between the vowel /a/ and zero, in particular, would seem-
ingly recommend to any analyst a transcription in which this vowel does not occur phonologically. While we have some reser-
vations about the move by which /a/ was eliminated as a distinct vowel above, this is irrelevant to the question of /a/. For as long as we have some way of designating those syllables which contain /a/, whether by a feature on their consonantism or by a separate vowel segment, the distribution of sounds in the re-
mainder syllables in the language is governed by purely mechan-
ical principles and this element can be omitted from phonemic form.

In the terms of a traditional, segment-oriented approach to pho-
netic and phonological structure, the analysis given by Kuipers and summarized above is, of course, extremely counterintuitive. If one accepts the proposition that such structure is limited to the concatenation of uniform, discrete, internally homoge-
ous segments (perhaps with the intercalation of some boundary elements of an essentially similar nature), with no interesting units either above or below this degree of fineness, and with each feature specification which is to have phonetic or phonolog-
ical relevance assigned precisely and locally to an indivi-
dual segment, it is difficult to accept the notions of 1) clus-
ters which are simultaneously unitary elements of phonologi-
cal structure and yet sequences of articulatory gestures; 2) stress assigned to a domain which contains no vocalic element to bear it; or 3) at least some vocalic properties assigned to domains which also do not contain vowels. In these terms, Halle's cri-
tics of Kuipers' use of stress marks independent of vowels, consonants other than the final one in a cluster being absolute-
ly unspecified for laryngeal articulation, assignment of vocalic features to consonants, and non-syllabic juncture as a set of illicit tricks are certainly understandable.

4. An Analysis in Terms of Syllables and Complex Segments

Subsequent proposals concerning phonetic and phonological struc-
ture have substantially enriched these notions, however, and the obstacles that seemed to prevent themselves to Halle in 1975 would no longer seem insurmountable. The notion of seg-
ment-internal structure, traditional in some schools of phonetic discussion and relied on implicitly in Anderson's (1972) paper on diphthongization, was suggested in a generative framework by Hoard (1971) and expanded by Campbell (1974). It has been further developed in studies of nasality (Anderson, 1976), tone (e.g., Lehman, 1975; Goldsmith, 1976a,b), syllabic steps (Hoard, below) and other domains still under discussion. The role of syllabic structure and of the syllable as a structural unit has of course been a matter of controversy for many years, but recent work such as that of Liberman (1975) and Liberman and Prince (1977) has made clear the fact that stress is most appropriately associated with syllables rather than with segments.

The growing literature on these and other aspects of "prosodic" structure in phonology bears directly on the points Halle found problematic in Kuipers' treatment. Many problems remain concerning the interaction of suprasegmental, segmental, and subsegmental domains of phonetic/phonological specification, but it is clear that the problem which appears in Kuipers' analysis finds a resolution within the framework of assumptions which is emerging. For example, the simultaneity and complexity of clusters posited by Kuipers would simply be described in the "prosodic" analysis developed by Goldsmith as the association of a single laryngeal specification with more than one such cluster. The analysis of oral articulatory processes, in the terms of representations such as those of Anderson (1976) as a specification extending over more than one domain of specification for other features. These possibilities are shown in (1a), (1b) below:

\[
\begin{array}{|c|c|}
\hline
\text{cons} & + \\
\text{llab} & + \\
\text{llab} & + \\
\text{ant} & + \\
\text{cont} & + \\
\text{cont} & + \\
\text{cont} & + \\
\text{ant} & + \\
\hline
\end{array}
\]

Both of these representations characterize (significant aspects of) the initial cluster of Kabardin t-‘p”n “our educating it” in ways that have not yet been shown to be significant in distinct. Both provide for an adequate definition of the unitary (though sometimes internally complex) segments that are relevant in Kabardin phonology. Similarly, given the notion of a syllable as a structural unit, there is nothing in principle to prevent us from regarding the segmental content of those properties which are distinctive of it or omitting properties that are predictable, even if this results in a situation in which some syllables in some representations do not contain any segmental material of the sort normally claimed to be "syllabic." If, as we have seen, the vocalic content of Kabardin syllables whose only vowel (if any) is /w/ can be completely predicted, there is then nothing to prevent us from specifying them only for their constituent consonants.

Note that we can in fact capture all of the regularities discussed above in the presentation of Kuipers' argument in terms of such representations. The stress rule, for example (given the distinction between stress-relevant and stress-irrelevant material, which is necessary equally in any analysis) can be stated simply as "stress the penultimate syllable (if there is one)." Syllables containing the feature of /w/ quality can then be uniformly marked as "syllabic," as can all stressed syllables. The rules stated above for the presence of schwa can then be interpreted as marking some pre-stress or post-stress syllables as fully syllabic and others as not syllabic.

Starting with representations in which each (potential or phonological) syllable is specified only for its consonants (including a feature of /w/-quality, perhaps) we thus arrive at one in which some such consonantal units are marked as bearing syllabic and some as non-syllabic. We can now employ the notion of rules which introduce or manipulate subsegmental domains of specification, in a way entirely similarly to the analysis given by Anderson (1972) for diphthongs. We can conceive of these "syllabic consens" undergoing a sort of diphthongization with respect to the very feature of syllabic, developing a non-syllabic onset portion and configuring the syllabic to their latter portion. Subsequently, the syllabic portion itself becomes sonorized by the operation of another rule, becoming a transition vocaloid of the type described as /w/ (or of the type /w/, if the appropriate feature is present).

Note that the phonetic character of this transition vocaloid, and especially its dependency on the quality of the preceding consonant, follows directly from the fact that in origin it is precisely a sonorant, syllabic copy of that consonant. The contents of original syllables which have been rendered entirely non-syllabic by the /w/ distribution rules (or rather their interpretations as syllabi-voculating rules) discussed above are then incorporated into preceding syllables, closing them. This development is suggested in (2) below:

\[
\begin{array}{|c|c|}
\hline
\text{T} & \text{P} \\
\text{syl} & \text{n} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{T} & \text{P} \\
\text{syl} & \text{n} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{T} & \text{P} \\
\text{syl} & \text{n} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{T} & \text{P} \\
\text{syl} & \text{n} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{T} & \text{P} \\
\text{syl} & \text{n} \\
\hline
\end{array}
\]
In (2), the abbreviations are as follows: the dollar sign denotes a structural syllable; capital letters denote the corresponding oral articulation; and other symbols (e and s) are the appropriate combination of oral and laryngeal features for those elements for which it is not essential to separate the two. The development of 'p' from (2a) proceeds as follows: first, the primary stress rule produces (2b) or some analog along the lines of the proposal of Liberman and Prince (1977). The rules of syllabicity distribution produce (2c), since the first syllable is stressed (and thus syllabic) but the second does not meet the conditions for post-stress syllabicity. Rep resentation (2d) arises by the "diphthongization" or internal differentiation with respect to syllabicity described above; (2e) represents the sonorization of the syllabic portion of the result, and (2f) shows the incorporation of the following non-syllabic material to close the first syllable.

Obviously, some aspects of this proposed development are sketchy and in need of further refinement and formalization, but the outline is clear. In essence, this analysis follows Kuipers (though without the assumptions he makes about the nature of phonemic representations) and casts his treatment in the terms of the proposals noted above about the nature of phonetic/phonological rules and representations. Nothing in this development would seem to be beyond the limits of proposals that have already been made for other languages, though their combined effect is to make possible the radical analysis of Khabarid as a "non-syllabic" language.

We should note that we do not have to follow Kuipers' analysis all the way to the end in order to derive some of the interesting consequences presented above. In particular, we do not have to accept the notion that the vowel /a/ is represented only as a feature on a consonant in order to get substantially this development: there is nothing to prevent us from saying that the distinctive properties of /a/ should in fact be represented in terms of a vocalic portion of its syllable, even though such a vocalic portion appears in syllables which show (or fail to show, depending on the environment) the vowel schwa. The appropriateness of representing /a/ as a "structural" vowel results from the fact that syllables containing it are always assigned full syllabicity, as opposed to those containing schwa, and a rule to this effect will be necessary if no structural vowel is present. In addition, certain limitations on the co-occurrence of /a/ and /e/ are suggested by the parallel proposed by Kuipers in somewhat illusory. Even though syllables with /a/ may be assigned a structural vowel, however, the case is quite different for schwa, and the result

is that we arrive at a "one-vowel" analysis of Khabarid. Some syllables (those with /a/) have distinctive vocalic content on this treatment, while others do not. Such an analysis is necessary in any event for Abasa, since in this language /a/ can occur initially or postvocically; in such a case, of course, it is not possible to treat /a/ as a feature on preceding consonants. Since schwa cannot occur except under conditions analogous (though not identical) to those found in Khabarid, however, there is no need to posit more than the single vowel /a/ as a structural unit in Abasa any more than in Khabarid.

5. Implications for Other Languages

We might suggest that the possibility of having such structurally voiceless syllables in a language is closely related to the fact that the language has a very reduced inventory of distinctive vocal qualities in general: after all, if there are only two potential vowels to start with, it is not quite so remarkable that one of them can be eliminated. It seems useful, however, to extend an analysis of the sort proposed above to other languages with rather richer inventories of vowel contrasts. The Upper Yuman languages, for example (including Yavapai, Halayapi, and Havasupai) suggest a very similar situation despite having a system with five vowels plus length potentially in contrast. These contrasts are realized (ignoring facts about compounds which can easily be incorporated into the analysis) only in stressed syllables; in pre-stress syllables, we find a situation very similar to that found above for schwa in Khabarid. A non-distinctive transition vowel, whose quality is entirely determined by the surrounding consonants, can appear after any consonantal unit under conditions which (though somewhat complex) are entirely mechanical.

It seems appropriate, then, to represent these pre-stress syllables as containing only distinctive consonantal content, despite the fact that the language as a whole has a comparatively rich vowel system, and to develop the transition vowels in a fashion analogous to that proposed for Khabarid schwa syllables. Such an analysis has in fact been suggested, in essence, in recent work on Upper Yuman languages by Hinton (1977) and Shaterian (1976). An opportunity to work with Ms. Holly Fathorne, a speaker of the Tolipta dialect of Yavapai, has made the appropriateness of such a treatment of pre-stress vowels in such languages clear to me.

One can pursue this point further, and note that in some circumstances it may even be appropriate to posit voiceless syllables in the same positions as some syllables with full vowels. In some languages of the River group in Yuman, for example, the facts are apparently quite parallel to those in Upper Yuman pre-stress syllables, except that under morphologically defined conditions, a distinctive long vowel may be associated with such a pre-stress syllable. In that case, we would wish to retain the phonologically voiceless analysis for those syllables containing only a transition vowel, while contrasting this syllable type with the full structural vowel found in other syllables in analogous positions.
The analysis which has been developed above of syllable and segment structure in Northwest Caucasian (and Yuman, and presumably other) languages seems to capture in a strikingly appropriate way the peculiarities of these systems, as Hauser has argued. It also points to more general theoretical possibilities. For instance, it is in terms of complex cases like these that we can hope to come to grips with the problems of internal segment and syllable structure that phonologists have addressed (as referred to above) in recent years. We can also hope that these developments can lead to important insights into the nature of phonological processes. It seems plausible to suggest, for example, that all instances of phonologically conditioned epenthesis arise by a combination of diachronicization and subsequent modification, as proposed above for the development of schwa in phonologically vowelless syllables. If true, this proposal should lead to interesting constraints on the types of change phonological rules can perform.

We should repeat again the point of presenting this material. An apparently appropriate, if controversial, analysis of an exotic language type has been discussed above, which depends crucially on certain recent theoretical innovations in the conception of phonetic/phonological structure and the rules which manipulate it. As such, this analysis both confirms the correctness of these innovations and deepens our understanding of their content. This is, of course, the object of the interplay of data and theoretical discussion in phonological theory.

ACKNOWLEDGMENT

I owe the characterization of the facts in Yuman, particularly the River languages, to my colleague Pamela Munro (whose description I may have garbled somewhat).

Syllables and Segments
A. Bell and J.H. Hauser, eds.

SYLLABICATION IN NORTHWEST INDIAN LANGUAGES,
WITH REMARKS ON THE NATURE OF SYLLABIC STOPS AND AFFRICATES

James E. Hoard
University of Oregon

1. Introduction

Pacific Northwest Indian languages are generally recognized as having rich consonant inventories. All the many languages in the Northwest (consisting of present-day British Columbia, Washington, Oregon, Idaho, and Western Montana) have glottalized consonants and contrasting velar and uvular obstructions. Some have pharyngeals, while a few—Nootka, Salish, Tewam, Qualicum, and Makah—lack nasals.

Contributing to the assessment that Northwest languages have unusual and complicated phonologies is the fact that many of them permit lengthy consonant sequences, either initially or finally or both. The phonemic transcriptions of many words (e.g., Bella Coola /na̚məs/ and Columbia /mə̡̄mə̡̄/ ) resemble algebraic formulas rather than more words of natural languages. Since very little has been written about syllabification in Northwest languages by those with firsthand knowledge, readers of these transcriptions who have not actually heard one or more of the languages might reasonably assume that the long consonant sequences are tautosyllabic. For example, Haugen (1956), basing his observations on Garvin (1948), treats Kutenai initial consonant sequences, which contain up to four consonants, as if they were tautosyllabic clusters. While Haugen's description of Kutenai consonant sequences is valuable in its own right, the description gives no indication of the actual syllabification of Kutenai words. According to Lawrence Morgan, who has worked extensively on Kutenai, the long sequences that can begin a Kutenai word or be medial in a word are not syllabified as single onsets (kwa, comm.). For example, /tsə̙ə̙tu/ is syllabified [tsə̙:tu:nə̚], /kə̚u̚axa̚/ is [kə̚u̚:ax:a̚], with released (and syllabic) s: [ksə̚:tu:nə̚], and /pə̚kə̚na̚/ is [pə̚kə̚:na̚].

Sections 2-5 present the syllabic structure of a few of the Northwest Indian languages in some detail. The data reveal that syllabic stops and affricates are another salient characteristic of these languages. In Section 7 consideration of the nature of these elements leads to the suggestion that they are complex segments. Section 8 concludes the paper.

All of the phonetic transcriptions are impressionistic, in the customary sense that they represent the result of applying to actual utterances a (putatively) universal phonetic theory cross-linguistically. The number of syllables indicated for an utterance reflects the number of audible pulses or "peaks of prominence" in that utterance. The placement of syllable boundaries between syllables indicates the points of relative separation or attachment of one group of (one or more) segments from
REFERENCES

Abbreviations:
ASA, Acoustical Society of America
CLA, Papers from the Regional Meeting, Chicago Linguistic Society, Chicago
FL, Foundations of Language
Haskins RL, Status Report on Speech Research. Haskins Laboratories, New Haven
IJAL, International Journal of American Linguistics
IULC, Indiana Univ. Linguistics Club, Bloomington
JASA, Journal of the Acoustical Society of America
J. Ch. Lang., Journal of Child Language
JL, Journal of Linguistics
JSRR, Journal of Speech and Hearing Research
Lg., Language
Lg. & Sp., Language and Speech
LSA, Linguistic Society of America
PCCL, Proceedings of the International Congress of Linguists
PSPS, Proceedings of the International Congress of Phonetic Sciences
PPCL, Papers and Reports on Child Language Development, Stanford Univ. Department of Linguistics
RLP, Annual Bulletin, Research Institute of Logopedics and Phoniatrics, Univ. of Tokyo, Tokyo.
SL, Studies in African Linguistics
TAPA, Texas Linguistic Forum, Department of Linguistics, University of Texas, Austin
UCPL, University of California Publications in Linguistics. Univ. of California Press, Berkeley and Los Angeles
ZFS, Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung

Adam, N. (1972) Unpublished phonological diary of son from 1.7 to 2.3. Palo Alto, Calif.
References

Anderson, J., and C. Jones (1974) Three theses concerning phonological repre-

York.

--- (1976) Vowel consonants and the internal structure of segments. JL,
23, 336-346.


Universitet Umeåforskningsförening Wideromte Avdelning Nåk, Umeå.

Bailey, C. J. N. (1958) Diacritic differentials in the syllabification of non-non-

Bailey (1978) Gradience in English syllabification and a revised concept of un-
marked syllabization. IJL.

Ph.D. Diss., University of Leeds.

Bathwell, R. (1974) The phonological syllable with special reference to Dan-
ish. Annual Report, Institute of Phonetics, University of Copenhagen,
6, 59-128.

Banet, A. (1952) Le Langue bar:ern. International African Institute, Ox-
ford.


Bell, A. (1977) Some patterns of occurrence and formation of syllable struc-
tures. JL, 6, 133-137.

--- (1979) If speakers can count syllables, what can they do? IJL.

--- (1976) Review of Pullum, Syllable, word, name, puree. JL, 6, 243-
244.


--- (1976b) Accent placement and perception of prominence in rhythm-
ical structures. In Non (1976b), 1-33.

--- (1979) Syllabic consonants. In J. H. Greenberg et al. (Eds.) Univers-


Bloom, O. (1973) Notes sur le langage d'un enfant. Memoires de la Societe
Linguistique de Paris, 36, 37-59.

Diss., Harvard Univ.

--- (1973) A Phonological Investigation of Aphasic Speech. Newton, The
Hague.

References

Bolinger, D. (1972) Accent is predictable (if you're a mind reader). JL.
45, 635-644.

Man, Ottawa.

Massachusetts.

Brown, R., and B. Moelili (1966) The "tip of the tongue" phenomenon. Jour-
nal of Verbal Learning and Verbal Behavior, 5, 325-337.

Bruce, A., R. Fox, and W. K. Lagally (Eds.) (1974) Papers from the Pan-
American conference on Natural Phonology. Chicago Linguistic Society, Chicago.


Coppock, L. (1974) Phonological features: problems and proposals. JL,
40, 52-68.

Kurttis (Eds.) Papers from the Brussels Phonological Conference, The
graph, 3, 75-85.


ton-Mifflin, New York.


Cowan, W. L. (1963) Handbook of the Semen Language. State Education De-
partment, Albany.

--- (1977) Accent and related phenomena in the Five Nations Iroquois lan-

Cram, N., and M. Halle (1968) The Sound Patterns of English. Harper and
Row, New York.

Linguistics, 6, 819-831.

Clark, H. H., and E. V. Clark (1977) Psychology and Language. Harcourt,
Brace, Toronto, New York.

--- (1977) The morphological treatment of vowel harmony in R. W. Drew-
er and B. E. Pesetsky (Eds.) Phonology 1979, 113-129. Institute for
Sprachwissenschaft der Univ. Innsbruck, Innsbruck.


Coker, C. H., and L. Rabiner (1975) The importance of spectral detail in ini-

Coles, J. R. (1975) The Northwest Caucasian languages: a phonological sur-
vey. Ph.D. Diss., Harvard Univ.


Eimas, P. D., R. W. Strange, and J. J. Jenkins (1976) Acoustic versus phonological factors in vowel identification. Real at the first meeting of the ASA.


Fay, David, and Anne Cutler (1977) Vowelization and the structure of the mental lexicon. Linguistic Inquiry, 8, 505-520.


Firth, J. R. (1956) Alphabets and phonology in India and Burma. In Firth (1957), 54-75.


(1977b) A look into the effects of context: some articulatory and perceptual findings. Real at the 8th International Congress of Phonetic Sciences, Leeds.


(1976) Syllables as concatenated delexicalized affixes. Real at the 2nd meeting of the ASA.

(1977a) Recent findings on articulatory process of value and tongue movements as syllable features. Real at the Symposium on Articulatory Modelling, Gronum.

Univ. of Gottenburg Laboratory of Phonetics, Gottenburg.


(1971a) Aspiration, tenselessness, and syllabification in English. J. 47, 133-140.


(1977) On simple and complex segments. Read at the annual meeting of the LSA, Chicago.


(1983) Subcategory for linearization: vowel length and nasality in English. CSG, 18, 132-164.


References

Press, Evanston, Ill.


Lovins, J. R. (1977) A phonetic reappraisal of some common and uncommon constraints on syllable structure. Read at the annual meeting of the ASA, Chicago.


Macchi, M. J., and O. Pujammin (1975) Syllable concatenation: a preliminary look. Read at the 9th meeting of the AOA.

Macchi, M. J., and G. Nigro (1977) Syllable affixes in speech synthesis. Read at the 9th meeting of the AOA.


[1977] Developmental reorganization of phonology: a hierarchy of basic units of acquisition. Proc. IAC, 1, 36-


References


Nakatani, L. I., and K. D. Dole (1977) Local of the local cues for word juncture. JASA, 61, 714-719.


Raphael, L. J., J. M. D. Dorsey, F. Freeman, and C. Tabin (1975) Vocal and nasal duration as cues to voicing in word-final stop consonants: spectrographic and perceptual studies. JASA, 30, 151-158.


(1925) Sound patterns in language. JASA, 30, 77-95.
References


