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A REVISED APPROACH TO SOUTHERN PAIUTE PHONOLOGY

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Fifty years after Edward Sapir published his classic "La Réalité psychologique des phonèmes", the one enduring feature of Southern Paiute phonology is that it is still a problem despite the efforts of numerous linguists who have attempted to unravel the knot. Rather than discuss every contribution to a phonological description of Southern Paiute, I will limit myself to the three principle contributors, that is, the three works most consistently quoted and used in further analysis—Sapir's (1930) Southern Paiute, A Shoshonean Language; Harris' (1966) "Stress, Voice, and Length in Southern Paiute"; and Chomsky and Halle's (1968:344-9) The Sound Pattern of English. Each of the modern descriptions has made certain claims and proposals about and for the generative treatment of Southern Paiute phonology, but each has failed to capture the full nature of the problem, and, in some cases, serious errors have been made in utilizing the data.

Sapir's Description

Sapir's description (1930:6-70) of Southern Paiute phonetics and phonology is easily one of the most thorough and well-examplified descriptions of any North American language; indeed, it is one of the best phonetic descriptions available for any language. Sapir describes the consonantal processes on pages 62 to 70. He states (62):

A word must begin with either a vowel ... or one of the following nine consonants: P, L, G, NW, C, B, R, D, T. When these consonants, by the processes of derivation and composition, take up a medial position and are immediately preceded by a vowel, voiced or unvoiced, they assume ... one of three distinct forms.

He then provides the following table of the consonantal variations (62):
<table>
<thead>
<tr>
<th>Initial</th>
<th>Spirantized</th>
<th>Geminated</th>
<th>Nasalized</th>
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<td>n-</td>
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<td>-nn-</td>
<td>-nn-</td>
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Table 1. The consonantal variations

This chart illustrates what happens to a morpheme-initial consonant when it is preceded by another morpheme. Which change affects the consonant is determined by the preceding morpheme. Sapir states (63):

..., the deciding factor is the nature of the preceding stem or suffix, which..., must be credited, as part of its inner form, with an inherent spirantizing, geminating, or nasalizing power..., Thus, for purposes of derivation and composition one needs to know always whether a given stem or suffix is one that spirantizes, geminates, or nasalizes.

Thus, a morpheme-initial q- will appear as -g- after a spirantizing stem, e.g., *ṣagga-qa* 'to be red' (*ṣagga* 'red'; *-qa* 'stative'); as -gg- after a geminating stem, *gucca-gga* 'to be gray' (*gucca* 'gray', *-ga* 'stative'); and as -ng- after a nasalizing stem, *paš-ga* 'to be smooth' (*pašš* 'smooth'; *-ga* 'stative'). Sapir indicated the "inner form" of a stem or affix by writing -S (spirantizing), -G (geminating), or -N (nasalizing). The stems just cited would therefore be written *ṣagga-gS* 'red', *gucca-gG* 'gray', and *paš-gN* 'smooth'. Despite the changes which the initial consonant of -ga undergoes, the suffix itself is consistently spirantizing, as in the participial forms of each of the above forms--*ṣagga-ṛ-g- 'being red', gucca-ṛ-g- 'being gray', and paš-ṛ-gN- 'being smooth'. The stative suffix is therefore -ga-S. The participial suffix -ṛ-g- also undergoes the regular consonantal processes after geminating and nasalizing stems, for example, -'ai-ṭš- 'not having' and moppel-ṇit- 'streaming'.

While -ṛ-g- 'stative' and -ṭš-N 'participial' both show the expected and regular consonantal changes in their initial consonants, many suffixes are only found with a single type of initial consonant which is invariant no matter what type of stem it is attached to. These invariant consonants can be either spirantized, geminated, or nasalized. For example, the suffix
-vaN 'future' nearly always occurs with a spirantized initial consonant (the variant -qaAN generally occurs after a stem which contains a nasal rather than one that is nasalizing, although it is not always clearcut), thus we find quagvi-vaN- 'will shoot' from quagvi-ugai- 'shoot' (compare ta-quagvi-qaafi- 'shoot with the foot (kick) while sitting' with the secondary verb -garS- 'while sitting'), and yai-vaN- 'will hunt' from yai-N 'hunt' (compare yai-ug'ai- 'go hunting' with the suffix -qaai-S 'go while -ing'); the suffix -qaai-S 'go while -ing' always occurs with a geminated initial consonant (this is a variant of -qaai-S 'go while -ing' which does have a variable consonant), thus we find payi-qw'ai- 'go back' from payi-S 'return (sg)'; (compare payi-ass 'one who goes home' with the participial suffix -ta-N), and payi-qw'ayi- 'walk off' from payi-N (compare gas-payi-niki- 'comes singing towards' with the suffix -qi-S 'come while -ing'); the suffix -nqit-G 'benefactive' always occurs with an initial pronominal stop, as in gas-nqiti- 'sing for' from gas-S 'sing' (compare gas-ru- 'singing' with the participial suffix -ta-N), and sa'a-nqit- 'make mush for' from sa'a-G 'boil' (compare na-sa'a-ganni 'sweet house' with the noun ganni-S 'house').

With the possibility of two types of initial consonant—the variable and the invariable—it is important to keep the forms distinct in the lexicon. Sapir did this by writing the invariable forms with the initial consonant which always occurred. The variable forms he wrote by indicating all three possibilities, for example, -qa, -nqat, -nqai 'stative'. On page 63, however, he uses the term "schematic form" and writes this suffix as -qa. This is the same as his "maximally correct" forms of 1933 (1949:50). If we drop the listing of all the variants, and write the "schematic form", there are four possibilities for the initial consonant of a morpheme. These four possibilities are (illustrated with the uvular stop series) g, k, gq, and gg, the first being the variable consonant and the remaining ones being the invariable consonants.

From the discussion in Sapir (1930), it is apparent that Sapir treated these processes as lexical rather than phonological, that is, the consonantal variations were due either to the type of stem to which a morpheme was attached or to an invariable initial consonant. Whenever a stem's "inner form" contradicted the initial consonant of the suffix, the suffix form took precedence. In the case of the variable suffixes, the variant appropriate to the stem was attached without regard to specific phonological rules. However, Sapir also states (45) that there are "only twelve, at most thirteen, primary [underlying, non-derived] consonants: g; g; gw; g; t; t; b; b; m; m; r; l; possibly also initial h-". We also states (45-6) that;
The unaspirated stops and affricates occur as such only initially before a voiced vowel and medially after an unvoiced vowel...; otherwise they are either ‘nasalised’... or ‘geminated’.

Concerning spirantization, he writes (46) that "all spirants (except g, w, y, h) are developed from stopped consonants".

From this discussion, it seems that Sapir considered the consonantal processes to be not just lexical rules, but also phonological rules and that he considered the voiceless stop series to underly the spirantized, geminated, and nasalized series. He does not, however, actively pursue the implications of these claims in his "phonemic" forms, although the only series that could be represented differently is the spirantized series. Throughout the grammar and lexicon, medial spirants are consistently written as underlying. McCawley (1967:110) discusses Sapir's "phonologic" representations, and states "if a morpheme always possesses a medial glottal stop, Sapir will write that segment in his phonologic representations even if there is a phonologic rule of the language which would insert it anyway". The medial, ungeminated, unaspirated stops of Southern Paiute are always spirantized, therefore, Sapir always writes spirants and not stops in morpheme internal positions. He does recognize, however, the underlying nature of the stop, hence his "schematic form" (63) is -g-a-z 'stative' even though this morpheme never surfaces with an initial ungeminated g. McCawley also states (110) that "Sapir would... treat one single phenomenon as two if its effects were manifested both in the alternations of some morphemes and in the constant shapes of others". Thus, for Sapir, spirantization was both a lexical rule and a phonological rule, although, in 1930, he considered the phonological aspect of this rule to be a diachronic rather than a synchronic process (63-64).

The discussion of stress and vocalic devoicing revolves around the question and definition of mora. Sapir (38) states that:

Of greater phonologic importance than the division of a word into syllables is that into units of length, moras. Every cosmic [underlying non-derived] short vowel... counts for one mora; every long vowel or diphthong... for two.

Stress placement in Southern Paiute is mora-counting, not syllable-counting. Sapir (39) called the stress placement rule the "law of alternating stresses" whereby "all odd moras are 'weak' or relatively unstressed, all even moras are 'strong' or relatively
stressed". Primary stress nearly always falls on the second mora, except in bisyllabic words which have primary stress on the first mora and words which begin with one of a few prefixes which have primary stress always associated with them, for example, gand 'my house', with stress on the second mora, gant 'house', a bisyllabic word with stress on the first mora, and g-jiv- 'drink in vain', and g-ppqne- 'look in vain', with stress on the prefix g- 'in vain'. The law of alternating stresses would therefore assign stress to the form tagqiu-gqi-ngqit-pptqei-eqqa'-mt 'they hit it so that it broke into pieces' to yield tagqiu-gqi-ngqit-pptqei-eqqa'-nt. Primary stress is on the usual second mora.

All final moras are deviced in Southern Paiute and while this devolving varies as to degree (Sapir 1930:27-33), I will treat it here as fairly regular in retaining the quality of the final vowel. This is a rather straightforward rule, and would seemingly require little comment, but for two considerations. First, Sapir explicitly states that non-final vocalic devoeing is bled by this rule (39) when he states that non-final devoeing affects all weak moras before a geminated stop or sibilant except "the next to the last mora, which is always preserved intact (owing to the unvoicing of the following mora)". Final vowel devoeing must therefore precede non-final devoeing in a derivation. Second, while Sapir makes no mention of the relative ordering of final vowel devoeing and the law of alternating stresses, I have ordered these as stress placement first and final devoeing second. Applying Sapir's rule formulations in either order can assign strong mora status to a final vowel, therefore, a word-final voiceless vowel could have relative stress. A slight modification to his law of alternating stresses would state that final vowels are always weak moras or a modification to the final vowel devoeing rule would state that final vowels lose their relative stress. Sapir would most likely have opted for the former modification as this leads to the simplest derivation with no false steps (viz., assigning stress to a syllable and then taking it away with a later rule).

Once stress is known, non-final vocalic devoeing can be described. While Sapir does not deal with ordered rules per se, such a notion seems implicit in his discussion. He explicitly states (39), following his description of the law of alternating stresses, that "we may now state the full law of non-final unvoicing". Indeed, his vocalic devoeing rule makes use of the 'weak' mora which he has defined by the stress rule above, thus, the law of alternating stresses affects non-final devoeing. His rule states (39):

Aside from the next to the last mora, which is always preserved intact (owing to the unvoicing of the following
mora, every weak mora standing before a geminated stop (pp; D; CE; DQ; QW) or sibilant (ss; postvocalic sibilants are always to be understood as geminated) loses its voice. A diphthong or long vowel can be partly unvoiced only when its second mora is weak.

This rule would then devoice the vowels in tequmqegbqegbelaqam. ‘they hit it so that it broke into pieces’ to yield the near-surface form tequmqegbqegbelaqam. In his statement of the distribution of unaspirated stops (45), Sapir says that “the unaspirated stops occur as such only initially before a voiced vowel and medially after an unvoiced vowel”. However, the rule of vocalic devoicing applies only to vowels before geminated stops. This is a rather clear case of Sapir's implied ordering as he states (46) that the unaspirated stops following voiceless vowels are geminated in origin. Sapir has thus implicitly ordered four rules: (1) the law of alternating stresses; (2) final vowel devoicing; (3) non-final vowel devoicing; and (4) degemination of stops after a voiceless vowel. The surface form of tequmqegbqegbelaqam is therefore tequmqegbqegbelaqam.

One final aspect of the devoicing of moras is the devoicing of voiced non-vowels in front of a voiceless vowel. Sapir (45) simply states that:

. . . most of the voiceless spirants . . .; the voiceless or partly voiceless nasals . . .; and the voiceless rolled R are all developed from the corresponding unaspirated or voiced forms . . . in connection with the unvoicing of moras.

The nasals do not seem to consistently devoice and ɑ is never found voiceless in Sapir’s data, but the spirants and glides devoice regularly. For example, t'eva ‘pine nut’ becomes t'eqa, and p'eqapwitsa ‘Sore Buttocks (acc.)’ becomes p'eqapwitsa.

In 1933, Sapir (1949:11) revised his treatment of intervocalic spirantization and, in a now (infamous) chart, showed both surface and underlying forms for a number of possible word shapes. The spirantized consonants were, naturally, treated as underlying simple stops, a marked departure from his 1930 treatment which treated spirantization as a lexical rule rather than a phonological rule. Sapir’s “words” were composed of nonsense syllables, but Cairns (1978:215) has revised Sapir’s chart to include real words of the specified shapes. The addition of the intervocalic spirantization rule to the previously described rules and the use of Cairns’ lists of words provides us with the following derivations:
Glosses are: 'pine nut', 'pine nut (accusative)', 'mountain', 'mountain (accusative)', 'bladder', 'bladder (accusative)'

Glosses are: 'blood', 'blood (accusative)', 'snow', 'snow (accusative)', 'puts on'

Glosses are: 'is a horse', 'nose', 'nose (accusative)', 'let it go', 'let ... go'
While these rules and derivations work well for the vast majority of data, there is one specific instance in which Sapir's rule as stated will not derive the correct form. His law of alternating stresses as stated does not take into account the prefixes which are always stressed on the first mora. These prefixes disrupt the normal stress pattern by assigning strong syllables on odd micas rather than even micas. Sapir (42) tries to explain these on historical grounds, but is only partially successful. He is finally forced to mark initial stress in the lexicon on the two that cannot be explained—the G 'in vain', and têra-ô 'desert, open expanse, bare'. The effects of these on mora-counting can be seen in the forms têra-am 'aigilizanii 'destined to be a desert dog, coyote' (from têra-ssêna'avi-gai-vaa-nits), where the second mora is voiceless.
before a geminate consonant; and \textit{tēr-a-qqwii-wa}: my unfeathered arrow (from \textit{tēr-a-qqwii-wa-ni}), where the third zero is strong and is not devoiced before the geminate consonant.

**Harm's Analysis**

Harm (1966) did a great deal of reanalysis of Sapir's data and made several rather startling claims. Most of his conclusions, however, are based not on derivational or naturalness considerations, but on feature economy in the rules and lexicon. Rather than discuss all of Harm's rules, I will confine the following comments to those rules which deal with the questions of the consonantal variations, stress, and voiceless vowels and will deal with his rules in the order in which he gives them.

In discussing long and short segments, Harm analyzes long vowels as underlying geminate clusters of short vowels, and long intervocalic nasals as underlyingly short, to be lengthened by rule. These two solutions are fairly straightforward, but his discussion of geminate stops is where the analysis begins counting features. As can be seen from Sapir's description, voiceless vowels, stress, and geminate obstruents are quite interrelated. Sapir's solution uses stress and gemination to predict voiceless vowels (with subsequent degemination following a voiceless vowel). Harm's solution, on the other hand, uses stress and voiceless vowels to predict gemination. On the basis of number of features used in the rules and lexicon, Harm sets up voiceless vowels as underlying and all stop consonants as short and voiceless. This seems to be a highly unnatural solution and has generated a large amount of criticism both from specialists in the Uomic languages and from theoreticians. Iannucci (1973:80-81), for example, writes:

One can not consider economy of description out of the context of other theoretical principles, especially that of the theory of 'markedness'. the existence of an underlying voiced/voiceless distinction for vowels /i/—at least—highly marked and thus quite damaging with respect to the economy of the system. This consideration of 'naturalness' in phonology leads us to view Harm's analysis as something of an exercise in 'hocus-pocus' linguistics.

Kelly (1978:95-96) goes further:

... Greenberf [sic] (1969) has shown that voiceless vowels are predictable in all languages, a fact which makes Harm's solution look highly unnatural, and no amount of feature saving can outweigh this unnaturalness.
This approach, which achieves economy but misses generalizations, ignores the original motivation for the simplicity metric ...

The bulk of criticism of Harns' analysis has dealt with his setting up underlying voiceless vowels; however, the first rule which deals with the problems in this paper (2b) is equally unnatural. Harns is describing the output of:

Rule 2b

\[ -\text{cns} +\text{voc} \rightarrow [+\text{stress}] \]

simply says (231) "all vowels receive stress" without further discussion. The long arguments describing the rationale behind underlying voiceless vowels and the brevity of this statement have probably equally contributed to the lack of attention which this rule has received, but it is no less unnatural than underlying voiceless vowels. In addition to the unnaturalness of stressing all vowels, this rule also stresses the voiceless vowels.

Rule 5 is fairly straightforward:

Rule 5

\[ (-) +\text{voice} / \text{voiceless} \]

This rule devices word final vowels and unstresses them.

Rule 6 then removes stress from odd syllables unless they are penultimate:

Rule 6

\[ -\text{cns} +\text{voc} \rightarrow [-\text{stress}] / \left( -\text{cns} +\text{voc} \right) \]

Rules 2b, 5, and 6 would "assign" stress by adding it to all vowels, deleting it word-finally, then deleting it on all odd non-penultimate vowels. This method of assigning stress to a word suffers not only from the sheer weight of being non-intuitive, but also from involving a rather complex false step in the derivation. Harns' rules may use features more economically, but his derivations...
are far more complex. Sapir's one step law of alternating stresses has become three steps in Harms' solution. In addition, Harms' solution cannot account for inverting first syllable stress on ꟓ-G 'in vain' and Ṭṝa-S 'desert, bare'.

Harms Rule 7 geminates consonants after a stressed voiceless vowel:

\[
\begin{array}{c}
{ [+\text{cns}] } & \rightarrow & { [+\text{long}] } \\
-\text{voc} & & -\text{voc} \\
\end{array}
\]

Once again, the question of naturalness raises its head and asks why gemination is triggered only by a stressed voiceless vowel and not by a stressed voiced vowel also. Indeed, the voiceless vowels, in general, are merely abstract markers to indicate that the following consonant is geminated if it follows stress. Over half of the underlying voiceless vowels are voiced at some point in the derivation. This use of voicelessness as an abstract feature can be illustrated in the derivation of ḷagṣə-sa²pəl 'sunflower mush'. The verb /sa²/ 'boil' (Sapir's sa²-a-G) is first nominalized with the passive participle suffix /-pl/ (Sapir's -apli); as discussed below, this invariably geminated consonant cannot be represented in Harms' system, but here, it is affixed to a geminating stem and the problem is not apparent), yielding /sa²-Api/ 'mush (what is boiled)'. The noun /Ag₃n²/ 'sunflower seeds' (Sapir's ag₃+N) is then compounded with /sa²-Api/ to yield /Ag₃s₃sa²Appl/ 'sunflower mush'. A modification to Harms' nasal deletion rule will then delete the nasal before the s so the form /Ag₃s₃Appl/ will go through the rules, but the incorrect *[Ag₃s₃appl] will be generated. Harms has no rule for geminating a fricative other than Rule 7 despite the fact that Sapir specifically states (1930:39) that 'postvocalic sibilants are always to be understood as geminated'. Harms' rules will take care of geminated ss by always having it preceded by a voiceless vowel. Thus, in order to correctly derive Ag₃s₃s₃Appl by Harms' rules, we must have /Ag₃n²/ as the underlying form of 'sunflower seeds'. The voiceless s will NEVER surface as such (except in final position), serving only to geminate a following s after the final nasal has been deleted. Compare, for example, the surface forms ḷag₃Appl 'sunflower seeds', and ḷag₃Appl 'sunflower plant'. Not only ḷag₃-N, but every other one of Sapir's nasalizing stems would have to end in a voiceless vowel in Harms' forms in order to account for the behavior of s in a following morpheme; for example, Nêt₃ʃ₉m₇-zA 'to let a person go' (from Sapir's n₇-N 'person' and s₉m₇-G 'to let go'; Harms' /n₇n=ʃ₉m₇A/), and o vít₃savlići 'wooden
dog' [from øyi-M 'wood' and satii-ci 'dog (absolutive)'; Harms' /opI=satii-ci/].

Rule 8 spirantizes (and voices) the stops after a voiced vowel:

\[ +\text{cns} \rightarrow [+\text{cnt}] + [+\text{voc}] \]

Rule 9 voices stressed vowels:

\[ +\text{voc} \rightarrow [+\text{voice}] \]

Rule 10 voices vowels before a voiced segment:

\[ +\text{voc} \rightarrow [+\text{voice}] / \]

As can be seen, Harms' rules may be simple, but where Sapir needed only one rule for non-final devoicing, Harms has two separate rules for vocalic voicing. These two rules cannot be collapsed and clearly illustrate a more complex derivation than Sapir's rules yield.

Rule 12 devoices consonants before a voiceless vowel:

\[ +\text{cns} \rightarrow [-\text{voice}] + [+\text{voc}] \]

According to Harms' approach, some of the forms used to illustrate Sapir's rules above would have the derivations found below.

/ˌtɛpə/ /ˌtɛpə/ /ˈqaɪpə/ /ˈqaɪpə/ /ˈpʊkwə/ /ˈpʊkwə/  
2b ˈtɛpə ˈtɛpə ɡəˈpə ɡəˈpə ˈpʊkwə ˈpʊkwə  
5 ˈtɛpə ˈtɛpə ɡəˈpə ɡəˈpə ˈpʊkwə ˈpʊkwə  
6 --- ˈtɛpə ɡəˈpə ɡəˈpə --- ˈpʊkwə  
7 --- --- --- --- ˈpʊkwə --- 
8 ˈtɛfə ˈtɛfə ɡəˈfə ɡəˈfə --- ˈpʊkwə 
9 --- --- --- --- ˈpʊkwə --- 
12 ˈtɛfə --- ɡəˈfə --- ˈpʊkwə  
[ˈtɛfə] [ˈtɛfə] [ˈqaɪfə] [ˈqaɪfə] [ˈpʊkwə] [ˈpʊkwə]

[Glosses are: 'pine nut', 'pine nut (accusative)', 'mountain', 'mountain (accusative)', 'bladder', 'bladder (accusative)']

/ˈpæpɪ/ /ˈpæpɪ/ /ˈmʊpɪə/ /ˈmʊpɪə/ /ˈmʊpɪə/  
2b ˈpæpɪ ˈpæpɪ nəˈpə ˈmʊpɪə ˈmʊpɪə  
5 ˈpæpɪ ˈpæpɪ ˈnəpə ˈmʊpɪə ˈmʊpɪə  
6 ˈpæpɪ ˈpæpɪ ˈnəpə ˈmʊpɪə ˈmʊpɪə  
7 ˈpæpɪ ˈpæpɪ ˈnəpə ˈmʊpɪə ˈmʊpɪə  
8 --- --- ˈnəpə ˈmʊpɪə ˈmʊpɪə  
9 ˈpæpɪ ˈpæpɪ ˈnəpə ˈmʊpɪə ˈmʊpɪə  
12 --- --- ˈnəpə ˈmʊpɪə ˈmʊpɪə  
[ˈpæpɪ] [ˈpæpɪ] [ˈnəpə] [ˈmʊpɪə] [ˈmʊpɪə]

[Glosses are: 'blood', 'blood (accusative)', 'puts on', 'nose', 'nose (accusative)']

/ˈmʊtəɡə/ /ˈmʊtəɡə/  
2b ˈmʊtəɡə ˈmʊtəɡə  
5 ˈmʊtəɡə ˈmʊtəɡə  
6 ˈmʊtəɡə ˈmʊtəɡə  
7 ˈmʊtəɡə ˈmʊtəɡə  
8 --- --- 
9 ˈmʊtəɡə ˈmʊtəɡə  
12 ˈmʊtəɡə ˈmʊtəɡə  
[ˈmʊtəɡə] [ˈmʊtəɡə]

[Glosses are: 'forehead', 'forehead (accusative)']

Examining the derivations reveals several serious problems with Harris's analysis. First, the starred forms reveal a serious weakness of his rules assigning stress to all vowels and then deleting it with the two rules which he has postulated. There is no rule to delete penultimate stress on an odd-numbered mora. It might seem to be possible to add a rule deleting specifically penultimate stress after another stressed vowel, but it must be ordered after Rule 7 has generated the following consonant and Rule 9 has voiced it (in the case of the voiceless vowels). This rule would be rather unnatural as it would be separated from the other stress rules. In
deriving Apśiqwu 'to fall asleep' from Harms' underlying /Apś4gu/
illustrates this misplaced stress rule:

/Apś4gu/ --> (2b) Apś4gu --> (5) Apśiqwu --> (6) Apś4qwu -->
(7) Apśiqwu --> (9) Apśiqwu --> (new rule) Apśiqwu -->
[Apśiqwu]

Second, the derivations are full of false steps, specifically with regards to stress. The majority of vowels stressed by Rule 2b are unstressed later in the derivation. For example, out of five vowels stressed by 2b in /píqaqwíttha/ 'Sore Buttocks (acc)', only two retain their stress in the final form [píqwaWítha].

Finally, the derivations are much longer than Sapir's and more convoluted. For example, in Sapir's solution, the derivation of [símaqwa] 'let it go (preterite)' requires only two steps while Harms' derivation requires five steps. It is clear that Harms' attempt to save features in the rules and lexicon fails if the total number of steps in a derivation is increased. In only eight of twenty-six derivations illustrated for Sapir's rules is Harms' derivation simpler than Sapir's, and in each of these, Sapir's derivation is only one step longer. Each of Sapir's longer derivations is shortened in Harms' derivation by assuming underlying voiceless vowels. This is not a significant savings.

One feature of Harms' reanalysis has, however, been widely accepted and has formed the basis of many subsequent discussions of not only Southern Paiute, but of other Uemic languages as well. Sapir had discussed the consonantal variations in lexical terms, that is, the initial consonant of the variable suffixes was determined by the "inner form" of the preceding morpheme. During word formation, prior to any phonological rules, one of the three possible shapes of the morpheme was matched to the stem. Harms reanalyzed this not in lexical terms, but in phonological terms, that is, the initial consonant of a morpheme was invariable in underlying form, but was changed by regular phonological rules. Instead of stems having an "inner form", Harms analyzed spirantizing stems as ending in a voiced vowel subject to Rule 1 which spirantizes the following consonant; geminating stems were analyzed as ending in a voiceless vowel which (by the numerous rules of stressing, destressing, voicing, and lengthening) geminates the following consonant; and nasalizing stems were analyzed as ending in a nasal which was lost word-finally and before vowels and resonants, but was assimilated to the place of articulation of a following stop. Rules 4b and 17 describe the nasal deletion and assimilation:
Rule 4b
\[ +\text{nas} \rightarrow \text{null} \]
\[ +\text{voc} \rightarrow \{ -\text{[voc]} \} \]

Rule 17
\[ +\text{nas} \rightarrow [\alpha \text{cmp} \beta \text{grv}] \]
\[ +\text{nas} \rightarrow [\alpha \text{cmp} \beta \text{grv}] \]

It should be noted that Harms' nasal deletion rule (4b), as formulated, does not work, because it does not include s in the conditioning environment. As formulated, Rule 4b would derive from /Aqén/ 'sunflower seeds' (Sapir's Aug-M, compare Ktêspîp 'sunflower plant') and /Aa'Api/ 'mush' (Sapir's ga'appi) the incorrect 'Aqëns'appp 'sunflower mush'. The correct form does not include the nasal—Aqëns'appp. Thus, what to Sapir was a lexical feature of the preceding stem, is to Harms a phonological feature. This was Harms' contribution to Southern Paiute phonology. Historically, there is evidence supporting the analysis of spirantizing stems ending in a vowel and nasalizing stems ending in an underlying nasal (see L. Miller 1982), but Harms' analysis of underlying voiceless vowels makes his solution for geminating stems counter-intuitive.

While Harms' solution for spirantizing and nasalizing stems seems to be a good one, there is one inherent flaw in treating consonantal variation strictly phonologically. The morphemes which begin with an invariant consonant are a serious problem in Harms' solution. Morphemes which always begin with a nasal pose no problem—the nasal is added to a vowel final stem, a voiceless vowel will voice in front of a voiced consonant (Rule 11), and, presumably, another rule will shorten a three consonant cluster (nasal, nasal, stop) by deleting the first nasal. The other two types of invariant morpheme, however, will not operate correctly under Harms' rules when affixed to a stem of a different type—that is, a spirant initial morpheme on either geminating or nasalizing stems, or a geminate initial morpheme on either spirantizing or nasalizing stems. The following derivations illustrate the problem.
Both the spirantized stems and the geminated stems require, in Harms' analysis, that the final segment of the stem be modified in some way. The stems ending in a nasal must drop the nasal, the stems ending in voiceless vowels must have the vowels voiced, and the stems ending in voiced vowels must have the vowels devoiced. There is no mechanism in Harms' approach by which this can be accomplished. Any phonological solution (such as creating an abstract "preceding vowel devoicing/voicing" feature) will be completely ad hoc and non-intuitive. We are thus left once again on the doorstep of a lexical solution as the phonological statements of Harms are inadequate to describe the data.

Chomsky and Halle's Discussion

It should not be surprising to find that a language of Southern Paiute's theoretical interest and quality of description has a place in the Sound Pattern of English (Chomsky and Halle 1968:34-9). Chomsky and Halle reworked Harms' analysis of stem-final features determining the initial consonant of the following morpheme. They made several key changes to Harms' rules, however, and thereby established a phonological framework which numerous following phonologists have accepted. They made, however, a serious error in using Sapir's chart (1949:51) of phonological and phonetic shapes without checking the forms thoroughly in his grammar (1930). Kelly (1976:122) makes the following remark:

McChesley (1974) praises this analysis as "highly insightful...an elegant analysis of rather fearsome-looking data". What data? Chomsky and Halle produce not one single word of Southern Paiute as evidence...

In addition, for some reason unknown to me, Chomsky and
Halle reinterpreted Sapir's bilabial and velar fricatives as voiced and voiceless variants of glides; therefore, their Rule (54) for devoicing of consonants only works on sonorants, which excludes the devoicing of y, g, and w.

One important revision of Harris' analysis by Chomsky and Halle is to set up geminate consonants as underlying, thus doing away with Harris' voiceless vowels. To account for the geminating stems, they set up an underlying step in stem final position which totally assimilates to a following consonant (here symbolized by C). They then generalize Harris' Rules 4b and 17 (which only dealt with nasals) to Rules (44) and (45):

**Rule 44**

\[ (+cons) \rightarrow \emptyset / \quad \{ +v \} \]

**Rule 45**

\[ (+cons) \rightarrow \begin{align*}
\text{xant} \\
\text{floor} \\
\text{high} \\
\text{back}
\end{align*} + \begin{align*}
\text{xant} \\
\text{floor} \\
\text{high} \\
\text{back}
\end{align*} \]

These two rules, while looking straightforward enough, are unable to handle several things. First, as discussed under Harris' rules, Rule (44) will not delete a nasal or obstruent in front of \( g \), if the stem-final obstruent stop is retained before \( g \), then it does not assimilate correctly, but becomes \( \emptyset \) rather than forming a geminate \( gg \). For example, /tac'/ 'tac' (Sapir's ta-0) plus /st\( u \) + pi/ 'toe, finger (absolutive)' (Sapir's sa-ag-\( u \)-\( i \)) would yield /tac + st\( u \) + pi/ which would become tatsu\( u \) after the application of rule (45); and tat\( u \)vi (ignoring the problems with Rule (46) for now) after the application of Rules (46), (47), and (51). This would presumably lead to a surface form such as *tatsu\( u \), although Chomsky and Halle's rules are poorly written after this point (due to their analysis of intervocalic voiced fricatives as glides). The correct surface form is tatsu\( u \) 'toe'.

Rules (44) and (45) also do not correctly delete stem-final nasals and obstruents before morpheme-initial glides. For example, /saag\( a \)c/ 'in hiding' (Sapir's sa-ag-\( a \)-\( x \)) and /wa-ag\( a \)-/ 'put' (Sapir's wa-ag\( a \)-\( x \)) become /saag\( a \)ag\( a \)-/ 'put in hiding', but Chomsky and Halle's rules predict \( +aag\( a \)ag\( a \)-\( x \)}. Also, geminating stems have the same effect on initial nasals as do nasalizing stems (Sapir 1920:63), but Chomsky and Halle's rules would derive /\( a \)ag\( a \)ag\( a \)-/ instead of /\( a \)ag\( a \)ag\( a \)-/
'prairie dogs' from /ayac/ 'prairie dog' (Sapir's ayA-G) and /-mt/ 'plural'.

Rule (46) spirantizes postvocalic stops, although it supposedly produces non-strident voiced continuant glides for p, t, and qw. I do not know where they got the idea that these were glides rather than fricatives, but it was certainly not from Sapir (1930 or 1949). Sapir clearly distinguished between the glides or semivowels, k and y (1930:56), and the other consonants. Chomsky and Halle's rule therefore, does not produce the correct phonetic forms:

Rule 46

\[-son \rightarrow \{+cont, +voice\} / V + \_\]
\[-strid \rightarrow \{+son, +cons\} \_\]
\[-cor \rightarrow \{+voc\} \_\]

This rule also contains one additional flaw. It only operates after a morpheme boundary. It will therefore be necessary, given this formulation, to set up voiced intervocalic fricatives which do not follow a morpheme boundary in the underlying form. Thus, the underlying form of 'hair' must be /pʰaɪ̯/ as there is no rule in Chomsky and Halle which will spirantize a morpheme-internal stop. Their statement of the underlying consonants of Southern Paiute (346), however, does not include voiced fricatives.

Rule (47) assigns stress and is a formal version of Sapir's law of alternating stresses. It is a rather impressive formulation and handles the data 99% effectively. The only problem arises with the two intractable prefixes é-G 'in vain' and tōra-S 'desert, bare' which always have first syllable stress:

Rule 47

\[V \rightarrow [1 \text{ stress}] \rightarrow \# \langle C_0 \left( C_0 W C_0 V \right) \rangle C_0 \rightarrow \langle [+\text{seq}] \rangle C_0 V \#\]

Rule (51) deletes the second of two obstruents in a cluster when followed by a stressed vowel. This rule necessarily applies after Rule (47) has assigned stress:

Rule 51

\[-son \rightarrow \# / [1 \text{ son}] \rightarrow \{+voc, +cons\} \_\]
Chomsky and Halle analyze geminates in Southern Paiute as clusters of two identical consonants; therefore, this rule is a degemination rule.

Rule (53) devoices a vowel before a word boundary or obstruent followed by a vowel.

Rule 53

\[ V \rightarrow [-\text{voice}] / [-\text{son}] \]

Stress is not important in the formulation of this rule because, at this point in a derivation, there will be no sequences of stressed vowel, obstruent, vowel. This is possible for Chomsky and Halle because they have changed the nongeminated stops into glides rather than fricatives. While this rule seems rather straightforward, there is an objection on the basis of naturalness. This rule misses the generalization that voiceless vowels both are always unstressed and always precede either a word boundary or a voiceless consonant. A more damaging aspect of this rule is that it does not take into account the difference between underlying /VCV/ and /VVCV/ sequences. /c/ is [+strident], therefore is correctly unaffected by Rule (46) which spirantizes non-strident obstruents. Rule (55), however, then shortens /c/ clusters to /c/, thus losing the distinction between /VCV/ and /VVCV/ sequences. For example, /qaccaqqa/ 'to make a splash' (Sapir's /qwasqaqqa/) by Rule (47) would have the second vowel stressed and then by Rule (51) would become /qacqqa/. Rule (53) would then produce /qacqqaq/. However, /qwasqya/ 'spashes about' (Sapir's /qwasqaqa/) would come out of Rule (47) with the form /qwasqya/, and Rule (53) would then produce *qwasqyaq, the correct surface form being /qwasqyaq/ (certain phonetic detail rules being ignored).

Rule (54) devoices sonorants in front of a voiceless vowel (treating voiced fricatives as sonorants).

Rule 54

\[ [-\text{son}] \rightarrow [-\text{voice}] / [-\text{cons}] \]

Chomsky and Halle's rules are in many ways simply formal versions of Sapir's prose rules, and thus are more intuitive and natural than Harn's. They suffer, however, from an extreme amount of carelessness in the formulations, allowing segments to leak through in great numbers. Their rules are even more serious because
of the fact that they only cite Sapir's 1933 (1949) chart, but then take morpheme boundaries into account in an inordinate number of their rules. Sapir's chart does not contain morpheme boundaries, yet Chomsky and Halle's Rule (46) is supposed to derive w and W [sic] from underlying u.

Chomsky and Halle's formulations of stem-final vowels, nasals, and stops looks adequate to account for the data presented, and they are an improvement over Harms' stem-final segments, but they still fail to account adequately for the morphemes which have invariable initial consonants. As with Harms' rules, morphemes with a nasalized consonant pose little problem, if a cluster reducing rule is in effect, but the invariable spirantized and geminated consonants pose severe problems. Adjusting Chomsky and Halle's rules for spirantization so that stops become fricatives, the following derivations illustrate what happens to the invariable consonants in Chomsky and Halle's system:

\[
\begin{align*}
\text{[glosses are: 'will shoot', 'will hunt', 'come back']}
\end{align*}
\]

Chomsky and Halle's rules, aside from being poorly written, cannot account for the data in phonological terms alone. Their rules, strictly applied, produce linguistic forms, but they are not Southern Paiute.

A Reappraisal

There are certain pieces of data which any reformulation of Southern Paiute phonology must be able to handle. First, it must be able to deal with the standard consonant variations, stress placement, and vowel devoicing in a natural and intuitive way. Second, it must be able to deal with abnormal stress placement with adjusted mora counting. And third, it must be able to deal with the morphemes with invariable initial consonants. It has been shown above that both Harms' and Chomsky and Halle's approaches fail to account for the second and third pieces of data completely and that the first piece of data is either handled sloppily or in an
unnatural, non-intuitive way. Even Sapir's description fails to handle the second set completely.

The first question which needs to be asked is how much of the description is lexical and how much is phonological. The consonantal variations which Kravna and Chomsky and Halle dealt with were the regular ones, that is, those cases where a single stem is always followed by the same type of consonant and a single morpheme always changes its initial consonants to suit the preceding stem. Their rules, however, have been shown to be inadequate to deal with morphemes which always begin with the same consonant. The rules could possibly be revised to handle the variable consonants, but any formulation would be extremely messy, and would still have problems dealing with morphemes with always have an initial spirantized consonant. Somehow the rules would have to delete the stem-final stop or nasal on just these suffixes—in other words, a lexical solution, not a phonological one, is called for.

Kelly (1978) has mustered several arguments and a fair amount of data supporting a strictly lexical solution to the consonant variations (although she seems to have thrown the baby out with the bathwater in trying to argue against any phonological input, especially in dealing with spirantization). Her best argument (129-34) shows several examples of morphemes which have dual marking of features, that is, stems which can be either spirantizing or geminatizing, geminating or nasalizing, etc. These cannot be handled in a strictly phonological framework. In Chomsky and Halle's analysis, a stem which varied in its final feature would have to listed twice in the lexicon with the same meaning—for example, once with a final vowel, and once with a final stop. Compare *apakpwisa* 'to flash red' (apaga- 'red'; kwisa 'flash') with *anepaquoro*—'paint the face' (apaga- 'red'; qoro 'paint'), where apaga 'red' has both spirantizing and geminating force. A strictly phonological treatment would require two entries in the lexicon—apaga and apaga—. Such variations in one, however, are to be expected when dealing with phonological classes, but with lexical classes where the processes of analogy and reanalysis are constantly at work levelling class distinctions.

Historically, the basis of the consonantal variations is phonological. I. Miller (1982) has demonstrated several ways in which the spirantizing, geminating, and nasalizing stems could have developed in Proto-Nunic. Phahoni, a language of the Central Nunic group (Southern Palute being in the Southern Nunic group), preserves the stem-final nasals in more environments in nouns than does Southern Palute (W. Miller 1975:5). When the accusative suffix -ga is affixed to a nasalizing stem, the underlying stem-final nasal surfaces. For example, /tsoon/ ['heads'] becomes /tsoona/
[tsona] 'beads (accusative)'. Also, for some speakers, the final nasal can nasalize the preceding vowel—[teŋə] 'beads'. Nasalization can also proceed inward in a word if the final syllable begins with a semivowel to yield all the following surface forms of /pỳn/ 'duck': [pỳŋ], [pỳʃ], [pỳŋ]. These changes are in addition to the usual environments for a stem-final nasal, that is, in front of a following stop as in /pỳsəŋ/ [pỳsəba] 'on the duck'.

It is unreasonable to assume, however, that what was once a phonological process must remain a phonological process. It is quite natural for phonological processes such as those found in the Numic languages to develop into lexicical processes. That is, the variation in morpheme-initial consonants may no longer be due to phonological conditioning (Is there a final consonant on the stem?), but to lexical conditioning (What class does this stem belong to?). The question is a difficult one. One consideration is whether or not the irregularities in a phonological treatment of consonantal variation are great enough to constitute a serious threat. While there is no objective measure of the amount of acceptable irregularity, it seems quite clear that the irregularities in Southern Paiute are quite numerous. Including the stems which have two possible processes and the morphemes which have invariant initial consonants alone, we find a significant number of problems with a strictly phonological approach to Southern Paiute consonants.

If, on the other hand, we assume a lexical solution to the consonant mutations, many of the problems are cleared up. Class membership, is, naturally, often flexible and somewhat variable, due to the natural tendency to standardize all stems into one class. Most stems are spirantizing; therefore, most of the stems with multiple class membership are members of the spirantizing class and either the geminating or nasalizing class. However, the set of stems which have multiple class membership in the geminating and nasalizing class, but not the spirantizing class, is quite small (only one of Kelly's examples is clearcut—tö'قن-GN 'hole'; compare tö'ęp 'hole' and mōvit't'ęp 'nose', both of which have the absolutive suffix -pə). In Shoshoni, verbs have been completely levelled in terms of class membership so that only the spirantizing class remains (a different class division has developed, however, from a stress shift in Pre-Proto-Central Numic (W. Miller 1980)).

On the basis of Shoshoni and Southern Paiute, it seems apparent that a phonological process, with respect to verbs, was morphologized at a very early date, but the morphemes with invariant initial consonants are also quite old, as many of the same morphemes are found with the same initial consonant in at least Central and Southern Numic, if not throughout Numic as a whole. For
example, the directional *-kwε 'thither' has an inviable geminated consonant for motion simultaneous with action in both Southern Paiute -gwεl, and Comanche (Central Numic) -h/kwεn (*hkwεn) and -kwn in Central Numic are both derived from Proto-Numic *-kwεn). The forms with invariable spirantized consonant mean motion prior to action and are Southern Paiute -gwεl and Comanche -kwεn (McLaughlin 1982). The benefactive suffix *-g4i is also identical in Southern Paiute and Shoshoni. The fact that all three branches of Numic use a "spirantized" consonant on the morpheme meaning "come in order to" (Comanche -k4εn, Southern Paiute -γl, Mono (Western Numic) -k4i), points to a lexical analysis as historically sound, as no strictly phonological treatment can deal with this particular type of consonant-initial morpheme without relying on some type of lexical marking or ad hoc phonological blocking feature.

Kelly (1978:162-3), on the basis of a lexical analysis of Southern Paiute and comparison with Irish, sets up underlying simple stops in word-initial position (only), voiced fricatives (never word-initial), geminate stops (never word-initial), and nasal-stop cluster (never word-initial). The nasal-stop clusters are fine and geminate stops can either be analyzed as clusters of identical stops or as a [+lisp] stop without problem (I have opted for the latter here on the basis of feature economy), but the voiced fricatives can be very easily derived by rule. Throughout her work, Kelly points out that Sapi, Harms, and Chomsky and Halle have treated spirantization as a morpheme boundary phenomenon, and thus, in a lexical framework, a phonological rule of spirantization can be discarded along with phonological rules of gemination and nasalization as morpheme boundary rules. Voiced fricatives and simple voiceless stops are in complementary distribution, however, and when a morpheme which begins with a stop in isolation, such as qinni 'house', follows a spirantizing stem, the stop is spirantized, as in qinni4i4a 'summer house'. There is no need to increase the number of underlying phonemes in order to accomodate a strictly lexical treatment of Southern Paiute. Morphemes which always begin with a spirantized consonant can be set up in underlying form with a simple stop with a rule in the lexicon making it a voiced fricative between vowels. Morphemes which have a variable initial consonant depending on the class of the preceding morpheme would have three underlying forms—one with a simple stop, one with a geminate stop, and one with a nasal-stop cluster. The phonological rules would then apply to the output of the lexical rules and spirantize the intervocalic simple stops. This is a more natural solution that does not rely on either morpheme boundaries or underlying voiced fricatives. It is also a fairly common rule among the world's languages.

There is one serious objection to a completely lexical
analysis of Southern Paiute, however (assuming that underlying simple stops are spirantized by a phonological rule). In compounds, the stem class of the preceding element determines the initial consonant of the following one. This is no problem when one of the elements is a derivational or inflectional affix, which is naturally subject to the variations inherent in a lexical analysis, but when both words are noun or verb stems, it is unexpected. Inflectional or derivational suffixes are to be expected to vary according to the class of stem to which they are affixed, and prefixes might carry some marking on a following stem, although this is a little more uncommon, but full noun and verb stems should have no effect on another noun or verb stem. This is not the case, however, in Southern Paiute. The variations in derivational and inflectional suffixes have already been amply illustrated and are not surprising. Prefixes, however, always affect the initial consonant of a following stem. The spirantizing prefixes, of course, do nothing, but allow the spirantization rule to operate—navagii- 'wash oneself' (from na-S 'reflexive' and pagi 'wash'). The nasalizing prefixes add a nasal—tei-teitogogii- 'run well' (from tei-R 'well' and toogii- 'run'). The geminating prefixes geminate the following consonant—jiitii- 'eat beforehand' (from ji-G 'beforehand, ready' and tii- 'eat'). In actuality, the prefixes work far more regularly in affecting the first consonant of a following stem than do the stems on following suffixes. Chomsky and Halle's rules (with certain important revisions) work quite adequately in describing the phonological effects of prefixes on following stems.

The consonantal variations also appear to operate between stems in the processes of compounding, although it is not as regular as between prefixes and stems, nor as irregular as between stems and suffixes. For example, note avagii- 'summer hut' (ava-S 'shade'; qanni 'house'); toskiiyi- 'partulation hut' (tsu-G 'child, give birth'; qanni); and tsegei- 'cave' (tsi-R from tempi- 'rock'); qanni- where the initial consonant of qanni- 'house' has regularly spirantized, geminated, and nasalized. Compare, however, the verb toogii-G which has spirantizes (teogii 'eating' with the participial suffix -tii which is subject to change), but which rather consistently geminates a following verb stem, as in toogii- to eat while sitting, keep eating' (qari- 'sit'); qii-sprittedi- 'to look for something to eat' (penni- 'see, look'), and tijogogii- 'eat while singing' (gan- 'sing'). It would be incorrect, however, to assume that all verbs in compounds have the initial consonant geminates. For example, quatsprgari- 'to sit down and defecate' (quits- 'defecate'), and unusqii- 'to whistle a tune' (usuqqi- 'to whistle'). However, a large majority of verbs as second members of verbal compounds have the initial consonant geminated. Even qari and sge generally have the initial consonant geminated in most
verbal compounds. In compounds with nouns, however, the consonants vary, as in mágagábá 'timbered knoll' (mazá-S 'brush'; gáxá 'sit'; -tê 'participale') (qarxá 'sitter, hill'); and cság wártá 'fir island (accusative)' (goqó-S 'fii') when the noun is first. With incorporated nouns, the consonants also vary, as in warísáS 'eat grass seeds' (wara-S 'grass seed'; teqqa 'eat'); go'attíga- 'smoke (tobacco-eat)' (qwo'a-G 'tobacco'); and gwiísíbantíqamá- 'go in order to eat people up' (qwií=usa-N (2); mix:'go'). When the noun follows the verb, however, the nach seems to occasionally gaminate the following noun, although the compound type verb-noun is rare. For example, yásíguqá محمد 'hunting horse' (yal-N 'hunt'; gáaás 'horse'), but also gásíqá 'menstrual hut' (gásáa-S 'to menstruate'; qáanni 'house'). Adjectives in initial position in a compound vary more than do active verbs in their effect on a following consonant, as in yáqásáábá 'to flash red' (yánqí 'red') and yáqásáábá 'paint the face'. The following generalizations tend to hold for compounds: (1) verbs generally gaminate a following consonant; (2) nouns, either incorporated or in compounds, cause normal consonant variations on a following consonant; (3) common second element verbs may show consonant mutation in their first consonant; and (4) adjectives behave ambiguously between nouns and verbs as to their effect on a following consonant.

It is therefore possible to set up a ranking for regularity of consonantal mutation at three places (in order of most regular to least): (1) after a prefix; (2) after a noun stem; and (3) after a verb stem (there are a few invariant noun suffixes and a confused noun stem or two, otherwise, the nouns are as regular as the prefixes). It seems possible, indeed, in the light of the overwhelming evidence, quite probable, that the prefixes and noun stems are operating under phonological rules of consonant variation, while the verb stems are operating under lexical rules of consonant variation. It seems rather odd to say that the generativists, in striving to describe the variations as phonological, and Kelly, in striving to describe the variations as lexical, are both right, depending on which set of morpheme boundaries one is looking at.

Are the Southern Paiute consonant mutations a phonological or a lexical process? Yes. The problem is that we are dealing with a language as a point in time, and as such, it is but a point in a continuum of on-going change. Past treatments of Southern Paiute have invariably tried to deal with the consonantal variations as with regular phonological processes or as complete lexical processes, that is, as one of two endpoints. The real situation, however, is that Southern Paiute is somewhere in the middle of reanalyzing a phonological process as a lexical process. Therefore, the greater the distance from the front of the word and the greater the average morphological complexity in a word class (verbs are
highly inflected and nouns much less so, the greater the amount of morphologization that has occurred. In addition, as morphologization proceeds, so does morphological levelling to produce ever larger numbers of spirantizing stems. Southern Paiute verbs have undistanced nouns on the road to morphologization, but not as greatly as they have in Central Numic. In Shoshoni, for example, the verbs have all been completely levelled to "spirantizing" stems, but the nouns retain more evidence of the final consonants that produced geminating and nasalizing stems, actually having more phonetic reality than just the effect on a following consonant. Shoshoni nouns, therefore, show where Southern Paiute has been while the verbs show where Southern Paiute is going. Shoshoni verb prefixes, just as in Southern Paiute, also show some of the most regular effects of consonant mutation.

Having cleared the way for both a phonological and lexical treatment of the Southern Paiute consonants, it is now necessary to clarify the segmental phonemes to be used in the rules which follow. The consonant phonemes of Southern Paiute are [+-syll] (Table 1):

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In addition, each of the [+cons] stops—g, b, s, and q—which can either be [+long] or [-long] in underlying form and g is always [+long] (to be shortened in word-initial position by rule). Two additional features are also needed for rule economy—-g is [+del rel] and m, n, g, and qw are [+nasal].

The vowel phonemes are [+-cons], [+-syll], [+-son]:

<table>
<thead>
<tr>
<th>a</th>
<th>i</th>
<th>k</th>
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Long vowels and diphthongs are treated as sequences of short vowels. The two prefixes that always have initial stress have the vowels marked [+stress] in underlying form. For both vowels and consonants the feature [voice] is also marked appropriately, although it does not serve to differentiate between any two underlying segments.

The lexicon will be set up in this analysis with two...
classes—nouns and verbs. Verbs fall into three categories: spirantizing, geminating, and nasalizing. Nouns end in either a vowel, an undifferentiated stop (C), or as undifferentiated nasal (N). Affixes are of two types—prefixes and suffixes. Prefixes end with either a vowel, an undifferentiated stop (C), or an undifferentiated nasal (N). Suffixes may begin with an invariable consonant and are either spirantizing, geminating, or nasalizing. One noun suffix—ci-N 'diminutive'—must be specifically marked to prevent its initial consonant from geminating or nasalizing after nouns which end in C or G. Some suffixes also undergo a special rule of nasalization after a nasal in the preceding syllable (Rule I), so these suffixes must also be marked in the lexicon.

The rules by which words are assembled will now put together a word which includes roughly a noun or verb stem plus affixes. If the word is a verb, the suffixes selected will already have the appropriate type of initial consonant (if there is a choice). Otherwise, the stem-final consonants precede the stem or affix initial consonants and the phonological rules will proceed. Thus, a verb such as tagugqagapalagla 'they hit it so that it went to pieces' will have the underlying form /taqgqiu + qgi + ggi + ppauqai + aqqa + mi/. The verb tagugqagaparuy 'keeps kicking out (his) feet while sitting' will have the underlying form /taC + taC + quqgvi + qgqvi + yu/. The form tagugqagalak 'destined to be a desert dog' will have the underlying form /taC + aqgma + qai + paa + ni/. The form qisqongapqi 'was on a dead run' will be from underlying /tsiri + toqo + qgi + pppqvi/. The noun qisqongapqi 'fir grove' will be from /aqgvi + qgma + pgi/. The noun qisqongapqi 'will kill all he passes along' will be derived from /paqqa + gu + qvai + gu + paa/. Finally, the verbal pishispangapi 'will make a canyon' will be from /uiC + pi + nua (t --> / t / ; 0 --> s /) + qpaan/. 

The first rule (I) affects those suffixes subject to nasalization after a nasal:

Rule I

\[ g --> \left[ +{\text{cons}} \right] + +{\text{nasal}} / +{\text{cons}} \left[ +{\text{nasal}} \right] C_0^{\text{v}} + +{\text{cons}} \left[ +{\text{cont}} \right] \left[ +{\text{cont}} \right] \]

(Only applies to suffixes marked +[Rule I])

For example: pishipa + gu + qvai + gu + paa 'will kill all he passes along' --> pishipa + gu + qukai + gu + qukei: uiC + pi + nua + qpaan. This rule seems to be rightward iterative, as in pishipa + gu + paa + pi + aqqa 'maybe
(he) will kill his' --> paqga + pu + Kpaa + Bpti + aga.

Rule II reduces unacceptable clusters derived by the word formation rules:

Rule II

[+cons] --> @ / (\{-cons\} \{\{+cons\}\} \{\{+cons\}\}

For example: (before a glide or vowel after a morpheme boundary) mosni + aki + p'i 'mosquito' --> moqapi, opin + yaq + pby + ppmq[, '(he) brought back a stick' --> opiyampyppqapi, (before a) wa'al + asac + p'i 'cedar sapling' --> wa'asacpipi; (before a consonant cluster) wa'ac + mpi + a 'cedar berries (acc)' --> wa'ampla. (A glottal stop is often inserted between a prefix and a vowel initial stem, as in tskn + appi + va 'sleep well' --> tsapppi, but does not, at this time, seem predictable.)

Rule III is the rule of assimilation of a stem-final consonant to a stem-initial consonant. At this point, there are four possible combinations--N + stop, C + stop, N + nasal, and C + nasal. In all but the N + stop combination, the assimilation is total--both the place and manner of articulation. With the N + stop combination, the nasal assimilates only to the place of articulation.

Rule III

[+cons] --> \{\{wot\}\} \{\{soc\}\} \{\{yround\}\} \{\{nas\}\} \{\{cons\}\} \{\{wot\}\} \{\{soc\}\} \{\{yround\}\} \{\{nas\}\}

For example: (N + stop) tsqani: 'rock house' --> tsgani; (C + stop) cuwuCpgayu: 'suckerfish' --> cuwupgayu; (N + nasal) tsqunapseyt 'has a good copulation' --> tsqunapseyt; (C + nasal) ayag: 'prairie dogs' --> sycma.

Rule IV is a housekeeping rule to convert the geminate clusters produced by Rule III into [+long] consonants for simplicity in writing later rules. Miner (1976) has proposed a universal "equivalence rule" which applies "perpetually" converting geminate clusters into [+long] segments and vice versa:
This universal rule would eliminate the need for housekeeping rule IV.

Rule IV

\[ C'_C \rightarrow 1 \quad 2 \]

The next rule (V) is the rule of intervocalic spirantization:

Rule V

\[
\begin{align*}
\text{-son} \\
\text{-long} \\
\text{-del rel} \\
\langle \text{cor} \rangle
\end{align*}
\rightarrow
\begin{align*}
\text{+cont} \\
\text{+voice} \\
\langle +\text{son} \rangle
\end{align*}
/ V -- V

Basically, this rule says: P, T, G, GW -> V, X, G, GW. For example: qutsqi 'neck' -> quravi; apagani 'summer home' -> avenani; puqvesvye 'take out (disease) with supernatural power' -> puqvesvye; but parovve 'beaver' -> parovve.

Rule VI assigns stress to even-numbered vowels. It has one significant difference from Chomsky and Halle's rule in that it is an iterative rule, determining the status of each vowel in turn in a rightward direction. The conditioning factors are either a word boundary or the last stress placed. Using this rule, it is possible to predict stress correctly following the prefixes with first syllable stress. Franklin and Bunte (1980:345) list several modern Southern Paiute morphemes which also alter the stress pattern following an invariably placed stress on one of the syllables of the suffix (for example, modern -pixai 'narrative past'). The following rule will correctly predict the modern Southern Paiute stress in addition to the stress in Sapir's data:

Rule VI

\[ V \rightarrow [+\text{stress}] \]

(RIGHTWARD ITERATIVE)
For example: *taqquqinga'qeqqat* 'they hit it so that it went to pieces' → *taqquqinga'qeqqat*aqeqat. *teqqa'na'vigiviant* 'destined to be a desert dog' → *teqqa'na'vigiviant*aqeqat. *teqqa'na'vigiviant* 'pine nut' → *teya*. (Primary stress will be assigned to the first stressed vowel by a later rule.)

Rule VII then devoices unstressed vowels in front of a [+long] consonant and word-finally. In addition it devoices [+voice] consonants in front of a voiceless vowel. This rule, therefore, captures the generalization that it is whole syllables which devoice in front of geminate consonants and word-finally. It is right to left iterative and devoices a segment in front of a voiceless segment with an opposite value for the feature [syllabic] (a voiceless consonant must also be [+long]).

Rule VII

[+seg] → [-voice] / $\bigg\{\begin{array}{l}
$+stress$\\
$-syll$\\
$+voice$\\
$-syll$\\
$+voice$\\
$[+voice]$\\
$[+voice]$\\
$[+voice]$\\
\end{array}\bigg\}$

(LEFTWARD ITERATIVE)

For example: *pacququ* 'beaver' → *pacququ*: *taqquqinga'qeqqat*aqeqat. *teqqa'na'vigiviant* 'sleeps well' → *teqqa'na'vigiviant*: *teqqa'na'vigiviant* 'destined to be a desert dog' → *teqqa'na'vigiviant*aqeqat. *teqqa'na'vigiviant*: *teya* 'pine nut' → *tefa*: *aqqa'sa'qep*: *aqqa'sa'qep*: 'sunflower mush' → *aqqa'sa'qep*: the feature [+long] must be used rather than [voice] in determining vowel devocalizing because c does not spirantive and only a [+long] cc will cause devocalizing, as in *gucquqat* 'gray' → *gucquqat*, but *pacququ* 'beaver' → *pacququ*.

Rule VIII is the rule which degeminates a stop after a voiceless vowel. It seems more natural, however, to link degemination with stress.

Rule VIII

\[C \rightarrow [-long] / \begin{array}{c}
V\\
-stress\\
V\\
+stress\\
\end{array}\]  

For example: *taqquqinga'qeqqat*aqeqat* 'they hit it so that it broke into pieces' → *taqquqinga'qeqqat*aqqa'sa'qep*: *aqqa'sa'qep*: 'sunflower mush' → *aqqa'sa'qep*:.
This paper has presented a natural set of rules to deal with several features of Southern Paiute phonology, although it cannot be said to constitute a complete survey. Several aspects, such as the strange occurrences of glottalization and the apparently random activity of glottal stops in general, have not even been touched upon here. There yet remains a great deal of work to be done before the full picture of Southern Paiute phonology can be seen.

NOTES

1 In the examples throughout this paper, I have generally modified Sapir's transcription to conform to modern practice; thus, Sapir's $c$ for an alveopalatal fricative is here $\theta$ (since the alveopalatal and alveolar affricates and fricatives are in complementary distribution, I have used $\theta$ for the fricative and $c$ for the affricate throughout, even though the surface forms are more often than not, alveopalatal). His $f$ with dieresis is here written $\breve{f}$. I have retained his use of capital letters to indicate voiceless segments. I have also used $\breve{j}$ and $\breve{u}$ to represent bilabial fricatives and $g$ to represent the voiced velar and uvular fricatives (which are in complementary distribution). In addition, I have used $\breve{k}$, $\breve{g}$, and $\breve{\omega}$ to indicate spirantizing, geminating, and nasalizing stems rather than Sapir's raised letters because of the size of the particular typeface I am using to print this paper.

Other author's transcriptions have also been modified to conform to the norms adapted for transcribing Sapir's forms. I have also consistently used $g$ and $gw$ for the velar and uvular stops (which are in complementary distribution—$k$ and $kw$ before or after an $i$ and $q$ and $qw$ elsewhere).

I would like to thank Kenneth Miner and Willem de Reuse who read an earlier version of this paper and made many useful comments. Any errors remaining, however, are my own.
REFERENCES


McLaughlin, John E. 1982. Two or three (or four) points about adverbs and aspect in Central Numic (Jto-Aztecan), Studies in Native American Languages. Kansas Working Papers in Linguistics Volume 7. Pages 64-89.


