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The Phonetic and Phonological Effects of Moribundity

Molly Babel
University of California, Berkeley

The Phonetic and Phonological Effects of Moribundity

Abstract
Structural change in a language are considered nearly inevitable consequences of language death (Campbell and Muntzel 1989; Wolfram 2002). The literature on sound change in endangered languages has focused on whether the changes are internally or externally motivated, and, therefore, the difference between categorical sound shifts and gradient phonetic effects has been overlooked (cf. Campbell and Muntzel 1989; Woolard 1989; Dorian 1993). In addition, this research has been largely impressionistic in nature, leaving subtle variation that is beyond the scope of narrow transcription out of the discussion (Schmidt 1985; Goodfellow 2005)

This paper discusses sound change in Mono Lake Northern Paiute – an American Indian language spoken in California – through two instrumental experiments that investigate the difference between categorical changes in the phonological inventory and subphonemic variation within a category. The first experiment examines the maintenance of a three-way oral stop contrast in laryngeal setting across three generations of speakers. The results suggest that while the youngest generation of speakers generally patterns like the elder generations, there is an increase in the amount of variability in consonant production. Static palatography was employed for the second experiment to investigate a shift in place of articulation for the sibilant across two generations of speakers. The findings illustrate that the traditional palatalized retroflexed sibilant has been replaced by a fricative identical to American English /s/, causing interesting changes to a phonetically motivated allophonic pattern in the traditional form of the language.

After considering the sound changes described in languages experiencing attrition, this paper concludes by arguing that sound change in obsolescing languages takes one of two predictable paths: approximation or transfer (terms originally applied to patterns of vowel mergers in Trudgill and Foxcroft (1978). Approximation, a type of change being experienced by the sounds examined in the first experiment, involves the expansion of phonological categories within the moribund language. Transfer, a type of substitution (e.g. Weinreich 1953; Thomason and Kaufman 1988), is exemplified by the second experiment where a dominant language phoneme replaces a similar sound in the obsolescing language. These types of changes, at least in their current state in Mono Lake Northern Paiute, do not cause neutralizations in the phonological system. This contradicts claims made by Andersen (1982), who argues that ultimate speakers of moribund languages fail to make phonological distinctions in the endangered language that are not supported by identical distinctions in the dominant language.

Cover Page Footnote
Thank you to Grace Dick, Leona Dick, Morris Jack, Elaine Lundy, Edith McCann, and Madeline Stevens for sharing your language with me. This research is also reported at greater length in a chapter titled "The phonetics and phonology of obsolescence in Northern Paiute" in Variation in Indigenous Minority Languages, edited by Dennis Preston and James Stanford.

The Phonetic and Phonological Effects of Moribundity

Molly Babel*

1 Introduction

The literature on sound change in endangered languages has largely focused on whether the changes are internally or externally motivated (Campbell and Muntzel 1989; Woolard 1989; Dorian 1993). This has left the differences between categorical phonological shifts and gradient phonetic effects largely overlooked. The distinction between the two paths of sound change is critical as categorical shifts can obliterate phonological contrasts that are present in the traditional, pre-contact varieties of obsolescing languages. Gradient phonetic effects, however, may have minimal impact on the native structure of the language. In a recent paper, Yu (2008) demonstrated that subphonemic changes occur in Washo, a moribund language, without neutralizing any phonological contrasts. Yu compared consonant patterns of Washo speakers recorded in the mid-20th century to individuals in their seventies. While he concludes that the young generation has maintained the pattern of the older speakers, Yu found that the contemporary generation of speakers had a less distinct boundary between short and long consonants.

There is little doubt that moribund languages experience changes at an increased pace (Campbell and Muntzel 1989; Wolfram 2002). Obsolescing languages are in contact with other more dominant languages, and community shifts to a dominant language can have dramatic effects on the language structure. This observation stands in contrast to traditional views of sound change which often consider it a gradual internal process where the phonetic realization of a phonological category is subtly altered until it enters new phonological space. The purpose of this paper is to determine the relationship between the subphonemic and phonological inventory effects of moribundity on Northern Paiute. I examine the maintenance of a three-way lenis/fortis contrast in the consonant inventory and a change in place of articulation of the coronal sibilant. I argue that these two sound changes are taking distinctly different paths of approximation/expansion through subphonemic variation and transfer through categorical shifts in place of articulation.

Expansion is a term that describes an increase in a sound's category size (Labov 1994:321–323). In expansion, a sound can encroach on the phonetic space of another, or it could simply increase its own phonetic space without merger. Trudgill and Foxcroft (1978) introduce approximation and transfer as two paths toward sound change to account for different types of vowel mergers. Approximation occurs when two phonologically distinct sounds shift in the direction of each other. It involves a series of imperceptible subphonemic shifts prior to the completion of the change. A phonological category is transferred when one phonological category is adopted and implemented into a lexical item, similar to lexical diffusion, until it completely replaces the previous category. Approximation and expansion share an underlying path of gradient variation. They can, then, be classified together into a single sound change route. Conversely, transfer assumes that the sound change was a categorical shift; this is analogous to substitution (Weinreich 1953; Thomason and Kaufman 1988).

The paper is structured as follows. Section 2 reviews previous work on sound change in endangered languages along with background to the traditional internally- versus externally-motivated dichotomy. I argue that while this distinction is important, it is also interesting to examine sound changes in terms of subphonemic variation and categorical changes. The Northern Paiute community and their socio-cultural dynamic are presented in Section 3. The experiments investigating the stop contrast and sibilant change are reported in Sections 4 and 5, respectively. The paper concludes with a broader prediction of the paths toward change in moribund languages.

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2 Sound Change and Language Loss

The number of investigations describing sound change in endangered languages is rather limited. Moreover, the descriptions are primarily phonological in nature, which means they inherently cover categorical changes. Andersen (1982:95) makes predictions about the types of phonological reduction expected in speakers who are undergoing linguistic attrition. Speakers of an obsolescing language are expected to make fewer phonological distinctions, yet maintain distinctions in the endangered language that also exist in the dominant language, and phonological distinctions with a low functional load are to be lost prior to those with a high functional load.

Campbell and Muntzel (1989:186-188) cite Andersen's predictions and claim that few linguists would disagree with them, providing several examples from Campbell's own work to support Andersen's predictions. For example, they recount the loss of vowel length contrasts, the merger of /ts/ and /s/, and the elimination of voiceless continuants in dialects of Pipil that are highly endangered (Campbell and Muntzel 1989:186-187). Campbell and Muntzel present several cases of overgeneralization in attriting languages that they attribute to internal changes. In these cases, phonological features present in the obsolescing language that are absent in the dominant language are amplified. For example, one of the last speakers of Jumaytepeque Xinca glottalized nearly every consonant (Campbell and Muntzel 1989:189).

Woolard (1989) argues against Campbell and Muntzel's view of change in moribund languages as internally motivated. She claims that the hyper-glottalized consonants in Xinca are, in fact, externally motivated. The fact that Spanish does not have glottalized consonants in its inventory has motivated the overgeneralization of the feature in Xinca (363). Descriptions of the changes in Dyirbal (Schmidt 1985) and K^{w}ak^{ʔw}ala (Goodfellow 2005) are also presented as externally motivated changes. Schmidt describes language change across generations in Dyirbal as a function of proficiency in the dominant language of the area, Australian English. Schmidt (1985:191) assumes that "instances of phonological interference in [Young Dyirbal] pronunciation" are the result of "differences between English and [Traditional Dyirbal] sound systems"; that is, they are externally motivated.

A more recent description of the effects of language obsolescence on a moribund language is given by Goodfellow (2005) on the K^{w}ak^{ʔw}ala-speaking people of British Columbia. Here, the changes in K^{w}ak^{ʔw}ala are seen as consequences of contact with English. One interesting loss for the youngest generation is the merger of the uvulars with the velar series. The young generation, however, remains mindful of a palatalization rule, whereby a velar palatalizes when preceding a vowel. Merged speakers still follow this rule, but only when the velar is underlying and not the velar used in place of a uvular (135–136). This suggests there has been no degradation of abstract phonological knowledge in the youngest speakers.

Dorian (1993:135) expresses doubts over the distinction between internally and externally motivated changes in situations of language contact. She warns that changes converging toward a dominant language are not always due to external factors and divergent changes are not always internal. In her description of East Sutherland Gaelic, Dorian documents two sound changes, a subphonemic change and a categorical change, across generations of speakers. She reports that young speakers do not nasalize phonemically nasalized vowels as strongly as older speakers (Dorian 1978:58). Also, Dorian describes young speakers as showing influence from English when they replace palatals with velar counterparts (174).

It has been difficult for researchers to conclusively prove whether convergent or divergent changes in obsolescing languages have been due to exclusively internal or external motivations. It is clear, however, that categorical changes, the loss of allophones, and subphonemic variation are all characteristics of sound change in obsolescing languages. Categorical changes with the transfer of a sound from the dominant language to the obsolescing language phoneme are particularly common. The extent to which similar phonological changes have occurred in Northern Paiute is considered through instrumental phonetic investigations below. The Northern Paiute language community is introduced in the next section.

3 Northern Paiute

Northern Paiute is a member of the Numic language family. The traditional territory occupies the western half of the Great Basin. The dialect under investigation in this paper is Mono Lake Northern Paiute (MLNP). MLNP is a severely endangered dialect with fewer than 15 speakers.

3.1 Consultants

Four female speakers of MLNP were consulted for the projects described below. Autobiographies of MLNP speakers shared during fieldwork sessions suggest the shift to English is quite recent. MLNP consultants B2 (b. 1925) and B3 (b. 1932) were monolingual until they began attending school. The eldest MLNP consultant, B1 (b. 1921), learned English early in her youth along with MLNP from an English-speaking relative. C1 (b. 1953) is the youngest MLNP speaker. Her older siblings introduced English into the home by the time of her birth. MLNP was C1's first language, but schooling and the cultural climate have dictated that English be her dominant language.

The consultants naturally divide themselves into two generations based on date of birth: Generation B composed of B1, B2, and B3, and, Generation C which is limited to C1. With these two generations, I will compare how the language has changed in terms of the phonetic realizations of the lenis/fortis contrast as reliance on English has increased in the community.

4 Investigation 1: Lenis/Fortis Contrast

MLNP makes a three-way contrast within its stops and affricates. Oral obstruents are contrasted as lenis, voiced fortis, and fortis, while nasal obstruents are distinguished by lenis and fortis categories. The three-way contrast is manifested word-medially and at conditioned morpheme boundaries; word-initially, contrasts are neutralized to fortis.

4.1 The Meaning of the Labels Lenis and Fortis

Lenis and fortis are poorly defined descriptive terms that are often misapplied to contrasts. According to Ladefoged and Maddieson (1997:95-98), fortis can refer to the increase of respiratory energy or to the increase of articulatory energy. Lenis means a decrease in the amount of energy exuded by the speaker. The increased output of energy associated with a fortis consonant can correlate with increased oral pressure and increased closure duration. In order to determine the best acoustic correlates of the contrast and to explore the potential generational differences, several acoustic measurements were taken, as described in the methods section below.

4.2 Methodology

A wordlist containing the lenis, voiced fortis, and fortis stop consonant types at all places of articulation was compiled. A minimum of five words from each phoneme category was included in the list. The wordlist was elicited in a single fieldwork session. Upon their turn, speakers were instructed to say each word three times. The recordings were made on a Marantz PMD670 solid-state recorder using a dynamic Shure microphone.

Initial impressions of the MLNP recordings showed that some tokens, particularly members of the voiced fortis series, had both significant voicing throughout the closure and a burst release. It was determined that three measurements would be taken: consonant closure, release, and percent of the closure that had visible vocal fold pulses (percent voiced). Closure duration was defined as the offset of a high amplitude vowel portion until the burst release or the onset of the following vowel. For tokens with a visible release in the MLNP data, the feature was measured from the burst of the stop release to the commencement of vocal fold vibration for the following vowel. All vowels and intervocalic consonants were labeled. Duration values were extracted from the labels and these were used for analysis.

4.3 Analysis and results

Since a generation variable would be conflated with speaker in a repeated measures ANOVA with the entire data set, separate analyses were conducted for each speaker for each of the acoustic measurements.

Closure duration. A series of ANOVAs was implemented using closure duration as the dependent variable. Speakers B1, B2, and C1 had effects of consonant category: B1 ($F(2, 204)=288$, $p<0.001$); B2 ($F(2, 208)=284$, $p<0.001$); and C1 ($F(2, 209)=165$, $p<0.001$). Post-hoc tests found differences between all three categories for these speakers ($p<0.001$). B3 also had an effect of consonant category ($F(2, 183) = 136$, $p<0.001$). Post-hoc testing revealed that while significant differences were made between lenis/fortis and lenis/voiced fortis pairs ($p<0.001$), the difference between fortis/voiced fortis pairs was beyond the level of significance ($p=0.07$) for B3. Speakers' mean closure durations are presented in Figure 1.

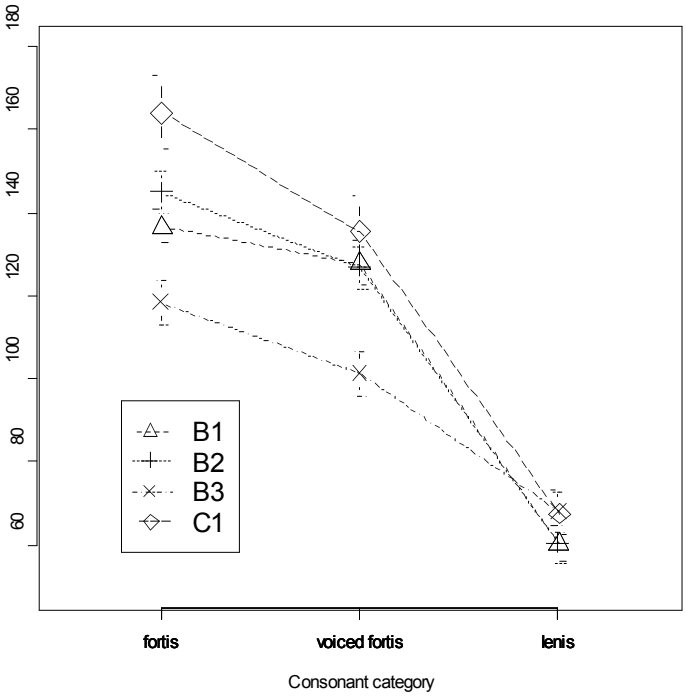

Figure 1: Mean closure duration of stop consonants for Generations B and C (the error bars represent a 95% confidence interval)

Release. ANOVAs were submitted with the release duration as the dependent variable and the consonant categories as the independent variable. Main effects were found for all speakers: B1 ($F(2, 205)=92$, $p<0.001$); B2 ($F(2, 208)=122$, $p<0.001$); B3 ($F(2, 183)=134$, $p<0.001$); and C1 ($F(2, 209)=85$, $p<0.001$). All speakers in Generation B reliably differentiated the consonant categories with release duration ($p<0.001$). C1 distinguished lenis/voiced fortis and lenis/fortis ($p<0.001$), but had insignificant results for fortis/voiced fortis pairs. Mean release durations are plotted in Figure 2.

Percent voiced. The final series of ANOVAs was submitted with the percent voiced data as the dependent variable. B1 and C1 had main effects of percent voiced (B1: $F(2, 204)=92$, $p<0.001$; C1 $F(2, 209)=173$, $p<0.001$) and produced reliable differences between all category comparisons ($p<0.001$). While B2 also had an effect of percent voiced ($F(2, 208)=322$, $p<0.001$) and she voiced lenis/fortis and fortis/voiced fortis pairs differently ($p<0.001$), there was no difference in her degree of voicing lenis and voiced fortis stops. B3's ANOVA returned significant ($F(2, 183)=391$, $p<0.001$); she voiced lenis/fortis and fortis/voiced fortis pairs significantly differently ($p<0.001$), as well as lenis/voiced fortis categories ($p<0.05$). Figure 3 presents the mean percent voiced values for the speakers.

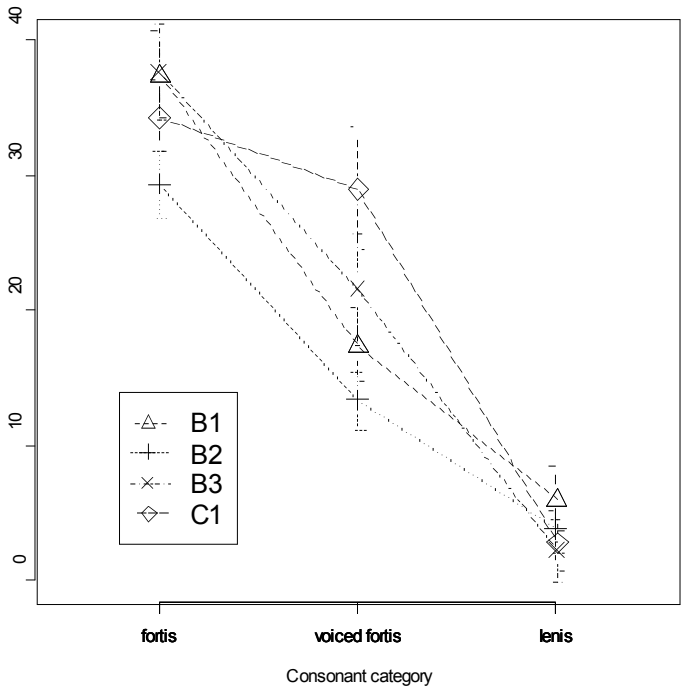

Figure 2: Mean release duration of stop consonants for Generations B and C. The error bars represent a 95% confidence interval.

Standard deviations were calculated for closure duration, release duration, and percent voiced. A high standard deviation implies that a speaker did not produce a consonant cue consistently. Standard deviation values for the release and percent voiced data did not vary much across speakers. The standard deviations of the closure duration patterned as follows: B1, 44 ms; B2, 47 ms; B3 36 ms; and, C1, 63 ms. These closure duration standard deviations illustrate that C1's productions were much more variable.

4.4 Discussion

The data presented above illustrates that all speakers of MLNP in Generations B and C are maintaining the contrasts between the lenis, voiced fortis, and fortis categories using a combination of phonetic features. Closure and release duration cue the difference between lenis and the fortis categories, while voicing distinguishes the fortis from the voiced fortis category.

For C1, three additional facts need to be noted. Despite the overall maintenance of her consonant categories, there is a general increase in closure duration that distances her average value from that of other speakers, perhaps as an attempt to increase its distinctiveness compared to English voiceless stops. Second, this expansion of the closure duration feature is accompanied by increased variation in production. Lastly, there is also the possible interpretation of both fortis categories as aspirated English stops; the release duration values of C1's fortis and voiced fortis categories both lie above the threshold for the English voicing contrast. The distribution of the data does not indicate a categorical shift to the English category, but rather suggests the approximation of the release gestures for the fortis and voiced fortis categories. These findings support the assertion made in Campbell and Muntzel (1989) in which the authors predict that variability in production increases as a function of the level of language obsolescence. C1, as the youngest speaker, has used MLNP less than other speakers of earlier generations.

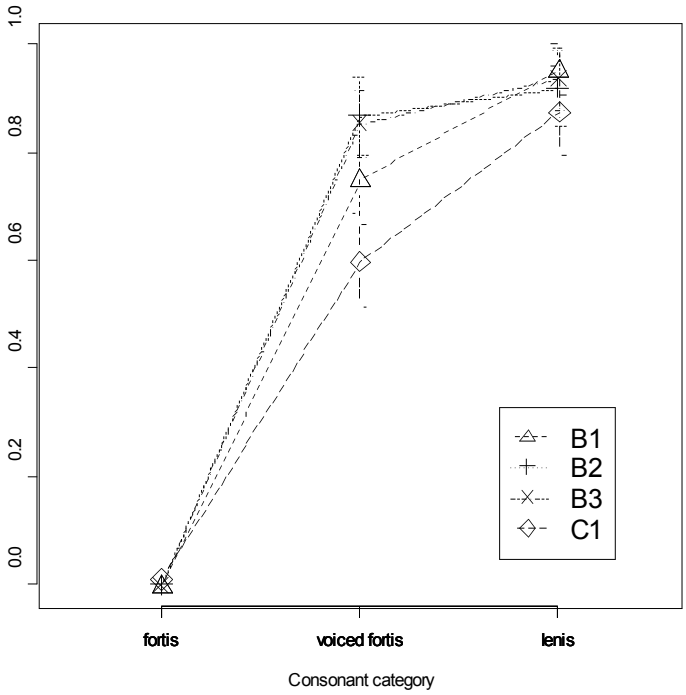

Figure 3: Mean percent voiced value of stop consonants for Generations B and C. The error bars represent a 95% confidence interval.

Yu (2008) had similar results with his data from Washo. The extant speakers maintain the phonological patterns of the deceased generation, but the categories were less distinct. This trend suggests that ultimate generations of speakers of obsolescing languages may not necessarily lose contrasts, but exhibit increased subphonemic variation, causing the category boundaries to become less discrete.

The next experiment investigates a change in the place of articulation for the sibilant for C1. I argue that this sibilant sound change is following a different path.

5 Investigation 2: Sibilants

All dialects of Northern Paiute have a coronal sibilant. The place of articulation for this sibilant has been described in a variety of ways that differ according to a speaker's generation (Thornes 2003, Liljeblad 1966). Thornes describes the phonological rule in Northern Paiute whereby the fricative palatalizes in the context of [i] as having generational variation as well.

Interestingly, both linguists describe younger, bilingual speakers as producing the sibilant in ways that distinguish their production from older generations of speakers with younger speakers approximating English categories. Experiment 2 has two goals: the first goal is to determine the generational differences in the production of the sibilant, and the second goal is to understand the variable nature of the palatalization rule.

5.1 Methodology

Three consultants participated in this experiment, two individuals from Generation B: B1 and B2; and, the single individual from Generation C. The method used for this investigation was static palatography. The palatograms and linguagrams were taken by creating a mixture of four parts carbon powder to one part cocoa powder and enough olive oil to create a thick substance. The mixture was applied to either the tongue or the palate using a small brush. After each production, a picture was taken and the consultant washed out her mouth to prepare for the next token.

The words used for this investigation are *pisa* 'good, well', *saa* 'cook', and *sii* 'wild onion'. Speakers from Generation B produced each word once for the palatograms. The speaker from

Generation C produced each word twice, as both linguagrams and palatograms were attained from her. These particular words were selected to determine the reflex of the sibilant palatalization rule discussed above: *pisa* and *sii* evaluate this rule, and *saa* was selected as a means of determining the default place of articulation.

5.2 Results and Analysis

The palatography results for C1 illustrate that her default place of articulation for the MLNP sibilant is laminal dental, as shown in her production of *saa* in Figure 4. The laminal part of her tongue is making contact with the central incisor and the apex of the tongue is, presumably, braced against the bottom teeth. This is a common production of the American English /s/ (Shadle 1991; Dart 1991). It is evident from the results that C1 palatalizes her MLNP sibilant in the general environment of /i/. For both *sii* and *pisa* the tongue contacts the palate near the lateral incisor and curves inward. The linguagrams illustrate that in the palatalized contexts the tongue is deeply grooved. This is apparent from the strip down the middle of the tongue where there is no paint, typical of the production for American English /ʃ/ (Ladefoged and Maddieson 1997:148-149).

Figure 4: C1's linguagram for *pisa* (1), *saa* (2), and *sii* (3). The black substance on her tongue shows the part of the tongue that contacted her palate.

For B2 we see the same articulation pattern for *saa* and *sii*. In these productions the tongue remains in contact with the palate until the canine. The tongue appears to curl in behind the alveolar ridge, but we see no evidence of apical lingual contact. We only find palatalization in *pisa*, and here we see lingual contact terminating at the first bicuspid. In the production of *pisa*, the width of contact is also greater.

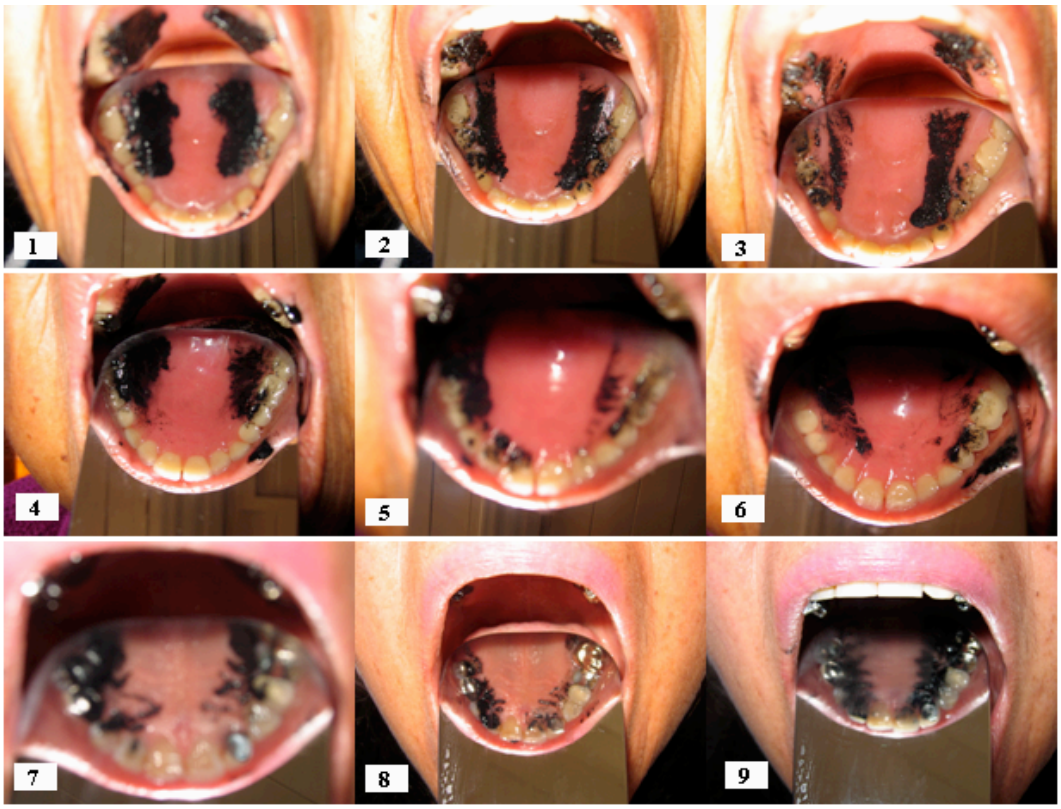

Figure 5: Palatograms. Top row: B2 *pisa* (1), *saa* (2), and *sii* (3); Middle row: B1 *pisa* (4), *saa* (5), and *sii* (6); and, Bottom row: C1 *pisa* (7), *saa* (8), and *sii* (9). The black substance on their palates demonstrates what part was contacted by their tongues.

In the palatograms attained from B1, lingual contact generally ends on the vicinity of the canine. This pattern holds for both *saa* and *sii*. On the left side of the image it appears the tongue made slight contact on the central incisor. In the palatalized environment, B1 creates lingual contact until the bicuspid. Also, as in the production of *pisa* for B2, the contact area is wider.

5.3 Discussion

Articulatory descriptions of the productions of the sibilant by the older generation following the palatograms closely follows Liljeblad's description of the sound as a laminal pre-palatal. This place of articulation for the sibilants in Generation B is an alveolo-palatal fricative: /ɕ/, but with a retroflexed tongue position. The palatalized version of this sound in MLNP following the high front vowel /i/ is a version of /ɕ/ with increased lingual contact and an articulation that is placed further back in the mouth. Conversely, C1's sibilants appear to be articulated as typical American English productions of /s/ and /ʃ/. Following Thornes (2003) and Liljeblad (1966), this is predicted for a speaker her age. As mentioned above, both Thornes and Liljeblad report younger speakers producing the sibilant in a place different from the place where it is produced by elders.

Hamann (2003:94-106) describes a tendency for languages to avoid retroflexed consonants after /i/ for a combination of perceptual and production reasons. This motivates the palatalization of /ɕ/ in B1 and B2. Because C1 has shifted the sibilant place of articulation, these phonetic motivations no longer underlie her phonological rule. Instead, she is free to palatalize her sibilant in any /i/ environment.

It is important to note that this change causes no ill effect for the intelligibility of the language as no phonological contrast is neutralized. Such a change is rather common in contact-induced changes and is included in the Thomason and Kaufman (1988:75) typology of contact-induced

structural effects. In cases of intense contact, phonological borrowing includes the phonemicization of allophonic alternations. C1 appears to be doing something similar; in her shift from /ɕ/ to /s/, she has adopted a phoneme from English to serve as her MLNP sibilant, and she has further recruited the phoneme /ʃ/ from English to serve as the MLNP allophone.

More importantly, what has been the path of this sound change? The conclusion must be speculative because of the lack of longitudinal data from C1, but it is conceivable that the American English sibilant was substituted for the Northern Paiute sibilant. It is highly implausible that this sound change occurred as the result of approximation from the traditional sibilant to the Americanized /s/. A more likely path to the change involves transfer where /s/ was incorporated into her MLNP system during a period of heavy English use or, perhaps, during her concurrent acquisition of the two languages as a child.

6 Conclusions

This paper has examined sound change in Northern Paiute, a moribund indigenous language of North America. Experiment 1 investigated a three-way lenis/fortis contrast across two generations of speakers. While the contrast was maintained within the phonological systems of each individual, it was found that C1, the youngest speaker of the language, had increased subphonemic variation compared to older speakers.

The second experiment examined a shift in the place of articulation for the language's sibilant from /ʑ/ to an English alveolar fricative /s/ for the youngest speaker. In addition, a more palatalized allophone of the traditional sibilant was also lost by the youngest speaker and replaced with the English /ʃ/. The articulatory leap from /ɕ/ to /s/ is analyzed as a categorical sound change as opposed to a change that occurred via a series of subtle imperceptible shifts. A sudden categorical shift in sibilants suggests that not all sound changes in obsolescing languages are the consummation of subphonemic variation resulting in the approximation of two sounds. The path a particular sound change takes may depend on the phonological system of the contact language. English /s/ is subtly different from the Northern Paiute sibilant, making a categorical shift in place of articulation possible. The descriptions of the substitution patterns for rhotics in Young Dyirbal (Schmidt 1985) and palatal consonants in East Sutherland Gaelic (Dorian 1978) include the application of perceptually and articulatorily similar phonological categories from the local varieties of English to the obsolescing language. From the descriptions seen here, it can be generalized that when phonological categories in moribund and dominant languages are similar, they may experience transfer-like sound changes.

Gradient sound changes do not follow the pattern described for transfer. In Northern Paiute, the unique three-way lenis/fortis contrast does not have an equal phonological counterpart in English, perhaps deterring transfer from taking place. The three-way contrast can be viewed as a three-way distinction in the timing of the closure duration and vocal fold vibration. Subtle changes in these timing relationships result in the gradient expansion of the phonetic space the fortis category occupies for Generation C and the approximation of release duration in the fortis and voiced fortis categories. The looser category boundaries in singleton and geminate consonants in Washo reported by Yu (2008) and the decreased nasalization of phonemically nasalized vowels in East Sutherland Gaelic described by Dorian (1978) are also gradient changes caused by alternations in timing relationships. Changes in singleton and geminate consonant categories relate to closure duration timing like that of Northern Paiute. Modifications to the timing of the lowering of the velum in phonemically nasalized vowels result in vowels that are less nasalized. In these languages, changes in timing cause gradient subphonemic effects. It can be predicted that phonological categories in obsolescing languages that rely on specific timing relationships will experience approximation-like sound changes, not phoneme substitution.

Subsequent research will show how far the predictions about phonological similarity and timing relationships and their implications for sound change in moribund languages will go. It is clear from the Northern Paiute data, however, that in moribund languages gradient phonetic changes are not always precursors to categorical changes but are changes of a different type. Given the proper time course, the paths of these changes may, nevertheless, end with the same result: the merger of two phonological categories.

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Department of Linguistics
University of California, Berkeley
Berkeley, CA 94720-2650
mbabel@berkeley.edu