MAPPING THE PATTERNS OF MAINTENANCE VERSUS MERGER IN BILINGUAL PHONOLOGY: THE PRESERVATION OF [a] vs. [œ] IN FRENCHVILLE FRENCH

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1. Maintenance and convergence in contact phonology

Much of the research on languages undergoing attrition in bilingual contexts documents the transfer of phonological properties from the dominant language to the receding language, but neglects to analyze areas of the phonology that are inexplicably unaffected by contact. We believe that this preferential focus on interference phenomena has skewed the vision of phonology in attrition toward a view where attrition necessarily entails a loss of structural attributes. Essentially, extant theories of bilingual phonology predict that interference, what we call convergence, occurs mainly in the context of low-level phonetic variation (Weinreich 1970, Andersen 1982). This reduces the linguistic effects of contact to a simple strategy of “seek and replace,” whereby the phonetic properties of the dominant language substitute for those of the receding one. Maintenance, then, is dependent on the need to preserve phonological contrasts (Andersen 1982). This formula relegates convergence to the phonetic domain and maintenance to the phonology. However intuitively appealing this notion may be with its strict division of labor between the two components of the sound system of a language, in our experience, it is inadequate to account for the actual patterns of preservation versus merger encountered in the speech of bilinguals. As we have demonstrated earlier (Bullock & Gerfen 2004a, 2004b, in press), convergence with English in the contact variety under analysis here, Frenchville French, can operate over areas of the sound system that are not necessarily low-level but contrastive, even if only marginally so. For instance, the French mid front rounded vowels /ø/ and /œ/ have both merged with the American English
rhoticized schwa. At the same time, Frenchville French maintains a distinct rhotic consonant, generally an apical tap or trill, that is not mapped to the English retroflexed or ‘bunched r’, even though such a merger would be arguably cost-free in that it would lead to no loss of contrast in either language. Such facts suggest a more complex perspective on the effects of long-term contact on the phonological system of bilinguals than can be accommodated by current models of bilingual phonology.

The present work demonstrates that there are areas of the phonological system of a contracting language that may be vulnerable to convergence, but that nonetheless remain target-like. Specifically, we document the preservation of the two French low vowels /a/ and /a/ in the speech of one of the remaining fluent speakers of Frenchville (Pennsylvania) French (hereafter FF). The resilience of this contrast in our speaker’s productions, which is perceptually salient, is remarkable given there are various linguistic internal and external pressures that might have caused him to alter his phonetic realizations of these two vowels. This analysis will demonstrate that the low vowel contrast is largely intact phonetically, and that the vowels are distributed in a manner entirely consistent with French phonology despite long-term contact with English. We surmise that our speaker’s bilingualism, far from disrupting the sound system of his receding French through interference, might have helped maintain this contrast. If so, this bolsters our claims made elsewhere that “convergence results in little loss or simplification to the system, at the same time it allows for the preservation of many of the acoustic and perceptual characteristics” of the original system (Bullock & Gerfen, in press). We argue further that the conservation of these vowels provides further evidence that “languages in contact can sustain incursions and nevertheless remain stable at the core” (Toribio et al., to appear). In other words, languages undergoing shift and attrition, despite showing some obvious signs of weakness, do not gradually turn over from one system to another, but remain substantially intact (see also Myers-Scotton 1998 on morphosyntax).

2. Frenchville French sociolinguistic history and phonology

FF is a direct nineteenth century import from the departments of the Haute-Saône and Haute-Marne in eastern France, a region that is reported to maintain a contrast between /a/ and /a/ (Carton 1983). The language was implanted into rural central western Pennsylvania in two small waves of migration between 1830 and 1845. Since that time, it has been a linguistic isolate, surviving more than the three generation shift pattern of immigrant communities, probably due to a combination of geographic remoteness, endogamous practices among the French-speaking Catholics in a largely protestant region, local schooling, and local employment as farmers, surface miners, loggers and laborers. Further, several elderly residents report that as
the village became increasingly bilingual many parents chose to compartmentalize French as their home language even if English were required as a language of broader communication outside the home.

Despite the fact that newspapers from the 60’s (“Bit of France is Rapidly Eroding Away in the Hills of Clearfield County”, Philadelphia Inquirer April 20, 1969) through the 90’s (“Just 2 Residents Still Speak City’s Unique French”, The News-Herald, July 19, 1990) have continually heralded the demise of French in Frenchville, fieldwork by the first author shows that the reports of the ‘last speakers’ were, not surprisingly, premature since our study participant, still a fluent speaker of FF, is not counted among the two residents identified by the press in 1990. Those speakers have since died and yet FF is still spoken. Nonetheless, the fact that all the fluent speakers, the ‘formerly fluent’ speakers, and the receptive bilinguals are over 60 years of age means that the ‘unique French’ of Frenchville is now moribund. Our participant in this study is one of the only known fluent speakers left in Frenchville. He is now in his 70’s and has not spoken FF regularly for several decades, nor has he ever learned to read or write in French, even though it was his first language and he spoke it regularly until the time he married in his early 20’s. Aside from a tour of military duty in Austria, he has always lived in the village where he worked as a laborer. He completed seven years of schooling in his youth, but left school early to assist his father on their farm. Today, he speaks French only occasionally with his brother and with the first author of this paper.

The FF naturalistic data elicited from the current study participant and his brother manifest a number of syntactic, morphological and lexical properties that are consistent with language decline. In brief, the mappings between syntactic features and their morphological exponents show signs of erosion but the core syntactic system appears to be monolingual-like (see Bullock & Toribio to appear). These findings parallel those for morphosyntax in other language contact situations (King 2000), and in language use by heritage speakers (Montrul 2004) and second language acquirers (Sorace 2000).

The FF phonological phenomena that have been analyzed in detail display a mix of innovative and conservative characteristics. As noted above, these speakers consistently merge the mid front round French vowels with the English retroflexed schwa, as produced in the word *sir*. This is endemic except before /r/ where [œ] may be variably preserved, as in a word like *soeur* ‘sister’, which is produced on a continuum from target-like [sœə] to partially retroflexed [s’œə] to a vowel fully convergent with the English retroflexed schwa [sœ] (Bullock & Gerfen 2004b). That all targeted vowels have not been
completely neutralized strongly suggests that convergence with English does not operate in a wholesale fashion, but is, instead, subject to limitations.¹

While the mid front round vowels have generally converged with English [ə] in FF, French schwa resists merger. When pronounced, schwa is preserved in our participants’ speech with an acoustic profile, indicating that it is articulated along the dimensions of height and backness in a manner appropriate for [œ] in Conservative Standard French (CSF)(see Bullock & Gerfen, in press). This reveals that the mid front round vowel is not banned outright from the FF vowel system, rather it is reserved for the phonetic reflex of schwa. In this sense, it has diverged phonetically from the realization of the mid front round vowels with which it is often reputed to be identical in most varieties of French (Morin 1978).

Consider the implications of these findings for theories of phonological attrition. If one focuses only on the merger of the mid front round vowels, the facts would appear to indicate that FF phonology is, in some sense, eroding phonologically from the loss of a potentially contrastive set of mid vowels and phonetically from the apparent reduction of its front round vowel series. But, considered together, the convergence of the mid front vowels with [ə] and the maintenance of schwa as [œ] point to a different interpretation. That is, rather than losing native phonetic properties and potential contrasts through transfer, the convergence can conceivably be viewed as contrast enhancing along a different dimension. That is, unlike in CSF, where schwa and [œ] are phonetically identical, but arguably phonologically different, in FF they are dramatically divergent, clearly signally independent phonological entities.

In sum, although there exist definite signs of English influence in FF, they do not necessarily occur where predicted. Further, the convergence manifested is not phonetically automatic, but appears to be at least partially dependent upon the phonological status of the targeted sounds, since schwa displays a surprising immunity to the merger. Significantly, it is only a close analysis of the patterns of schwa maintenance that allows us to identify the repercussions of the convergence on the vowel system more systemically. What at first glance appears to be simple case of phonetic transfer or replacement turn out, at closer inspection, to actually preserve or to even enhance an internal phonological distinction in the native language. Thus, convergence and maintenance appear to operate in tandem.

In the analysis that follows, we consider the preservation in FF of the low vowels, a contrast that is only tenuously maintained today in CSF and that may well be expected to be vulnerable to alteration. The overriding question

¹ The exact motivation for these limitations is unclear. They could result from phonological constraints banning two adjacent rhoticized elements, from articulatory competition, or from perceptual salience (see Bullock & Gerfen 2004b for a full discussion).
for this research becomes, given the convergence elsewhere in the system, how is it that our speaker has preserved this arguably unstable contrast?

3. The problem

The two low vowels of contemporary French in France are subject to a great deal of variation. In many speakers, the low vowels, which are acoustically quite similar, have neutralized to the anterior low vowel and contrast has been abandoned. Even for those speakers for whom a contrast is maintained, it is often indeterminate with massive variation among individuals regarding how these vowels are distributed within specific lexical items (Martinet & Walter 1973, Walter 1976, Warnant 1987, Fagan 1989). A qualitative contrast between the low vowels is generally accompanied by a length difference where [aː] is considerably longer than [a]. When the posterior vowel is maintained, its realization is conditioned in CSF by several phonological factors, overviewed in (1) (Walker 2001, Tranel 1987).

(1) Phonological Context
   a. [a] occurs more often in stressed syllables than in unstressed ones.
   b. [a] occurs preferentially before [z] as in phrase “sentence” [frɑːz], gaz “gas” [ɡæːz]
   c. [wɔː] occurs preferentially after /t/: roi “king” [ʁwɔː], trois “three” [tʁwɔː]

Additionally, there are a number of orthographic cues, generally justified by historical deletion or by morphological differentiation, that signal the choice of the back variant in particular lexical items. These are given in (2) with lexical examples.

(2) Orthographic cues
   a. words with orthographic â favor [a]: âne “donkey” [ɑːn], câble “cable” [kɑːbl]
   b. words ending in silent s favor [a]: bas “low” [bɑː], mois “month” [mɔː]

Finally, there are a number of minimal pairs, following the cues in (2), signaling that the low vowel difference may be contrastive for some speakers. Exemplars are given in (3).

(3) Phonemic contrasts
   patte “paw” [pat]          pâte “dough” [pɑːt]
   moi “me” [mɔː]            mois “month” [mɔː]
Phonetically, the two low vowels are of identical height and are identifiable only by a relatively small degree of difference in the front-back dimension reflected acoustically in the second formant. The average formant measures correlating with height (F1) and roughly with backness (F2) are shown in (4) (Clas, Demers & Charbonneau 1968).

(4) Average formant frequencies

<table>
<thead>
<tr>
<th></th>
<th>F1</th>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>French /a/</td>
<td>750</td>
<td>1350</td>
</tr>
<tr>
<td>French /a/</td>
<td>750</td>
<td>1200</td>
</tr>
</tbody>
</table>

It is perhaps a combination of the acoustic proximity of these vowels and their opaque phonological differentiation that has provoked variability or merger to a single low vowel in many monolingual grammars.

The preceding description of the unstable phonetic and phonological status of the low vowels in CSF and various pressures on our speaker suggest that he might have altered the phonetic categories for the French low vowels in either of two ways. First, there are factors that might lead him to map the two low vowels to a single category; these include (a) our speaker’s inability to read French, thus depriving him of the orthographic cues for the posterior vowels and (b) the acoustic proximity of these vowels, which might make them perceptually indistinct. Conversely, there are pressures due to our participant’s bilingualism that might have led to a different mapping. That is, (c) the decline of our speaker’s French due to several decades of an almost exclusive use of English, and (d) the presence of a similarly discrete set of low vowels (anterior [æ] vs. posterior [a]) in his dominant language, English, might motivate him to settle on a convergent set of front–back low vowels for both of his component languages, since, arguably, the difference between the realization of the French and English low vowels is allophonic in nature.

Under either scenario, the most likely outcome of long-term isolation and contact with English is that the FF speaker would have altered the phonetic categories for the low vowel series with respect to CSF. Yet the following analysis is inspired by the observation of the first author that our speaker appears to use both low vowels in his speech. This observation, then, leads to the specific research questions posed in (5).

(5) a. Are the low vowels of this speaker distributed randomly across the low vowel space (i.e., in free variation)?
   b. Are the low vowels of this speaker distributed according to the norms of CSF (i.e., are they inherited)?
c. Are the low vowels of this speaker mapped to distinct anterior-posterior categories in a manner distinct from the norms of CSF (ie., are they more akin to English or to French)?

3. The data and methods

The corpus for this study was collected in taped sessions of structured but naturalistic interview sessions. These were recorded on a Marantz PDM221 professional cassette recorder and subsequently digitized using a sampling rate of 44kHz with 16bit quantization on a Macintosh G4 laptop. From these recordings, we extracted every audible token of the low vowels and, using Praat, manually measured the first three formants for each vowel at midpoint and the duration of each vowel. We also indicated for each vowel whether it was produced with or without stress, since FF stress may fall on syllables other than the final one. We report only on the measures of the first two formants and on the durations here.

The data were coded in two different ways. First, we coded each token according to the tendencies documented for CSF and outlined above in (1) and (2). This means that we only coded a vowel as a back variant when it met either the phonological or orthographic criteria specified above. For example, by this coding, the pronoun moi “me”, with a front vowel, contrasts with mois “month,” considered as a back vowel due to its final orthographic s. We report first on the results analyzed according to this coding scheme.

3.1 Results of FF compared strictly to CSF

Our first analysis considers the height of the vowels. These results are shown in Table 1. Note that we have uneven sample sizes. This reflects the relative rarity of the back low vowel in the French lexicon and is not due to our sampling. Statistical results of a two-tailed unpaired t-test indicate that the 10hz difference for the mean F1 values of these vowels is not significant (t(284)=.971, p = .17). Thus, our speaker produces these vowels at the same height.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Tokens</th>
<th>F1 (Hz)</th>
<th>Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>225</td>
<td>690</td>
<td>73</td>
</tr>
<tr>
<td>/ə/</td>
<td>61</td>
<td>680</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 1: Means of F1 values for vowel height

With regard to the front-back dimension, we hypothesized that we would find a difference between the two vowels, as this was perceptible in the speech sample. Thus, we completed an unpaired, one-tailed t-test which demonstrated
that the mean difference in backness for these two categories is highly significant ($t(284) = 7.695, p = .0001$). These results are shown in Table 2.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Tokens</th>
<th>Mean F2-F1 in Hz</th>
<th>Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>225</td>
<td>644</td>
<td>173</td>
</tr>
<tr>
<td>/α/</td>
<td>61</td>
<td>438</td>
<td>223</td>
</tr>
</tbody>
</table>

Table 2: Means of $F2-F1$ for backness

Interpreting smaller differences between F1 and F2 as a correlate for backness, it is clear from the results in Table 2 that [α] is produced significantly further back than is the anterior vowel. The vowels, plotted with regard to CSF norms in a standard vowel plot can be seen in the scattergram in Figure 1. The x-axis represents the value of the F2-F1 difference for each vowel while the F1 value is plotted long the y-axis. While there is a degree of overlap apparent in the distribution of these vowels, there is a nonetheless a visible separation of the front and back categories.

![Figure 1: Vowels plotted according to CSF norms](image)

The results for durational differences between these two vowel categories are also significant. Since we did not have a prediction regarding vowel length, we ran a two-tailed unpaired t-test. The results, as shown in Table 3, reveal that the back low vowel is appreciably longer than its front counterpart, as it normally is in CSF ($t(284) = -3.25, p = .0007$).
Table 3: Mean durations in milliseconds

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Tokens</th>
<th>Duration in ms</th>
<th>Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>225</td>
<td>111</td>
<td>89</td>
</tr>
<tr>
<td>/ə/</td>
<td>61</td>
<td>153</td>
<td>83</td>
</tr>
</tbody>
</table>

3.2 Front to back ‘migrations’ according to FF norms

While coding the data, it was apparent that many of the vowels that would be classified as low front vowels in CSF sounded audibly back, but in predictable contexts. Therefore, we recoded the data corresponding to the extended phonological environment for the FF back vowel. All tokens that met the following criteria were recoded as FF back vowels: (a) all tokens containing orthographic “oi”, (b) low vowels preceding a fricative, and (c) all low vowels in stressed, final position. In Figure 2, we present a scattergram of these vowels, which we term ‘migrating vowels’ plotted only within the category of the anterior vowels.

![Figure 2: Migrating ‘front’ vowels](image)

Notice that the recategorized vowels tend to cluster between the 450 and 550 Hz range on the x-axis, falling rather solidly between the anterior and the posterior mean. If they are plotted instead as back vowels, as in Figure 3, then a clearer visible representation of the significant separation between the two vowel categories according to the front–back dimension emerges.
4. Discussion

In answer to our study questions, the acoustic analysis has shown that our FF speaker does indeed preserve a significant contrast between low vowels, with the respective vowels largely distributed according to the phonology of CSF. Further, the average formant measures for these vowels are phonetically very similar to CSF along the posterior–anterior dimension norms, even though this speaker produces them as less open than the corresponding CSF vowels, as shown in Table 3 (CSF measures from Clas et al. 1968).

<table>
<thead>
<tr>
<th>Vowel</th>
<th>F1</th>
<th>F2-F1</th>
<th>F1</th>
<th>F2-F1</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>750</td>
<td>600</td>
<td>600</td>
<td>644</td>
</tr>
<tr>
<td>/a/</td>
<td>750</td>
<td>450</td>
<td>450</td>
<td>438</td>
</tr>
</tbody>
</table>

Table 3: Mean durations in milliseconds

These facts lead us to conclude that our answer to research question (5a) is in the negative; these vowels are not randomly distributed. In answer to question (5b), our speaker does maintain an inherited contrast.

On the other hand, our FF speaker shows some innovation with respect to CSF. If we consider the contexts to which he has extended the posterior low vowel, a pattern begins to emerge. Specifically, he neutralizes ‘oi’ [wa] productions to the posterior vowel, and extends the back round vowel to all stressed low vowels in absolute final position, whereas CSF often limits the posterior vowel in this position to contexts marked by an orthographic s. Each of these innovations could be due to our speaker’s lack of literacy in French. That is, our speaker has no knowledge of French orthographic norms. Thus, he is almost certain to be unaware of the orthographic final s that helps to
reinforce the contrast in CSF, and he has, therefore, neutralized the different pronunciations. However, it should be mentioned here that there is evidence that the contrast for this speaker has been acquired lexically for certain items. Specifically, his pronunciation of the French word râteau [ʁaːtɔ], a word that he uses for “rake” or “thresher”, is produced consistently with the posterior low vowel, precisely as the circumflex would indicate for a CSF pronunciation. Since we must assume that he is unaware of the circumflex, but has still acquired this lexical item with the posterior vowel pronunciation, it is not impossible that he could have acquired the other orthographically marked distinctions on a lexical basis. That he instead appears to have neutralized them may equally well be due to factors other than his lack of literacy. For instance, these vowels could already have been backed in the input he received when acquiring French as a child, or the presence of a similar low back vowel in English in similar environments may have enhanced his perception and production of the back vowel (e.g., [wa]: wash, walk, waltz, final [ə]: spa, pa, ma). In either case, these FF innovations with respect to CSF are not random, but phonologically generalized.

The extension of the posterior variant to the context preceding all fricatives, and not just [z] as in CSF, can be viewed as a phonologically conditioned innovation. Here the effect cannot be easily attributable to our speaker’s bilingualism since, within stressed syllables in English, both posterior and anterior low vowels can occur before fricatives such as [s] (e.g., anterior class, grass, past and posterior possible, pasta, lost.) Instead, we interpret this change as an extension of an environment already present in CSF.

The conclusion that we draw from our speaker’s innovations is that they are entirely consistent with internally motivated changes in his French. In all cases, our subject has merely extended a pattern of distribution for the low back vowels that was already present in that language. This implies that despite long-term English dominance, his French phonology remains target-like with respect to the low vowel categories. Any effect of his English in extending the context for the posterior vowel may merely be to enhance congruence between the two languages.

It is instructive to compare the mean frequencies of the FF vowel formants with those given for American English (Ladefoged 1993) given in Table 4.

<table>
<thead>
<tr>
<th></th>
<th>AE [æ]</th>
<th>FF[a]</th>
<th>FF[α]</th>
<th>AE[α]</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>690</td>
<td>690</td>
<td>680</td>
<td>710</td>
</tr>
<tr>
<td>F2-F1</td>
<td>870</td>
<td>600</td>
<td>450</td>
<td>390</td>
</tr>
</tbody>
</table>

Table 4: American English and FF low vowel frequencies
What is apparent from an inspection of Table 4 is that the AE low vowels are dispersed or distant in the sense of Lindblom (1986, 1990) along the front–back dimension as shown by the mean F2-F1 values. The Frenchville vowels, which we have determined to be phonologically contrastive, are each produced more centrally than their English counterpoints. What this implies is that, unless his French has affected the low vowel categories of his English, he appears to maintain a phonetically discrete set of front–back low vowels in his French that he has not mapped to his English vowel categories (in the sense of Flege 1987). While we have not yet analyzed his English vowels, we know that he does not have any pronunciation properties that deviate perceptibly from his monolingual western central Pennsylvania neighbors.

5. **Implications of this analysis**

In our previous research on FF, we have demonstrated that the susceptibility of the phonology to convergence with English cannot be viewed as a mere low-level phonetic merger. We have suggested that “bilingual phonologies may become particularly permeable where they are acoustically and perceptually unstable and where they are already congruent to some degree” (Bullock & Gerfen 2004a:103). Given the results of the current analysis, a larger question emerges: How do we reconcile the maintenance of the French low vowel categories in FF with the merger of the mid front round vowels, since this case presents a profile that is very similar to the convergent one? First, as with the front round vowels, the contrast between [a] and [ɑ] is inherently unstable perceptually and acoustically, which makes it a likely candidate for convergence. Second, congruent categories exist for these vowels along the parameters of vowel height and relative front–back position in the dominant language, English.

We suggest that it may be that the phonological congruence with English helps to preserve separate French categories for these vowels. That is, an English contrast between front–back low vowels may enhance the preexisting French one, thus underscoring the role of phonology in cross-language perception (Best 1995) and production. Importantly, this does not entail that our speaker necessarily maps his phonetic categories for these vowels onto those of his dominant language. For instance, it may be that for this speaker the anterior vowels are not perceived to be sufficiently similar in French and English to merge together or, perhaps, that one of more of these vowels serve for him as salient sociophonetic markers of ‘Frenchness’ or ‘Englishness’.

Although robust empirical work on the phonetic systems of bilinguals in attrition contexts is scant, there appears to be a growing consensus that only some phonetic characteristics of the receding language are impacted by
contact, and that a simple explanation for patterns of maintenance versus merger will prove illusive (Godson 2004, Bond, Markus & Stockmal 2004). We add that our Frenchville studies diverge significantly from previous works in considering phonetic properties in tandem with traditional concerns of phonological distributions. The picture that is emerging is one in which the outcome of convergence between two systems appears to be remarkably conservative. That is, despite some salient English-like properties in FF pronunciation, the phonology and, indeed, the phonetic system of the language remain resolutely French.

REFERENCES


