Some Theoretical Considerations on the Merger of the Low Vowel Phonemes in American English
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SOME THEORETICAL CONSIDERATIONS ON THE MERGER OF THE LOW VOWEL PHONEMES IN AMERICAN ENGLISH

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The purpose of this paper is to examine the phonological systems of speakers who are in the process of adopting a phonemic merger. The merger in question is the merger of the low back vowel phonemes of American English as represented in the minimal pair cot/caught. This contrast is based on the feature "round" as illustrated in Figure I.

	[a̟] front unrounded		[ɒ] back slightly rounded
/a/	[a] central unrounded	/ɔ/	[ɔ] back rounded
	[ɑ] back unrounded		[ɔ̈ˠ] back rounded, schwa glide

Figure I. Distribution of principal allophones

The most common form of merger in the United States results from the adoption of a phonological rule of unrounding and usually subsequent fronting which applies to the rounded phoneme. The loss of contrast resulting from the adoption of this rule has been reported for much of the United States west of the Mississippi River and for most of Canada. The discussion in this paper is based on data collected in Southern California, Orange County specifically, among school age children and teenagers.

Background

The American English taxonomic phoneme /ɔ/ has never been as "stable" as the case might appear from the standard phonemic descriptions of American English and from textbooks in English as a second language. Wetmore (1959) in a detailed study using the records of the linguistic atlas interviews tried to answer the following questions:

(1) What is the allophonic range of the low vowel phonemes? What is the norm for each phoneme?
(2) What are the phonetic subclasses? What are the allophonic norms for these subclasses?
(3) What are the lexical items which are exceptions to the phonetic subclasses?
(4) What are the geographical and social differences in (1), (2), and (3)?
(5) What are the differences for individuals (including style) for (1), (2), and (3)?

On a theoretical level Wetmore found two phonemic systems. In two geographical areas, Western Pennsylvania and Eastern Maine, there was no contrast

between words such as cot and caught since both were pronounced with a low back slightly rounded vowel. Wetmore used /ɒ/ as the phonemic symbol. In all other areas there was a phonemic contrast based on rounding: usually unrounded back /ɑ/ in cot and rounded back /ɔ/ in caught. In no area did he find a merger resulting from the application of a phonological process of unrounding and fronting resulting in a central vowel phoneme as has been reported for Western United States.

In order to underline the extreme variability which Wetmore found, I will briefly review some of his findings for one area. For Vermont, Wetmore reports that the primary phones for the two phonemes are a back rounded one and a back unrounded one. Wetmore claimed that there was no phonemic overlap. On the other hand the distribution of the phonemes themselves was highly irregular. The -g subclass was the most variable: the unrounded phoneme was the norm for fog, hog, and frog but the rounded phoneme was normally found in dog. However, three informants used a rounded phone in fog and an unrounded one in dog. The -f class was also quite variable: office was recorded only with unrounded phones, but in coffin and coffee there was apparently free variation of rounded and unrounded phones. For the -n class, which theoretically is contrastive (don vs dawn) the rounded phones were more frequent for words like dawn but there are occasional unrounded ones recorded. Individual words of this class varied greatly. Ten of eighteen informants used a rounded phone in launch, the other eight used only unrounded phones. In closet and hospital, only one informant used rounded phones. In automobile, eight informants used rounded phones, two used unrounded phones, and one used both. A close examination of the other areas reviewed by Wetmore reveals that this sort of variability is found throughout the Eastern States.

Sources for the Contrast

There are several historical sources for the low vowels which seem to be so asystematically distributed through the lexicon. The primary source was Middl English short o. The unrounding and fronting of this phoneme spread through the phonetic subclasses at different rates in different areas. Examples are given in Figure II in which the contexts in which the change has not been complet in many areas of the United States are enclosed.

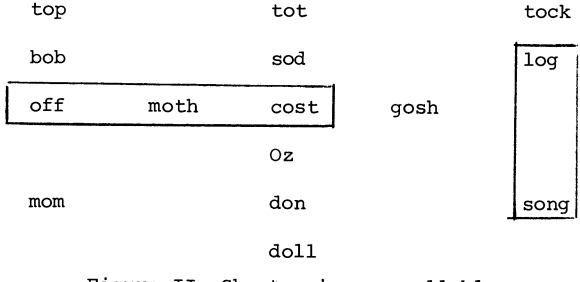

Figure II. Short o in monosyllables

It has already been mentioned that in certain areas a rounded phone is still used for all of these subclasses; however this is not the case for most varieties of American and Canadian English for which the unrounding and fronting processes are well advanced. The most conservative context for all speakers is the velar nasal. The only stop which is a negative constraint on unrounding is the velar stop, -g. This class is highly variable in all areas even for the lexical items in this class. The voiceless fricative context is also conservativ for most Easterners. However, even in this class there is much variability. The palatal fricative has been a positive constraint for unrounding for many but not all speakers. In the context of -f,-th, and -s, the shift is variable and is constrained by several factors including syllable boundry, number of syllables in the word, and so forth. The degree of fronting also varies according to geographical area.

After the rule of fronting and unrounding had been well established at leas in certain contexts, other vowel combinations were monophthongized resulting in a back rounded vowel, normally long and tense: (1) /a/+/l/ as in call, ball, salt, talk, caulk, and so forth, (2) /au/ as in law, hawk, strawberry, and so forth, (3) /ou/ as in fought, bought, taught, daughter, and so forth, (4) and for some speakers /a/ after /w/ was rounded in words such as swamp, water, watch, and so forth. The result of this monophthongization was a new set of contrasts in those environments in which short o had been previously unrounded, that is, the previous contrast was reformulated in different phonological terms. These possible contrasts are given in Figure III.

Open Syllable	Closed Syllable
popper(P)	tot(T)
pauper(WP)	taught(WT)
bobbles(B)	tock(K)
baubles(WB)	talk(WK)
totter(D)	Oz(Z)
daughter(WD)	cause(WZ)
la(#)	mod(D)
law(W#)	Maude(WD)
comma(M)	mom(M)
trauma(WM)	Maughm(WM)
	don(N)
	dawn(WN)

Figure III. Possible Contrasts /ɑ/ vs /ɔ/

In word final position the contrast is highly variable: in some areas all word final low vowels are round, in others all are unrounded, others maintain the contrast. The greatest number of contrastive pairs is found with T/WT as cot, caught, tot,taught,sot,sought. In no case does the contrast have a high functional load; minimal pairs are few and usually rare. Also the frequency of the unrounded phones is much higher than that of the rounded phones.

Based on the data from the Eastern dialects alone, I propose that the most adequate view is one of continuous change as illustrated in Figure IV.

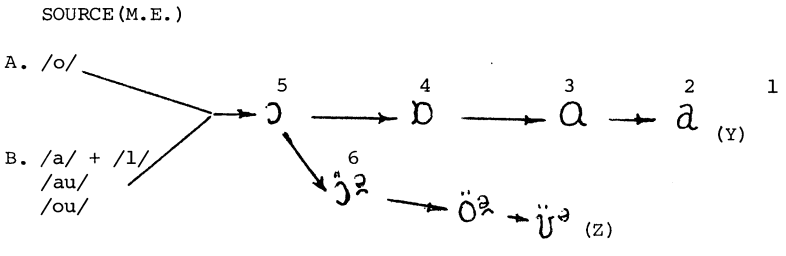

Figure IV. The Path of Change

In Figure IV (Y) indicates the path of change followed by most American dialects; (Z) indicates the path of raising followed by some Northeastern dialects, such as in New York City. The numbers identify the relative fronting of the phones. From these we are able the calculate the mean as an index of unrounding and fronting for various groups and individuals.

For a full description of the function of the low vowel phonemes in American English one would have to indicate at which stages the various phonetic subclasses were located on this path of change. This amounts to describing the constraints operating on the phonological rule of unrounding and fronting.

The Merger in Southern California

In a recent paper (Terrell, 1975) I reported the preliminary results from the data we have collected from interviews with school children and teenagers in Southern California. Our working assumption was that the informants could be divided into two groups: those born and raised in Southern California and those who moved here after the age of two with their families. We realized that many in the latter group would quickly adopt the speech patterns of native Californians; however, we

expected to find differences on a group level at least. The overall results are given in Figure V.

(1) Natives who use no rounded phones (61)	72%
(2) Natives who use some rounded phones (24)	28%
(3) Natives who contrast (0)	0%
(4) Nonnatives who use no rounded phones (23)	64%
(5) Nonnatives who use some rounded phones (11)	36%
(6) Nonnatives who contrast (2)	6%
(7) Black natives/nonnatives who contrast (17)	100%

Figure V. Distribution of Rounded Allophones

These totals reflect all subclasses except -r, which was not tested or tabulated, and velar -l before which all informants tend to favor rounded phones.

To our surprise even on a group level the differences between the natives and nonnatives are minimal. Futher investigation with each individual interview revealed that some of the natives had learned to use backed and rounded phones in certain contexts and that most of the nonnatives had learned the California pattern very quickly resulting in merger in all contexts. Thus just by listening to the interview it was in most cases impossible to determine whether the informant was a native or nonnative. For example one informant who had been born and raised in NewJersey and who moved to California when he was ten years old (he was thirteen at the time of the interview), used no rounded phones in any context (except for velar -l) and was completely indistinguishable from native Californians by his speech.

For these reasons we divided the interviews into the subgroups indicated in Figure V in order to calculate the means of the index of fronting. The results are given in Table I.

	Natives (no round)	Nonnatives (no round)	Natives (some round)	Nonnatives (some round)	Blacks (total) (all contrast)	
Mean	2.41	2.45	2.81	2.97	3.28	
S.D.	.63	.60	.73	.91	1.10	
Var.	.39	.36	.53	.84	1.21	
N=	2257	715	1502	800	1960	cases

Table I. Means for Total Corpus

From the data in Figure V, in Table I and additional data presented in Terrell (1975), we may conclude the following: (1) No native Californian under the age of 18 systematically contrasts phonemes on the basis of the feature "round". (2) Among the natives who used rounded phones sporadically, all had nonnative parents. (3) Most nonnatives adopt the

merger shortly after moving to California,most in lessthan two years. (4) Merger has not spread through the Black youth of Southern California. (5) Merger is nonstigmatized; rounded allophones are stigmatized if the rounding is sufficiently strong. (6) The unrounding and fronting of back phones has been completed for all contexts.

We would like to determine how the relationship between merger and phonological context is dealt with by (1) those who use no rounded phones,(2) native Californians who learn to use rounded phones, (3) non-natives who are in the process of adopting the merger, and (4) Black adolescents who may be in the initial stages of adopting the merger. The overall data is displayed in Table II in which the means for the five groups of Table I are broken down by phonological context. In Table II "C" stands for the reflexes of M.E. short o , "WC" stands for M.E. /au/,/ou/, or /a/+/l/. **The me**ans are given in the same order as in Table I.

We will examine the pattern for Black speakers first. The phonological rule which applied first to the Middle English short o has produced a central vowel in all contexts except for voiceless anterior fricatives and the voiced velar stop /d/ and the voiced velar nasal/ŋ/. This fronting is even more extreme in most contexts than for any of the white speakers. This is perhaps explicable by the fact that the Black group maintains the round-unround contrast and uses the fronting of the unround phoneme in order to maintain phonetic distance between the two phonemes. Since white Californians do not maintain this contrast they could allow more phonetic variation in the relative fronting or backir the allophones of their single phoneme.

The rounded phoneme /ɔ/ for Black speakers has as its principal allophones [ɒ] and [ɔ] ; however in certain contexts, the data suggest that the rules of unrounding and fronting have begun to be applied at least by some individuals. Selected contexts are compared in Table III in which the means for "rounded" classes are given followed by the percentage of rounded phones used in these contexts.

	Black Males (N=8)	Black Females (N=9)	Total Group (N=17 informants)
(1) Contrastive			
WT	4.49(98%)	4.37(95%)	4.42(95%)
WK	4.55(97%)	4.18(83%)	4.34(89%)
WZ	3.88(88%)	4.33(100%)	4.11(94%)
WN	3.20(35%)	3.81(72%)	3.54(56%)
(2) Voiceless Fricatives			
F	4.34(94%)	3.49(44%)	3.89(68%)
θ	4.05(84%)	3.48(52%)	3.72(66%)
S	4.16(97%)	3.92(75%)	4.03(81%)
(3) Voiced Velars			
G	4.10(94%)	3.50(56%)	3.78(74%)
NG	3.95(95%)	4.00(100%)	3.97(98%)
EL	4.22(96%)	3.87(76%)	4.03(87%)

Table III. Means for Selected Subclasses for Black Population

			Labials	Dentals	Alveolars	Palatals/Velars
Stops	VL	C	198/206/238/220/244		200/206/230/224/204	211/216/233/235/216
		WC	200/250/250/350/381		200/211/250/346/442	214/234/250/296/435
	VD	C	209/225/254/214/206		209/200/231/214/200	231/242/283/280/344
		WC	211/220/256/267/200		226/233/262/250/329	
Fricat.	VL		222/226/238/312/389	222/222/300/338/373	199/200/243/274/353	238/238/240/239/215
	VD	C	225/217/238/236/208	254/245/281/283/218	257/250/292/271/212	
		WC			215/200/250/350/412	
Affric.	VL					252/267/277/243/218
	VD					232/217/256/236/206
Nasals		C	251/261/275/245/256		265/260/282/250/204	271/233/328/290/397
		WC			267/275/300/321/356	
Laterals					224/250/295/281/224	339/339/387/415/403
Word Final			239/262/268/292/376			

TABLE II Means for Total Corpus by phonetic subclass by informant groups

Back rounded allophones are maintained most strongly in the contrastive contexts except for WN and before velar nasals and laterals. The fronting is most apparent in the WN class especially for males who used rounded phones only 35% of the time. On the other hand females seem to be somewhat more advanced than males in fronting in noncontrastive contexts. It is possible that the rounded phoneme is considered to be an integral part of Black vernacular speech. If so a possible explanation for the differences would be that males tend to be more conservative in conserving the vernacular, whereas females are more influenced by white standards.

Let us now turn to a detailed examination of the four groups of white speakers. The means from Table I for the natives who use no rounded phones and for the nonnatives who have adopted this pattern are not significantly different. An even closer examination of the means for each phonetic subclass fails to yield any appreciable differences. The Standard Deviation and Variance figures are also lower than for any other group. The norm for both groups is a central phone and there is very little variation from this norm in any context. The general constraints for unrounding and fronting for these groups is for the process to apply if the following sound is (1) an obstruent rather than a sonorant, (2) a stop rather than an affricate or a fricative, (3) a voiceless rather than a voiced consonant, (4) a nasal rather than a lateral, and (5) an anterior consonant rather than a posterior one.

The data from Table I suggest that the pattern used by natives who use some rounded phones is actually closer to the pattern used by nonnatives in process of adopting the merger. Selected subclasses are displayed in Table IV in order to compare there two groups more closely. Means and the percentage of rounded phones used are compared with averages for the groups who use no rounded phones (natives and nonnatives).

	Natives (with round phones)	Nonnatives (with round phones)	Merger Groups (No round phones)
Contrastive Contexts			
T/WT	2.31/2.50(15%)	2.24/3.46(61%)	2.09/2.02(0%)
K/WK	2.32/2.50(6%)	2.35/2.96(26%)	2.12/2.19(0%)
Z/WZ	2.92/2.50(0%)	2.71/3.50(50%)	2.55/2.69(0%)
N/WN	2.82/3.00(0%)	2.50/3.21(33%)	2.70/2.69(0%)
Voiceless Fricatives			
F	2.83(23%)	3.12(36%)	2.33(0%)
θ	3.00(18%)	3.38(52%)	2.22(0%)
S	2.58(13%)	3.00(25%)	1.99(0%)
Voiced Velars			
G	2.83(24%)	2.98(37%)	2.37(0%)
NG	3.28(41%)	3.90(91%)	2.63(0%)
EL	3.87(72%)	4.15(85%)	3.39(39%)
Contrastive Total	2.51/2.64(7%)	2.39/3.22(40%)	2.27/2.27(0%)
Noncontrastive Total	3.24(34%)	3.43(50%)	2.61(12%)

Table IV Means for selected subclasses

These data show that there are striking differences between the native and nonnative groups. Except in isolated instances the native group is not able to use the rounded phones contrastively. In contrastive contexts rounded phones are used by natives in only 7% of the possible instances compared to almost one-half of the time (40%) for nonnatives. The means for each subclass are so close that the differences are not great enough to provide a margin for contrast. In fact, natives seem to use more backed phones in all contexts. It is possible that these native speakers have heard the use of rounded phones by their parents and others (since all in this group have nonnative parents) and have coded this use of rounded phones into a general tendency to use more backed phones. This backing and sporadic rounding is purely phonetic however as is evident from the fact that the rounding is most pronounced in noncontrastive contexts.

In order to examine these patterns for individuals the data from Table IV for the contrastive and noncontrastive contexts are displayed broken down by individual informants with the highest rates of use of rounded phones in Table V. (The first number represents the number of years in the home state; the second, the second the number of years in California).

	Natives						
Contrastive	20%	18%	14%	14%	10%	5%	0%
Noncontrastive	42%	54%	43%	25%	38%	33%	12%
	Nonnatives						
Contrastive	91%	86%	52%	24%	20%	5%	0%
Noncontrastive	81%	75%	51%	46%	15%	33%	44%
	Ohio (10+2)	Iowa (3+10)	Penn (7+5)	Ken (5+7)	Tex (10+3)	Tex (7+6)	N.C. (11+1)

Table V Percent of rounded phones of individual informants

These data support the conclusion that natives are unable to use the feature "round" contrastively. The nonnatives, on the other hand evidently start with a round-nonround contrast which is quickly lost as the rule of unrounding and fronting is adopted. The quick loss of contrast may be explained by the fact that in those contexts in which the contrast is strongest, the voiceless stops, the rule of fronting is most applicable.

In summary the differences between these groups may be interpreted formally as follows. All natives have a low central vowel /a/ as underlying in all contexts. The feature "round" functions only redundantly. For the informants who use some rounded phones, we may posit that they have adopted a sort of redundancy rule which backs and rounds allophones

of /a/ in certain contexts. This rule is highly variable from individual to individual since it represents each informant's approximation to the system he hears from family and others. The nonnatives,on the other hand, have an underlying round phoneme posited on the basis of the speech of their original communities. As they arrive in California they adopt the unrounding and fronting rule as a variable phonological rule. When the application of this rule approaches 100% the lexical items are restructured with a central unrounded phoneme.

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