# Part B

## *The Life History of Linguistic Change*

# 5

# *Triggering Events*

The preliminary chapters of this volume have been devoted to an examination of the cognitive consequences of linguistic change. This pursuit was in part driven by the desire to resolve the Darwinian Paradox of Volume 2, repeated below:

> The evolution of species and the evolution of language are identical in form, although the fundamental mechanism of the former is absent in the latter.

That fundamental mechanism is of course natural selection. No matter what view we have of the mechanism of linguistic evolution, it is clear that human language has evolved the capacity to transfer propositional information about near and remote times and places.[1] To identify a cognate of natural selection in the sound changes now in progress, we would have to find a mechanism through which the capacity to communicate such truth-conditional information was enhanced – or at least preserved – by the innovative forms. In our studies of the cognitive consequences of linguistic change in Chapters 2–4 we might have discovered a general capacity for dealing with the effects of change, perhaps in the form of a pandialectal phonology that assigned each new variant its proper interpretation. But no such mechanism was found in the natural misunderstandings of Chapter 2 or in the CDC experiments of Chapters 3 and 4. Instead, we found people repeatedly confused by the new forms, even those that matched their own productions. These results can only reinforce the negative view of change that was dominant in the nineteenth century reviewed in Chapter 1 of Volume 2. Sound change does interfere with the primary function of language as an instrument for conveying truth-conditional information. Both our evolutionary perspective and our sociolinguistic orientation lead us to reject the earlier attribution of change to laziness, carelessness and ignorance. What, then, are the forces that initiate, shape and drive to completion the sweeping linguistic changes described in Volumes 1 and 2? The present chapter is the first in a series that attempts to answer this question.

## 5.1 Bends in the Chain of Causality

There is general agreement that the heart of the study of language change is the search for causes. It is what we generally mean by the explanation of change. While we would like to apply to this search the universal principles that govern grammar as a whole, it is also understood, following Meillet (1921), that no universal principles can account for the sporadic course of change, in which particular changes begin and end at a given time in history. The actuation problem demands that we search for universals in particulars.

However, the pursuit of the causes of any given change might, on further reflection, involve us in an unsatisfactory and endless recursion. It goes without saying that any given state of a language is the outcome of a previous state of that language, and so on – back in time as far as our knowledge can carry us. The title of this chapter needs, then, some justification if it refers to linguistic events. In an endless chain of causes, every state of the language is a triggering event for the one that follows. Even if there is no detectable change in a given system, the system itself has a cause: the state of equilibrium that was reached in the preceding period. And when there is change, as Martinet (1955) has argued, the evolving system reflects a series of earlier readjustments, which spiral backward in time.

I would like to defend the concept of "triggering event" by arguing that this sequence of preceding causes is not smooth and uniform. Rather, there are bends in the chain of causality at which the triggering events are located, as suggested in Figure 5.1. Around the bend there are further chains of causality, but they are often orthogonal to the question that drives the original search. A nonlinguistic example may illustrate the point. We are all interested in the prehistory that gave rise to mammalian evolution, and in this causal sequence we encounter the extinction of dinosaurs, along with plesiosaurs, mosasaurs, and a majority of all other existing families at the K–T boundary between the Cretaceous and Tertiary Periods. What caused this massive extinction? The most strongly supported theory is that of Luis and Walter Alvarez, originally proposed in the 1980s: that the K–T extinction was the result of the impact of a large meteor with the earth.

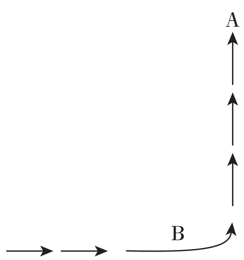


**Figure 5.1** A bend in the chain of causality

> While the exact killing mechanisms may or may not yet have been identified, all the data – including the rate of extinction, the nature of the recovery, and the patterns of survivorship – are concordant with the hypothesis of extinction by asteroid impact. (Fastovsky and Sheehan 2004)

The hypothesis of a meteor impact, if it continues to be supported, provides a satisfactory answer to the search for the triggering event that gave rise to mammalian predominance in the evolutionary sequence. But what, then, were the causes of this intersection of asteroid and earth? It is an important question for the future of the human race, which would be profoundly influenced by a potential major impact of this kind. Yet the pursuit of that question would not further illuminate the later history of biological evolution. The triggering event in this case is the joint result of many other historical events whose concatenation is not relevant to our original question. A triggering event of the linguistic changes we have been studying may indeed be an earlier linguistic event, one which represents a terminus a quo for the historical development as well as a terminus ad quem for the inquiry.

Chain shifts are a natural subject for the study of causal sequences and for the search for triggering events. Section 1.5 of Chapter 1 describes six such chain shifts, which involve two to six events. In each case we can posit an earliest event in the chain. Though there is always some uncertainty on this, we can ask in each case: what preceding event brought about this initial element of the chain shift?

We might think, again following Martinet, that this triggering event must be an external event impinging on the linguistic process, like the Norman Invasion or World War II – an event outside of the realm of autonomous linguistic explanation. For some shifts, this is indeed the case. But in others it will appear that there are linguistic bends in the chain of causality, and I will argue that there are triggering events of a purely linguistic character. Their explanation calls upon a different set of principles from those that operate on the changes they initiate.

First, however, it can be shown that bends in the linguistic chain are essential characteristics of chain shifts. In fact, without such shifts of direction it will be difficult to defend the very concept of a chain shift.

Consider the simplest kind of chain shift.

(1) $B \rightarrow A \rightarrow$

Here A is the *leaving* element and B is the *entering* element.[2] A causal connection might be said to exist if A moved away because B approached A, reducing the margin of security, or if A moved away, increasing the margin of security, and B consequently moved in the direction of A. However, such chain shift events are subject to an alternative interpretation. The movement of A may be generalized to B, just as a change affecting a front vowel may be generalized to the corresponding back vowel without any relevant change in margins of security. In (2) below, if A is a vowel /e/ moving in the vowel space from mid to high, and B is a low vowel

/æ/ moving from low to mid behind it, one could argue that the movements of A and B are causally related. But this can also be conceived of as a single expression, as in (3): an expression in which all front vowels undergo the loss of one degree of openness. Whatever factor C acted on /e/ to make it less open, it came to act equally on /æ/, so that the causal relationship is seen as in (4) rather than (1).

(2) A $\quad$ e → i
B $\quad$ æ → e

(3) $\alpha \text{ open} \rightarrow \alpha\text{-1 open} \,/\, \underset{[+\text{ant}]}{\_\_\_\_\_}$

(4)
$$\begin{tikzcd} & C \arrow[dl] \arrow[dr] & \\ B & & A \end{tikzcd}$$

However, option (4) is not available if A and B are different kinds of linguistic processes. Thus, in the Southern Shift (Figure 1.5), A is the monophthongization of /ay/ and B is the lowering and centralization of the nucleus of /ey/ (ANAE, Ch. 18) – as represented in (5). In A, /ay/ is a vowel from the subsystem of front upgliding vowels that moves to the system of long and ingliding vowels, while B is an adjustment entirely within the set of front upgliding vowels.

(5) A $\quad$ ay → ah
B $\quad$ ey → ay

Here we must accept a chain shift of type (1), since there is no single process that can be generalized in order to unite the behavior of A and B. The causal relationship seems clear: the removal of /ay/ from the front upgliding system has led to a re-adjustment by the well-recognized principle of maximum dispersion: the tendency of vowels to achieve equidistant positions within a subsystem (Martinet 1955,

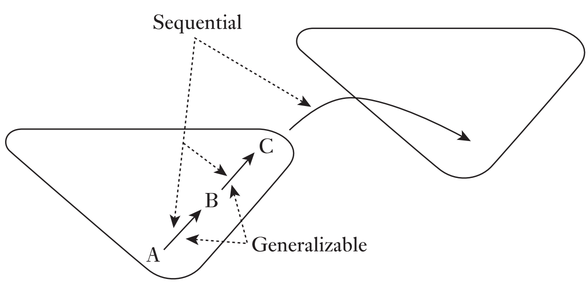


**Figure 5.2** Generalizable and sequential chain shifts within and across subsystems

Liljencrants and Lindblom 1972, Disner 1978, Lindblom 1988).[3] Figure 5.2 sums up the characterization of these two situations: generalizable shifts within a subsystem, and sequential shifts across subsystems.

The type of causal explanation applied to chain shifts is not in question here. In this search for triggering events, one may take a teleological position, like that of Martinet (1955) or Jakobson (1972), and argue that speakers shift their vowels to minimize misunderstanding. Or one can attribute these linked movements to the mechanical effects of misunderstanding on the probability matching of the language learner (Volume 1, Chapter 20). Evidence for the causal link may come from temporal sequencing, geographic nesting or internal correlation (ANAE, Chs 14, 18). However, the order of events is crucial to the present discussion: whether we are dealing with a drag chain or a push chain will be a determining factor in the search for triggering events.

### *5.1.1 Subsystems of English vowels*

Much of the logic of chain shifting involves movements out of and into subsystems. The binary notation used throughout Volumes 1 and 2 and developed in most detail in ANAE, Ch. 2 is designed to characterize these subsystems in a coherent and systematic manner. Figure 1.1 outlined the four subsystems of North American English: short vowels, front upgliding vowels, back upgliding vowels, and the smaller set of long and ingliding vowels. The notation does not describe the set of contrasts in any one dialect, but rather the initial position from which present-day dialects can be derived. In that sense, the individual units are historical word classes comparable to the lexical key words presented in Wells (1982).[4]

The principles of maximal dispersion and maintenance of margins of security, developed in Martinet (1955), operate within subsystems. Chapter 9 of Volume 1 presented data from natural misunderstandings (the same data set as in Chapter 2 of this volume), which show that confusions occur primarily within members of a subsystem, rather than across subsystems. There is for example more confusion between /i/ and /e/ than between /e/ and /ey/, and more between /ey/ and /ay/ than between /ay/ and /aw/.[5]

## 5.2 Causes of the Canadian Shift

The Canadian Shift, first shown in Figure 1.6, is reproduced here as Figure 5.3. It involves three events, as shown: the backing and raising of /o/, the backing of /æ/, and the lowering and backing of /e/.

This chain shift was first described by Clarke et al. in 1995, on the basis of word lists read by sixteen college students, and has since been confirmed by several

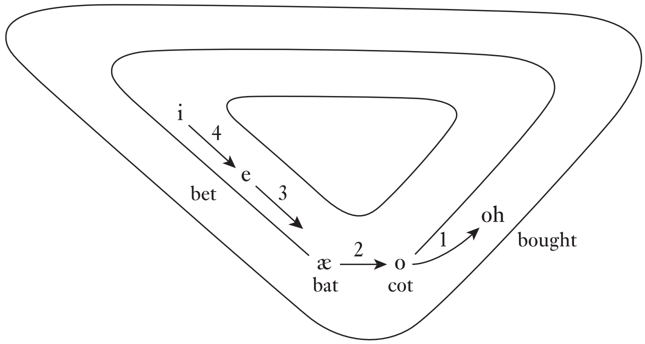


**Figure 5.3** The Canadian Shift

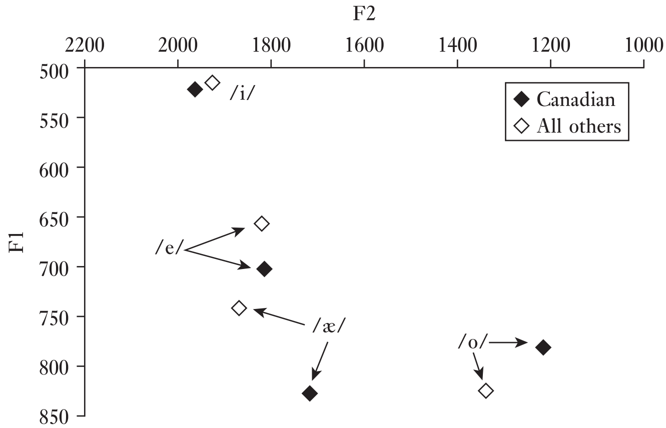


**Figure 5.4** Mean values of vowels in the Canadian Shift for the Canada region [N = 25] and all other dialects combined [N = 414]

other studies of Canadian English (ANAE, Ch. 16, De Decker and Mackenzie 2000, Boberg 2005, Hollett 2006, Hagiwara 2006, and Roeder and Jarmasz 2009). It is the most consistent marker of the Canadian English dialect in ANAE, and it is the basis for the isogloss defining the Canada region of North American English (including all points in Canada outside of the Atlantic Provinces).[6] Figure 5.4 compares the Canada dialect region with the combined means for all other regions for the vowels involved in the shift. There is no significant difference for /i/ in the ANAE, though other studies find backing and/or lowering. Canadian /e/ is significantly lower than the general mean, and an even greater difference appears for /æ/. One can also observe that /o/ is well back of the general average.

It was clear from the outset that the lowering and backing of the short front vowels was a response to the low back merger of /o/ and /oh/ in *cot* and *caught* or *Don* and *dawn*, well established in Canada. To which subsystem do we assign the collapsed vowel phonologically? The decision is dictated by phonological facts. While the original short *o* was a checked vowel, which cannot occur in stressed word-final position, the merged vowel occurs in free as well as in checked position: that is, the vowel of *cot* is now an allophone of the vowel of *caw*. Though both vowels may shift position in the course of the merger,[7] it is /o/ that moves to the long and ingliding subsystem rather than /oh/ to the short subsystem. Figure 5.3 embeds the Canadian Shift in the acoustically defined phonological space characteristic of the modern West Germanic languages, with a peripheral region enclosing a nonperipheral region. By the principles of chain shifting developed in Chapters 5 and 6 of Volume 1, tense or long vowel nuclei rise along the peripheral track, and lax or short nuclei fall along the nonperipheral track. A shift from a short to a long subsystem appears as a movement towards a peripheral track, as indicated in Figure 5.3.[8] The remaining short vowels then readjust their positions along the nonperipheral track, to achieve maximal dispersion.

The temporal relations of the low back merger and of the Canadian shift are consistent with the causal assignment to the merger as prior. As noted above, the first report of the shift of /e/ and /æ/ dates from 1995. The low back merger in Canada was firmly documented well before then (Scargill and Warkentyne 1972, Gregg 1957). Chambers (1993: 11–12) cites literary sources for the merger already in the middle of the nineteenth century.

The geographic distributions of the Canadian Shift and of the low back merger are also consistent with the causal connection inferred; here we encounter the nesting relation that plays an important role in the application of dialect geography to historical sequencing. Figure 5.5 maps the distribution of ANAE subjects who satisfy the acoustic criteria for the Canadian Shift (grey symbols) and the isogloss that defines the region in which these symbols predominate. The homogeneity of this isogloss – the proportion of speakers within the area who satisfy the criteria – is .84. Twenty-one of the twenty-five Canadians within the isogloss satisfy it, producing an even more reliable definition of the Canadian dialect than Canadian Raising (ANAE, Ch. 15). However, consistency – the proportion of speakers showing the trait who fall within the isogloss – is quite low, since the same forces are operating wherever the low back merger is found. The implicational relation between the Canadian Shift and the low back merger is evident, in that only three of the sixty speakers who show the Canadian Shift have /o/ and /oh/ as distinct. The important geographic relation is that the Canadian Shift isogloss is strictly contained within the low back merger isogloss on Figure 5.5. The low back merger extends to a much wider territory, covering the West, Western Pennsylvania and Eastern New England in the US. A total of 123 speakers produced /o/ and /oh/ as the same in minimal pair tests, and only sixty showed the back shifting of /e/ and /æ/. At the same time, the Canadian Shift does appear among a minority group of speakers in other low back merger areas: twelve in the West; five in Western Pennsylvania; four in Texas, where the merger is reported to be in progress (Bailey

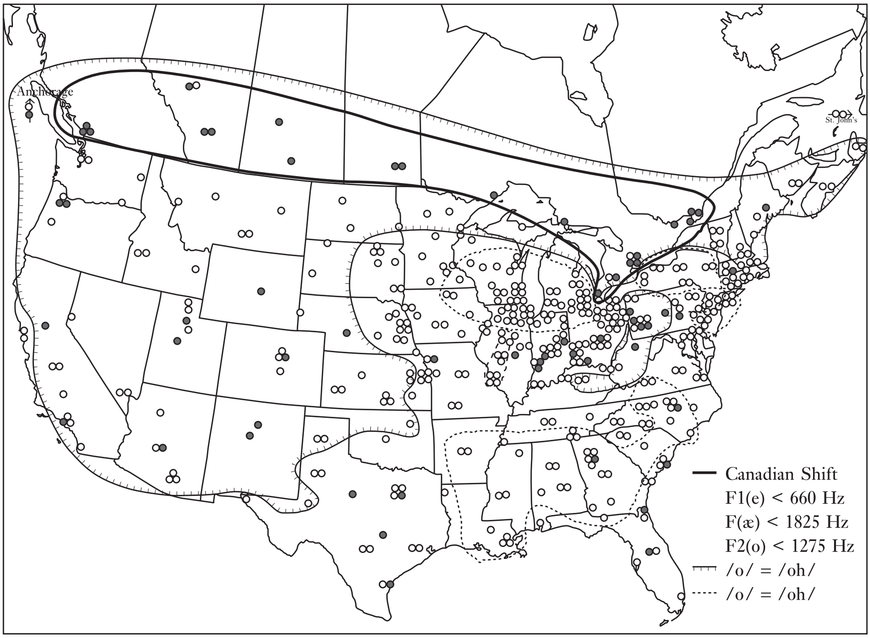


**Figure 5.5** Nesting of Canadian Shift within the Low Back Merger isogloss. Grey symbols = satisfies three conditions of the Canadian Shift

et al. 1991); and seven in the Midland, where the merger is generally in transition.[9] However, only two grey symbols appear within the dashed isoglosses: these outline the areas of greatest resistance to the merger: in the Inland North, the Mid-Atlantic states and the South. The two exceptional cases are in cities of the South with strongest Midland influence: Atlanta and Raleigh-Durham.

Both temporal evidence and spatial evidence thus indicate that the low back merger is a prior condition for the backing of /æ/ and accompanying backing and lowering of /e/.[10] In removing /o/ from the subset of short vowels, it acts as the triggering event for the Canadian Shift.

## 5.3 Causes of the Pittsburgh Shift

ANAE reported a chain shift in the city of Pittsburgh, first shown as Figure 1.7 and reproduced here as Figure 5.6.

The low back merger is solidly entrenched in Pittsburgh, as it is in Canada. But in Pittsburgh the phoneme /ʌ/ moves downward on the nonperipheral track from mid back-of-center position, while /æ/ remains in place in the low front area.

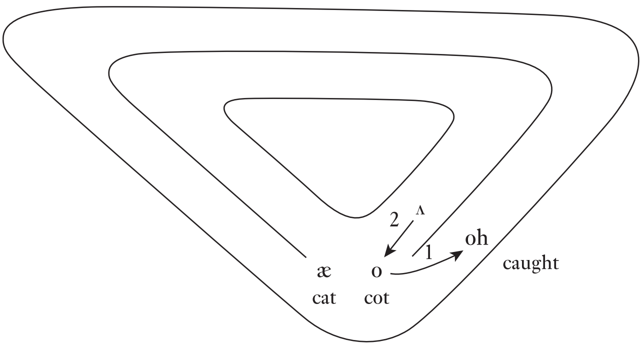


**Figure 5.6** The Pittsburgh Shift

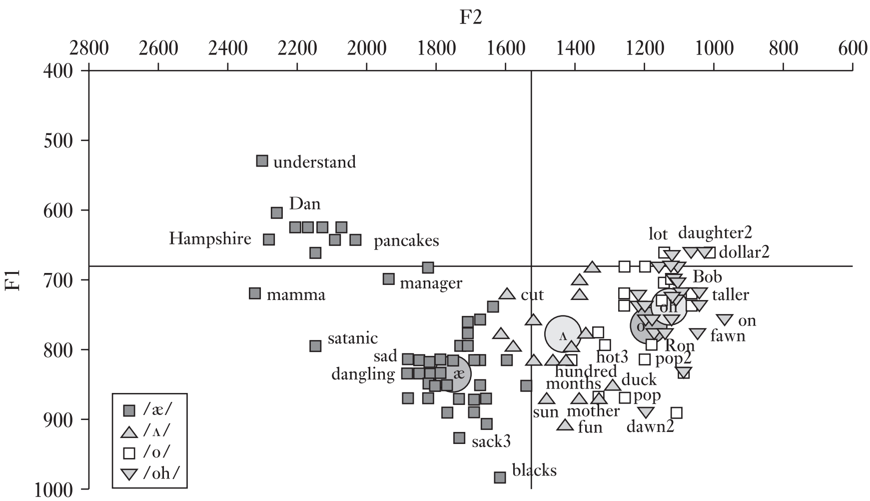


**Figure 5.7** The Pittsburgh Shift in the system of Kenneth K., 35 [1996], TS 545

Figure 5.7 provides a detailed view of this downward movement in the vowel system of a 35-year-old man from Pittsburgh, interviewed in 1996. On the left, the short-*a* vowels follow the nasal system: words with nasal codas are raised to mid and upper mid position, while all others are in a tight cluster in low front position. In the back, /o/ is clearly merged with /oh/ in the same lower mid back position as in Canada. Between /æ/ and /o/~/oh/ are located the majority of the tokens of /ʌ/. Words with /ʌ/ before /n/ are particularly low (*sun*, *mother*, *fun*, *months*); the token of *duck* is regularly heard as *dock* by speakers of other dialects.

Figure 5.8 places this Pittsburgh development against the mean values of the low vowels for Canada and eighteen other North American dialects.[11] It can be

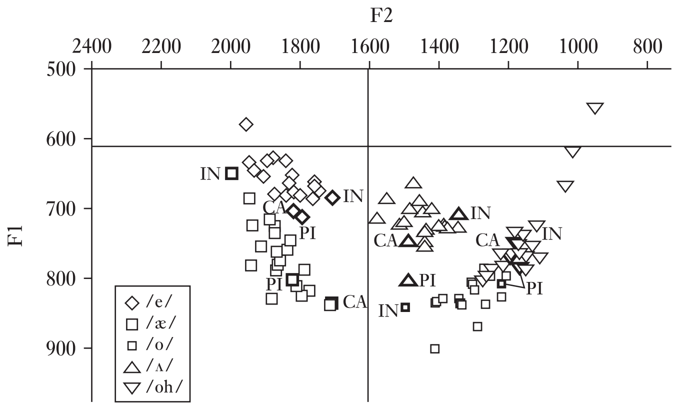


**Figure 5.8** Mean positions of low vowels for twenty ANAE dialects, with Canadian Shift labeled for Canada [CA], Pittsburgh Shift labeled for Pittsburgh [PI] and Northern Cities Shift labeled for the Inland North [IN]

seen that the mean position of /æ/ in Canada is well to the back of other dialects while Pittsburgh /æ/ is in normal low front position.[12] At right, both Canada and Pittsburgh show the merger of /o/ and /oh/ in lower mid back position (the two Canada tokens practically coincide). In the center, the Pittsburgh mean for /ʌ/ is much lower than that of any other dialect, not far from the general distribution of /o/.

The low back merger is evidently the conditioning event for the Pittsburgh Shift, just as it is for the Canadian Shift. Here, however, we have the same cause with two different effects. In the search for causes of linguistic change, it seems reasonable to expect that the same cause will have similar or comparable effects. Why is it that /ʌ/ instead of /æ/ moved into the empty space created by the back shift of /o/ and merger with /oh/?

Among North American English sound changes, there are other cases of two neighboring phonemes competing to fill the empty space in the pattern.[13] One might say that these are two equal possibilities, and it is a matter of chance which one is realized. But these choices are not equally probable: there are sixty communities which show evidence of the Canadian Shift, and only one city with the Pittsburgh Shift.[14] To account for the unique Pittsburgh development, it is not unreasonable to turn to the other unique feature of the Pittsburgh dialect: the monophthongization of /aw/. The Pittsburgh long monophthong in *down*, *town*, *south*, *out* and *house* is located in low central position, partially overlapping with /ʌ/. There is no danger of confusion between /ʌ/ and /aw/, however, since monophthongized /aw/ has twice the length of /ʌ/, so that typically the longest /ʌ/ is shorter than the shortest /aw/ (ANAE: 273). One hypothesis is that the lowering of /ʌ/ is the result of a change in the organization of the vowel system of Pittsburgh speakers in which

/ʌ/ is re-analyzed as /a/, the short counterpart of /ah/. This would oppose the long and short pairs *down* ~ *dun*, *about* ~ *but*, *howl* ~ *hull* as /dahn/ ~ /dan/, /baht/ ~ /bat/, /hahl/ ~ /hal/. If further evidence supports such an abstract re-analysis, then both the low back merger and the monophthongization of /aw/ appear to be triggering events for the Pittsburgh Shift. Both are movements of a word class into the long and ingliding subsystem from other subsystems.

## 5.4 Causes of the Low Back Merger

Given our understanding of the effect of the low back merger on other linguistic events, the question that naturally arises is: what are the causes of the low back merger? Herold (1990, 1997) has provided a convincing social account of the actuation of the low back merger in Northeastern Pennsylvania, namely the influx of large numbers of immigrants from Eastern Europe into coal-mining communities. However, no linguistic mechanism for a substratum effect has yet been established, and the inquiry we are conducting here calls for a much more general solution. We must account for the linguistic antecedents of the collapse of /o/ and /oh/ in more than half of the North American continent, with its wide variety of vowel systems, and in Scotland as well. Why, then, is the distinction between /o/ and /oh/ so likely to collapse? If there is a linguistic answer to this question, then the low back merger is not the triggering event we are looking for, but only a link in the causal chain.

A first thought as to the cause of a merger is the functional load of the distinction. In the case of /o/ and /oh/, there is no problem in finding minimal pairs. We can generate sizable numbers, in the style of (6).

| | | | | |
|---|---|---|---|---|
| (6) | cot | caught | cock | caulk |
| | rot | wrought | tock | talk |
| | tot | taught | odd | awed |
| | sot | sought | nod | gnawed |
| | cotter | caught her | cod | cawed |
| | dotter | daughter | mod | Maud |
| | Don | dawn | sod | sawed |
| | yon | yawn | Sol | Saul |
| | pond | pawned | moll | maul |
| | fond | fawned | collar | caller |
| | hock | hawk | holler | hauler |
| | stock | stalk | odd ability | audibility |

However, this proliferation of minimal pairs masks the odd skewing in the distribution of /o/ and /oh/ that can be seen in Table 5.1. Almost all of the contrasts

**Table 5.1** Distribution of /o/ and /oh/ contrasts

| | /o/ | /oh/ |
|---|---|---|
| APICALS | | |
| **t** | **cot, tot, hot, got, dot** | **caught, bought, taut, fought** |
| **d** | **odd, hod, god, sod** | **awed, hawed, gaud, sawed** |
| **s** | **toss, moss, floss, cost, loss** | **sauce, exhaust, caustic** |
| z | (Oz, positive) | cause, clause, hawser, pause, paws |
| **n** | **don, Ron, pond** | **dawn, awn, yawn, lawn** |
| **l** | **doll, moll, collar** | **all, tall, maul, caller** |
| NON-APICALS | | |
| p | hop, pop, top, sop | – – – – – |
| b | rob, hob | (daub, bauble) |
| tʃ | Scotch, botch, watch | – – – – – |
| j | lodge, dodge, Roger | – – – – – |
| g | log, hog, cog, dog | (auger, augment, augur, August) |
| **k** | **stock, hock, clock** | **stalk, hawk, talk** |
| f | (boff, toff) | *off*, *doff*, *scoff* (cough, trough) |
| θ | (Goth) | *cloth*, *moth* |
| ʃ | (gosh, bosh) | (wash) |
| ð | (bother) | – – – – – |
| ʒ | – – – – – | – – – – – |
| m | bomb, Tom, prom | – – – – – |
| ŋ | (pong, Kong) | *strong*, *song*, *wrong*, *strong* |
| # | – – – – – | law, saw, flaw, thaw, claw |

between /o/ and /oh/ occur before a set of five apical consonants (/t/, /d/, /s/, /n/, /l/) and one non-apical (/k/), as indicated by the bold items. Occurrences of /o/ before /z/ are limited to special lexical items and words in which intervocalic /s/ is voiced. In the lower half of Table 5.1 there are six environments where /oh/ is not represented at all, and one – final position – where /o/ does not appear.

Three sets of /oh/ words in Table 5.1 are italicized. These are /o/ words that are tensed in American English before front voiceless fricatives and nasals – the same core phonetic conditioning that operates in the tensing of short *a* in the Mid-Atlantic region and of broad *a* in Britain (Ferguson 1975, Labov 1989b).[15] This tensing process, which typically proceeds by lexical diffusion (including words with coda /g/), produces an enormous amount of dialect differentiation, but does not substantially increase contrast between /o/ and /oh/. In sum, there is a total of six environments in which one side or the other is represented by a small number of learned, colloquial or specialized vocabulary items, so that in twelve environments contrast is marginal and minimal pairs are not to be found.[16]

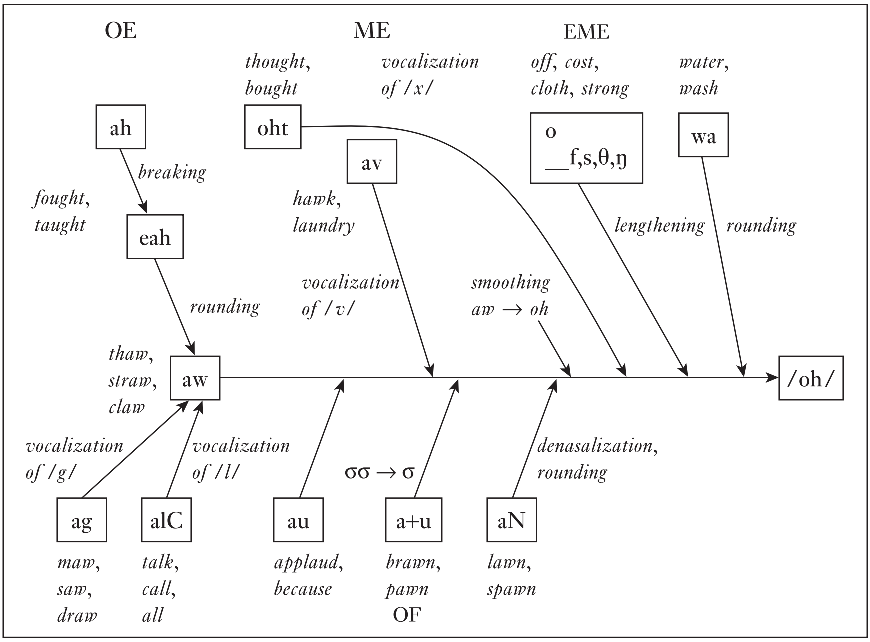


**Figure 5.9** Historical development of the long open *o* word class

In order to see how this bizarre distribution came about, it will be helpful to review the historical formation of this word class, summarized schematically in Figure 5.9. Proceeding from left to right, the diagram shows:

1 an original /aw/ diphthong in Old English (*thaw*, *straw*, *claw*);

2 additions to Old English /aw/ through Early Middle English sound changes:

a breaking and rounding of /a/ in verb preterits before complex codas beginning with /x/ (*fought*, *taught*);
b vocalization and rounding of /l/ in complex codas (*talk*, *call*, *all*);
c vocalization of coda /g/ to [ɤ] (*maw*, *saw*, *draw*);

3 additions to /aw/ in Middle English through vocalization of /v/ (*hawk*, *laundry*; the latter is a borrowing from Middle French, see 4 below);

4 accretion of new /aw/ forms from Middle French loan words:

a original back upgliding diphthongs (*applaud*, *because*);
b collapse of bisyllabic /a + u/ words to single syllables (*pawn*, *brawn*);
c denasalization and rounding of nasal vowels (*lawn*, *spawn*);

5 smoothing (monophthongization) of /aw/ to /oh/:

6 lengthening of /o/ to /oh/ in Early Modern English before voiceless fricatives and velar nasals (*cloth*, *off*, *loss*, *lost*, *strong*, *song*, *wrong*, *long*);

7 lexically irregular rounding of /a/ after /w/ (*water*, *warrant*, *walrus*).

The /aw/ class traced here is not a reflex of Proto-Germanic /aw/, which is realized in Old English as **e:a**, in **le:af**, **he:ap**, **de:aw** (modern *leaf*, *heap*, *dew*). Because it was cobbled together by a series of conditioned sound changes, its distribution is a matter of historical accident.

The general sound change that set the stage for the low back merger was the smoothing of Middle English /aw/ to /oh/.[17] It must have anteceded the tensing of /o/ before voiceless fricatives and nasals, since these join in the further history of this category. We can argue that it must also have preceded the completion of the Great Vowel Shift in the back vowels, by which Middle English *u:* diphthongized to /aw/. The smoothing of /aw/ created the juxtaposition of /o/ and /oh/ – two lower back mid vowels differentiated only by length, which is unstable on two counts. First, it is well established that length distinctions without accompanying differences in vowel quality tend to collapse, in English and in many other languages (Chen and Wang 1975). The second reason for the instability of the contrast is the highly skewed distribution of Table 5.1. Given this situation, the merger of the opposition is a likely outcome, unless qualitative differences develop to support it. Such qualitative differentiation of /o/ and /oh/ did develop in three areas outlined by the dotted isoglosses of Figure 5.5: (1) the unrounding and fronting of /o/ in Western New England and New York State;[18] (2) the raising of /oh/ to upper mid position in East Coast dialects from Providence to Baltimore; (3) the restoration of the back upglide of /oh/ in the South.[19] Outside of these areas, the low back merger is either complete or in transition. It follows that the juxtaposition of long and short *o* created by the smoothing of /aw/ to /oh/ was the triggering event of the low back merger.

What is the relationship of the other events captured in Figure 5.9 to the low back merger? The /aw/ class originated in final position, where it could not contrast with short open /o/. The changes that followed were largely conditioned by the vocalization of /l/, /g/, /x/ and /v/ in coda position in a variety of situations. They created limited contrasts, which resisted the merger to a certain extent; one could say that it was the absence of sound changes conditioned by other consonants that favored the merger.

If the smoothing of /aw/ was the triggering event for the low back merger, and ultimately for the Canadian Shift and the Pittsburgh Shift, we must ask if it in turn had a relevant predecessor. I argued that the smoothing of /aw/ must have preceded the completion of the Great Vowel Shift, on the assumption that this shift was a drag chain. But it is also possible that a push chain was involved, and that /uː/ as a descending diphthong [ʊu] → [əu] → [au] → in *out*, *south*, *down* reduced the margin of security of /aw/ [ɑu] in a way that promoted the shift of the latter to [ɔː]. If that is the case, we would have to expand our inquiry into the triggering event of the Great Vowel Shift, a question that has been much discussed (Luick 1903, Martinet 1955, Stockwell and Minkova 1997). There is not enough evidence to pursue this connection here, except to emphasize the possibility of a chain of linguistic triggering events receding into the distant past. In any case, there is no reason to believe that any one external event intervened to produce any of these chain shifts.

## 5.5 The Fronting of /uw/

In the two cases just studied, the low back merger was seen to initiate subsequent changes in the vowel system, which were responses to the tendency of subsystems to maintain equidistant spacing or maximal dispersion. We will now consider a sound change that appears to be inconsistent with previous explanations based on these principles. This is the fronting of /uw/, an ongoing shift that covers 90 percent of the North American continent. The various phonetic forms involved are shown in (7).

(7) ʊ$^{u}$ ⟶ ʉ$^{u}$ ⟶ ü$^{u}$ ⟶ ü
ü$^{u}$ ↘ ɪ$^{u}$

Martinet (1955) advanced an explanation for what is now recognized as a general principle of chain shifting: back vowels move to the front.[20] He argued that the repeated fronting of /u/ and /o/ is the result of the fact that the preference for front–back symmetry in the vowel system is countered by the asymmetry of the supraglottal tract, there being less articulatory space in the back than in the front. Fronting is then the result of pressure to relieve overcrowding among the back vowels. Specifically, this happens when, through one linguistic process or another, a vowel system develops four degrees of height among the back vowels. Haudricourt and Juilland (1949) applied this logic to a wide range of sound changes in Western Europe and confirmed Martinet's prediction in every case. Labov (1991), defining three major dialects of English, argued that the third dialect, characterized by the low back merger, would be stable and would resist the fronting of /uw/ and /ow/, predominant in the South and the Midland.

Figure 5.10 shows that the completed ANAE data do not satisfy this expectation. The grey symbols identify speakers for whom /uw/ after coronal consonants, in *do*, *too*, *two*, *soon*, *noon*, etc., is front of center – that is, the mean second formant is greater than the midpoint of 1550 Hz in this normalized system. This group includes 89 percent of the population studied; there are only forty-nine of the 439 ANAE subjects for whom this is not the case. Furthermore, these forty-nine are concentrated

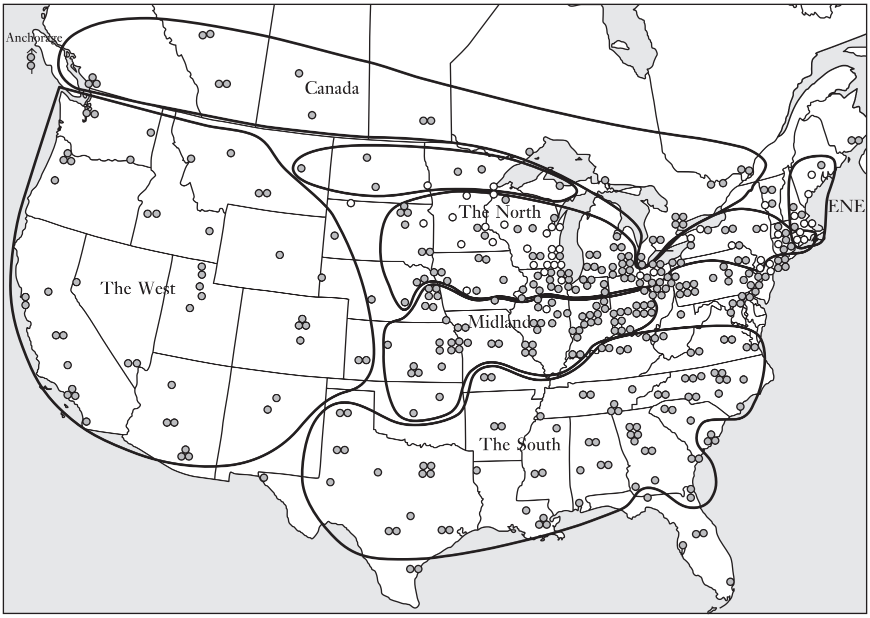


**Figure 5.10** Fronting of /uw/ after coronal consonants. Grey symbols: F2 > 1550 Hz

in two narrowly circumscribed areas, New England and Minnesota–Wisconsin. In general, Eastern New England is a conservative area in regard to the fronting of both /uw/ and /ow/, and its behavior is consistent with what we would expect from the low back merger in that area. The Minnesota–Wisconsin area shows considerable variation in regard to the low back merger. But the conservative character of the vowel system, with back /uw/ and /ow/ often monophthongal, must be accounted for by a strong Scandinavian and German substratum (Allen 1973).

Once we have dispensed with these two areas, it is apparent that /uw/ is fronted in all other regions: in the Midland, the Mid-Atlantic states, the South and, most importantly, in three areas where the low back merger is complete: Canada, the West, and Western Pennsylvania. There is no reason to think that this massive, continent-wide fronting is a response to overcrowding among the back vowels.

Although the structural approach to the causes of /uw/ fronting in North American English seems to have failed in this case, we can open a structural inquiry into the causes of this phenomenon from another direction. Because /uw/ fronting is so widespread in North America, it is unlikely that we will find a triggering event in a specific population movement – like the migration of Slavic-speaking coal miners into Northeastern Pennsylvania, identified by Herold (1990). The antecedent event must be one of great generality. One clue to the problem may be found in the very large difference between the extreme fronting of /uw/ after coronal

**Table 5.2** Regression coefficients for F2 of /uw/ and /ow/ for all of North American English (vowels before /l/ excluded)[21]

| | /uw/ [N = 4747] | | /ow/ [N = 6736] | |
|---|---|---|---|---|
| | Coefficient | Probability | Coefficient | Probability |
| Constant | 1547 | | 1386 | |
| SOCIAL | | | | |
| Age * 25 yrs | –101 | < .0001 | –24 | < .0001 |
| Female | 42 | < .0001 | 46 | < .0002 |
| PHONETIC | | | | |
| *Onset* | | | | |
| Coronal | **480** | < .0001 | 94 | < .0001 |
| Velar | 181 | < .0001 | 43 | < .0001 |
| Liquid | 151 | < .0001 | – | n.s. |
| Obstruent + Liquid | 164 | < .0001 | – | n.s. |
| Labial | 104 | < .0001 | –70 | < .0001 |
| Nasal | –54 | .0020 | | |
| *Coda* | | | | |
| None | – | n.s. | 31 | < .0003 |
| Coronal | 70 | < .0001 | – | n.s. |
| Nasal | –193 | < .0001 | –101 | < .0001 |
| Fricative | –137 | < .0001 | –21 | .0023 |
| Stop | –89 | < .0001 | –39 | < .0002 |
| Voiced | 40 | .0095 | – | n.s. |
| Following syllables | – | n.s. | –75 | < .0001 |

consonants – which is the focus of Figure 5.10 – and the limited fronting of /uw/ after noncoronal consonants in *roof*, *boots*, *coop*, *food*, *move*, etc. While 390 ANAE subjects shifted /uw/ after coronal consonants front of center, only 130 did so for the noncoronal class. Table 5.2 includes the output of a regression analysis of the second formants of all 4,747 tokens of /uw/ in ANAE. Columns 2 and 3 display the very large effect of coronal onset for /uw/.

The age coefficient in the first row of Table 5.2[22] indicates vigorous change in progress for the fronting of /uw/ in apparent time. With each generation of speakers, twenty-five years younger than the last, the fronting of /uw/ as a whole advances by 101 Hz. The second row shows that, as in most sound changes in progress, women are in the lead, in this case by half a generation. Among the internal constraints, the effect of a preceding coronal stands out at 480 Hz, more than twice the effect of any other factor. This means that, for the average speaker with a mean F2 for /uw/ after coronal consonants of 1800 Hz, the value of /uw/ after noncoronals is around 1300 Hz, halfway between the values for a back and for a central vowel.

This preponderant effect of preceding coronals is a striking exception to the general rule that English vowels are influenced by the following environment more than the preceding one.[23] It is not difficult to explain the tendency for preceding coronals to promote the fronting of /uw/, which is a widespread effect. It appears strongly in Lennig's (1978) analysis of sound change in progress in Parisian French. Melchert (1983) derives Hittite second singular pronoun *zi:g* [tsi:g] from pre-Indo-European **tu:* by a conditioned sound change of fronting after apical consonants, followed by palatalization of /t/.[24] The F2 locus of apical consonants is generally close to 1800 Hz, so that a following back /uw/ requires a rapid transition of 1000 Hz from that locus to the F2 of the vowel nucleus. Articulatory ease will favor the raising of this vocalic second formant. If sound change begins to front /uw/, allophones after coronals will be in advance of others. Yet the size of this effect, 480 Hz, is more than one would expect from a phonetically motivated influence.

One way of evaluating the coronal effect on /uw/ is to compare it to the coronal effect on the fronting of the mid back vowel /ow/. This parallel process is not as widespread as the fronting of /uw/, but it is vigorously in progress throughout the Midland, the South and the Mid-Atlantic states (ANAE, Ch. 12). The right-hand side of Table 5.2 reports the age coefficients for /ow/. To ensure comparability for phonetic effects, all regions of North America are included, even though there is no active fronting for about half the population. The coefficients for /ow/ are therefore generally lower, since sound changes in progress magnify phonetic effects.

In general, the effects on /uw/ and /ow/, both external and internal, are in the same direction. The point of interest is the relation of the coefficient for preceding coronals to other effects on /ow/. While this coefficient for/uw/ is two and a half times greater than any other, the one for /ow/ is comparable to other phonetic effects and is less than the influence of following nasals. If the effect of a preceding coronal on /uw/ were the result of the same mechanism as the /ow/ effect, we would expect it to be only 20 percent greater, since the distance between second formants and the apical locus for extreme back /ow/ is only 20 percent more for /uw/ than for /ow/: 1000 Hz as opposed to 800 Hz. It follows that mechanical effects are not likely to account for the 480 Hz coronal coefficient for /uw/: this appears to be a phonological effect, not a phonetic one.

The suggestion of a phonological effect leads us to consider the relevance of the /yuw/ class of high rising diphthongs, which is historically quite distinct from the class of falling /uw/. The /yuw/ class was derived from a variety of different sources (Jespersen 1949, 3.8).

- Old English i:w, as in *Ti:wesdæg* "Tuesday"
- Old English e:ow, as in *e:ow* "you" (pl. acc./dat.)
- Middle French iu, as in *riule* "rule"
- Middle French unstressed e+u, as in *seur* "sure"
- Middle French u, as in *rude*
- Middle French ui, as in *fruit*
- Middle French iv, as in Old French *sivre* → *M.E. sewe* "sue"

In Early Modern English, these seven sources were joined by an eighth one, which was distinct in Middle English:

- OE e:a, as in *de:aw* "dew"

Although some scholars believe that this vowel was once equivalent to French front rounded [y], Jespersen argues that it has consistently been a rising diphthong [ju], noted /yuw/ in ANAE. In modern dialects, the /y/ glide is generally maintained after labials and velars, except in Norfolk and a few other sites in England (Trudgill 1974b, 1986). In North America the glide has long been variable after apicals. In many cities it became a marker of refined speech and it varied according to the preceding context: the likelihood of a /y/ glide is greatest after /t/ as in *tune*, and lowest after /l/ and /r/ as in *lewd* and *rude* (where it is also frequently deleted in British English today, including in RP).[25]

The development of the /yuw/ class is closely aligned to the problem under study. In current North American English, the historical /y/ glide has all but disappeared after coronal consonants such as in *tune*, *dew*, *suit*, *stupid*. In the middle of the twentieth century, Kurath and McDavid (1961) found widespread use of the glide after coronals in the South, while the characteristic Northern form was [ɪu], an unrounded front vowel moving back towards a high back target (see also Kenyon and Knott 1953, who represent this vowel generally as [iu]). This vocalic realization set up the contrast indicated in Figure 1.1 as /iw/ versus /uw/ exemplified by such minimal pairs as *dew* and *do*, *lute* and *loot*, *tutor* and *tooter*. Chapter 8 of ANAE investigated the contrast with the minimal pair *dew* ~ *do*, and mapped both word classes in spontaneous speech as well. Figure 5.11 shows that the distinction has almost disappeared in North America. It is mainly confined to two limited areas in the South, one in central North Carolina, the other in the smaller cities of the Gulf states. Only an occasional trace of the /y/ glide was found.

This merger of course took place only after coronals, since the contrast existed only after coronals. In other environments the distinction is not a vocalic one; that is, the difference between *beauty* /byuwtiy/ and *booty* /buwtiy/ does not depend upon vowel quality, since the front position of the vowel in the first word is the result of its proximity to /y/. The merger after coronals was accomplished by the fronting of /uw/ in those environments. It is only when the merger is complete that the binding force of the phoneme /uw/ (see Chapter 8) brings the noncoronal allophones to the front.

Figure 5.12 shows the high back vowel of a speaker of the most conservative dialect in regard to the fronting of /uw/ and /ow/: that of Providence, Rhode Island. (In this diagram and in the ones to follow, /Tuw/ indicates /uw/ after coronals and /Kuw/ indicates /uw/ after noncoronals.) Here the means for all vowels are back of center, including /iw/ in *stupid* and *Tuesday*. The vowels after noncoronals are further back, not far from the benchmark of vowels before /l/ (which are not included in the calculation of /Kuw/ means).

Figure 5.13 shows more advanced fronting in three different patterns. Typical for the North, Canada and the West is Figure 5.13a, which displays the /uw/ and

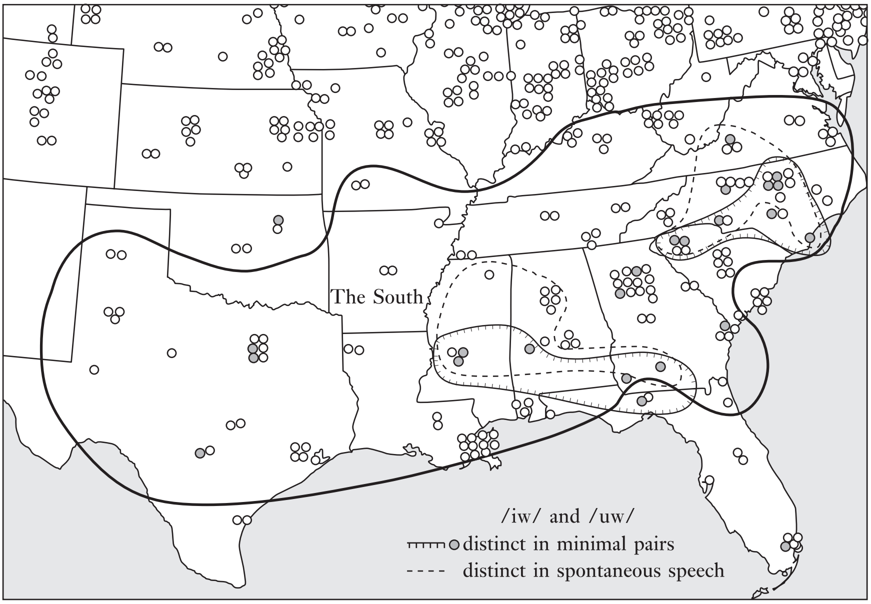


**Figure 5.11** Retention of the /iw/ ~ /uw/ contrast in North American English. Grey symbols and oriented isogloss: speakers with /iw/ and /uw/ distinct in production and perception on minimal pair tests. Dashed isogloss encloses communities where acoustic measurements show a significant difference between /iw/ and /uw/ in spontaneous speech. Solid isogloss defines the South as the area where /ay/ is monophthongal before obstruents

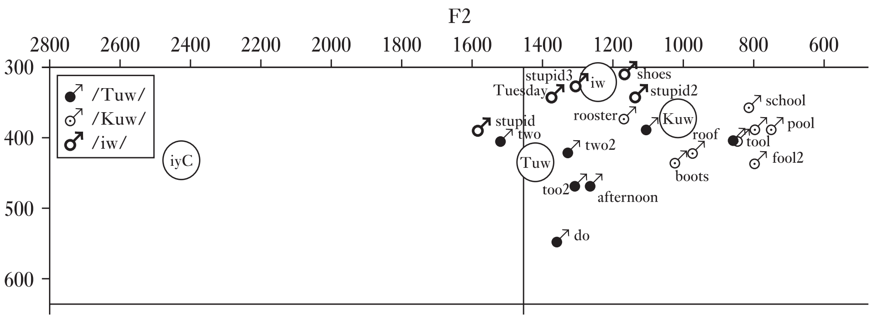


**Figure 5.12** High back upgliding vowels of a conservative speaker from Providence, Rhode Island: Alex S., 42 [1996], TS 474

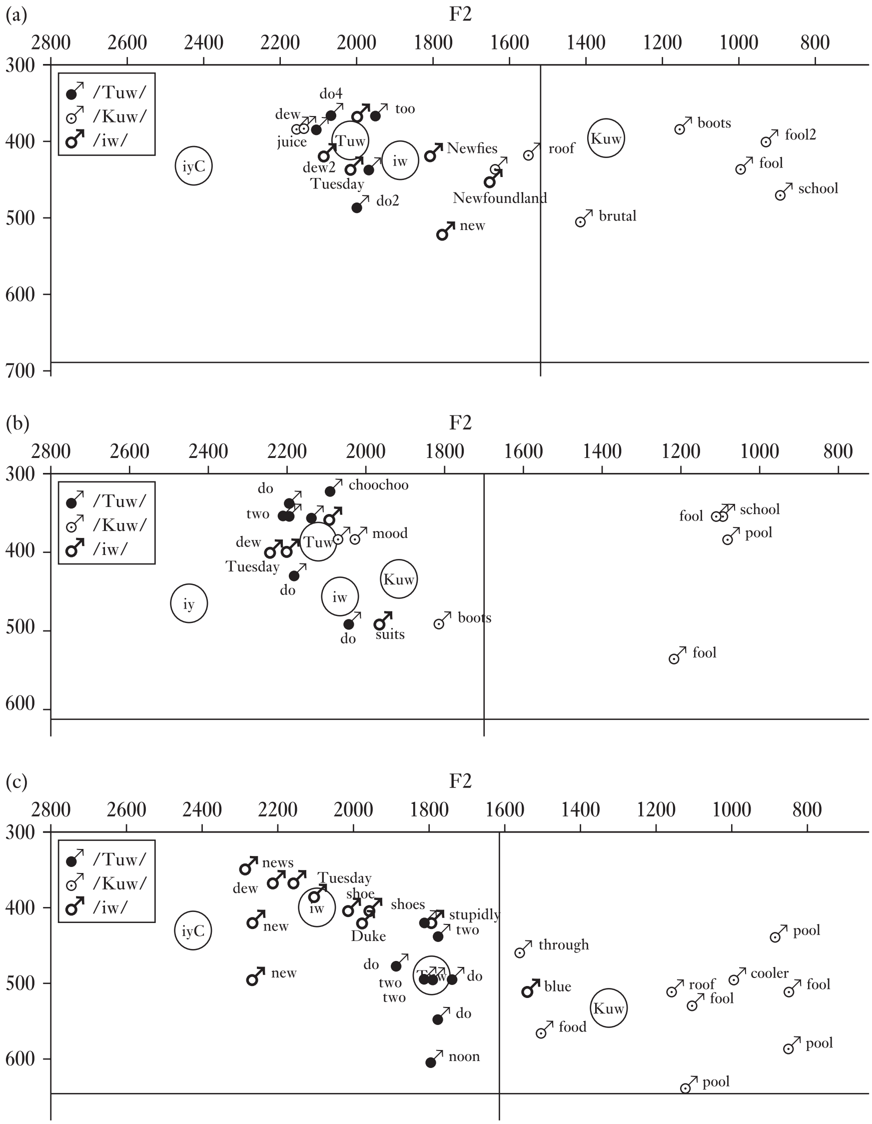


**Figure 5.13** Three fronting patterns of the high back upgliding vowels: Figure 5.13a Differentiation of /uw/ after coronals (Tuw) and noncoronals (Kuw): Brent M., 25 [1997], Edmonton, Alberta, TS 654; Figure 5.13b Consolidation of /iw/ and /uw/ in front position: Fay M., 34 [1995], Lexington, KY, TS 283; Figure 5.13c Maintenance of /iw/ ~ /uw/ distinction: Matthew D., 45 [1996], Charlotte, NC, TS 483

/iw/ vowels of a speaker from Alberta. The mean for /Tuw/ is more than 2000 Hz, well front of the center mark of 1550 Hz, and there is no differentiation of /Tuw/ and /iw/. But the mean of Kuw in *roof*, *boots* etc. is well back of center, lower than 1400 Hz. This differentiation by 500 Hz is the phonetic realization of the regression coefficient of 480 Hz in Table 5.2. Figure 5.13b, the high back vowels of a speaker from Lexington, Kentucky, reveals a fully fronted system, where /iw/, /Tuw/ and /Kuw/ are indistinguishable in high front rounded position, some 900 Hz fronter than /uw/ before /l/. Figure 5.13c shows the high vowels of a speaker from Charlotte, North Carolina, who maintains the distinction between /iw/ and /uw/. The /iw/ class in *new*, *dew*, *Tuesday*, *Duke*, *shoes* is tightly clustered around a mean at 400, 2094 Hz, while /Tuw/ shows an equally tight cluster at 493, 1789 Hz. Both F1 and F2 differences are significant at the .001 level. The fact that /Tuw/ is only slightly front of center suggests that the distinction between /iw/ and /Tuw/ is maintained only by inhibiting the fronting of /Tuw/. In other words, the merger of /iw/ and /Tuw/ is correlated with the full fronting of /Tuw/.

Table 5.3 compares the means, age and coronal onset coefficients of /uw/ for eight major North American English dialects. The regional mean values show that the South and the Midland are the most advanced and the North the least advanced. The array of negative age coefficients indicates that all dialects except the Mid-Atlantic are engaged in change in progress in apparent time, but the size of the age gradient varies widely. Though the South is advanced in fronting, the age coefficient is quite low and, most notably, the coronal onset coefficient is only a small fraction of that found for other dialects. It is less than a third of the coefficient for the equally advanced Midland dialect, reflecting the Southern tendency to retain the /iw/ ~ /uw/ distinction.

The fully fronted /Kuw/ in Figure 5.13b reflects the general merger of /iw/ with /uw/ as a whole, even though /iw/ has no allophones in common with /Kuw/. The phonological effects of this merger are comparable to the phonological

**Table 5.3** Regression analyses of F2 of /uw/ not before /l/ by region. All coefficients significant at $p < .0001$ level

| | N | Mean F2(uw) | Age * 25 | Coronal Onset |
|---|---|---|---|---|
| Midland | 580 | 1713 | –107 | 442 |
| South | 1,107 | 1703 | –86 | 141 |
| E. New England | 116 | 1584 | –244 | 456 |
| Mid-Atlantic | 190 | 1534 | | |
| Western Pennsylvania | 161 | 1529 | –119 | 338 |
| West | 468 | 1520 | –76 | 362 |
| Canada | 521 | 1492 | –155 | 469 |
| North | 1,062 | 1359 | –83 | 514 |

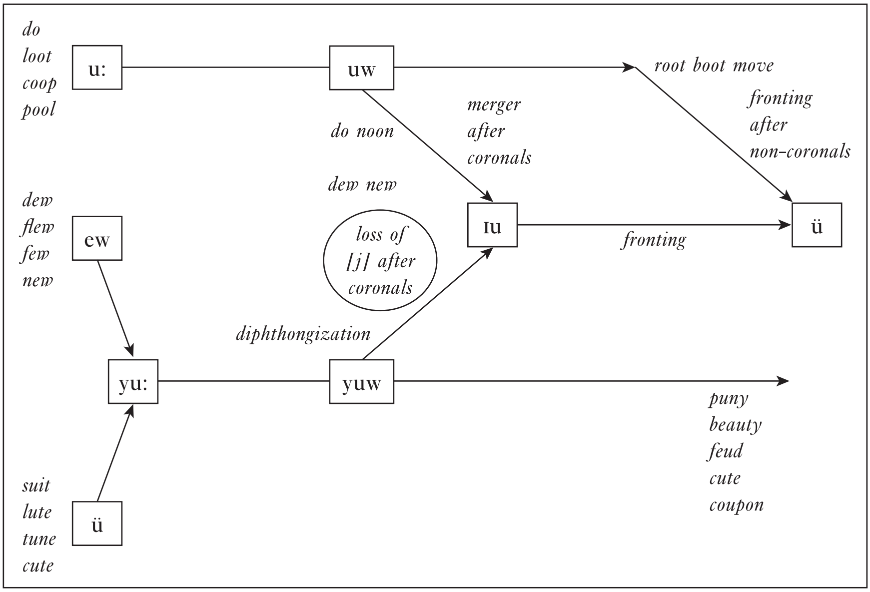


**Figure 5.14** Development of /uw/

effect of the merger of /o/ and /oh/, and (in the discussion to follow) of the merger of /o/ and /ah/.

Figure 5.14 traces the history of these developments in a single overview, showing the origins of the /yuw/ class and its eventual merger with /uw/ in the course of the fronting process. As in the case of the low back merger, there is no external triggering event, but rather a series of interconnected changes across a long period. As with /oh/, historical accidents led to the formation of a highly skewed and marginal contrast of /iw/ versus /uw/. It is proposed here that the triggering event for the fronting of /uw/ is the collapse of the /iw/~/uw/ distinction. That distinction was the result of the loss of /y/ after coronals, one of the many deletions of the "peripheral phonemes" of modern English (Vachek 1964).[26] It is not likely that any further inquiry into the causes of the loss of this glide will illuminate our understanding of the fronting of /uw/ in North America.

## 5.6 The Northern Cities Shift

The Northern Cities Shift (NCS) was first described in 1972 in LYS, and its various stages have since been traced by a number of scholars (Labov 1991, Eckert 2000, Gordon 2001), as well as in the exploration of the principles of chain shifting in these volumes. Chapter 14 of ANAE shows that the Northern Cities Shift is the dominant

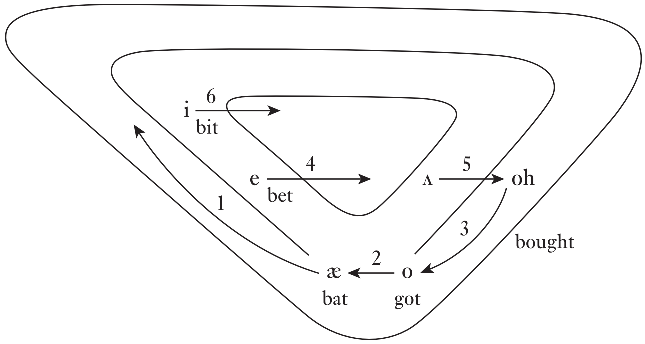


**Figure 5.15** The Northern Cities Shift

vowel system of the Inland North, a territory of some 88,000 square miles, with approximately 34 million speakers. This rotation of short vowels is a remarkable development, given the relative stability of the English short vowel system from Old English up to the twentieth century.

Figure 5.15 reproduces the ordering of events in phonological space first presented in Figure 1.4. The events are clearly established, although some points of order are still open to question.[27] Let us consider the sequence by going backwards in time. The most recent event in Figure 5.15 is stage 6, the backing of /i/, which we take to be a later generalization of the backing of /e/. The latest stage in the main sequence is stage 5: the backing and rounding of /ʌ/ to the point that Inland North *bus* can sound like *boss* in other dialects. This seems to be a joint response to two preceding events: the increased margin of security in the back, caused by the lowering of /oh/, and a decrease in the margin of security, caused by the backward shift of /e/ towards the /ʌ/ region – so that Inland North *desk* sounds like *dusk* to speakers of other dialects. The lowering of /oh/ appears to be a response to the fronting of /o/, which in turn is generally accepted to be a response to the vacancy in the low front area created by the general raising and fronting of /æ/.

One causal link is missing from this account: what is responsible for the lowering and backing of /e/? As noted in the discussion of the Pittsburgh Shift in 5.3, the exit of a given vowel from a subsystem may attract two different neighboring vowels into the region vacated. In this case, early evidence indicates that /e/ first moved downward, into the low central area vacated by /æ/, at the same time that /o/ moved forward, creating a considerable overlap of /e/ and /o/ for many Inland North speakers (Labov and Baranowski 2006). Although this overlap has continued, the predominant tendency in the following decades was for /e/ to shift to the back, impinging on /ʌ/ (Eckert 2000).[28]

The current situation in the ANAE records of the 1990s was displayed in Figure 5.8, where the means for the Inland North (IN) are labeled against the background of nineteen other dialects. Here the IN mean for /æ/ (not including tokens before nasals) is higher and fronter than any of the other /æ/ means. A corresponding shift is seen in the IN mean for /o/, which is considerably fronter than any other. The diamond representing /e/ for IN is further back than in any other dialect, and the IN /ʌ/ is at the rear edge of the distribution for that vowel. We do not, however, see a marked lowering of /oh/ in this display.

In this account of the NCS the initial event is clearly the general raising of /æ/, marked "1" on Figure 5.15. The temporal evidence also favors this interpretation. The earliest records from the 1960s show both fronting of /o/ and raising of /æ/, but no evidence of the other sound changes (Fasold 1969, LYS). The geographic evidence for ordering is not as clear as in the Canadian Shift, since the complexity of the NCS requires that its geographic outlines be established by pairwise relations among its components.[29] Nevertheless, there seems little doubt that the general raising of /æ/ is the triggering event for the NCS. In the spirit of our current inquiry, we ask: what in turn triggered the raising of /æ/?

Although the generalized raising of short *a* is found throughout the Inland North, it is unique in the English-speaking world. No other dialect of English shows such a generalized tensing and raising, affecting even the function word *that* and polysyllables like *athletic* and *attitude.* All other dialects with short-*a* raising will differentiate prenasal vowels from others, but in the Inland North this difference is usually not significant. The unique character of this general raising emerges in Figure 5.16, based on an analysis of F1 of /æ/ in North America into four "natural

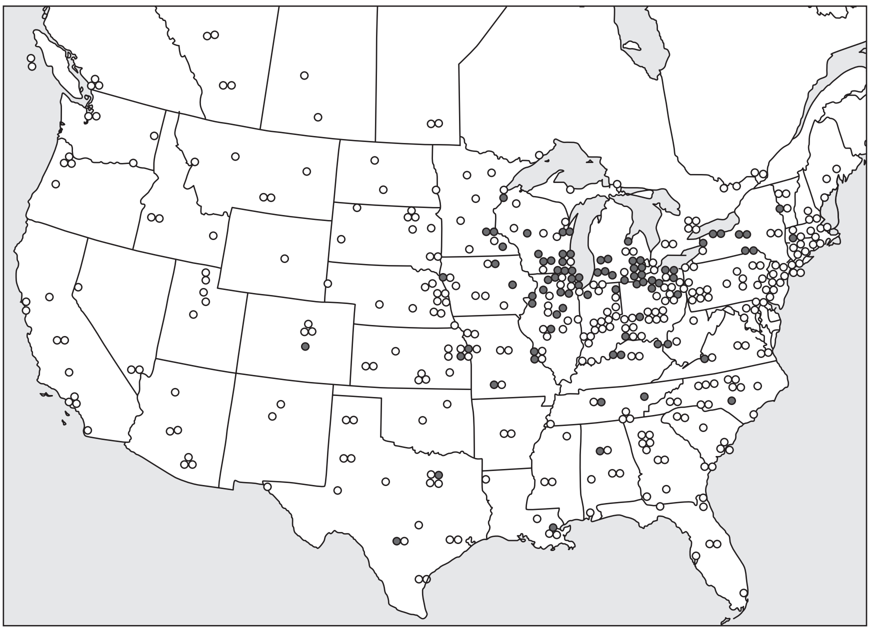

**Figure 5.16** Natural break map for mean F1 of /æ/ (four ranges) showing range of 445 to 684 Hz (vowels before nasal consonants not included)

break" categories.[30] The black circles show the category with lowest F1 range, from 445 to 684 Hz. The natural break algorithm automatically isolates the Inland North, including all of the cities around the Great Lakes[31] and along the Erie Canal in New York State, along with the later extension along the Chicago–St Louis corridor and a small scattering of isolated speakers in the upper regions of the South. While /æ/ is raised and fronted in particular contexts by almost all speakers of North American English, a historical process in this particular area has eliminated all contextual conditions, in a process that may be represented as (8).

(8) [+low, +ant] → [+tense]

The local character of this phenomenon, that is, its heavy concentration in the Inland North, shifts the inquiry to the identification of the people involved in this event and to the short-*a* tensing conditions in the dialects they spoke.

The ANAE maps of the NCS in Western New York State display a series of cities strung out on a line from east to west: Schenectady, Syracuse, Rochester, Buffalo.[32] They were founded as small villages by New England settlers in the eighteenth century and developed as major cities early in the nineteenth, when the Erie Canal was constructed (Figure 5.17). The Erie Canal realized an ambitious plan to open a waterway to the west, connecting New York City with the Great Lakes.[33] It was begun in 1817 and completed in 1825, with extraordinary economic consequences for Western New York State. Before the canal, the cost to ship one ton of goods from Buffalo to New York City was $100; using the canal, the same amount could be shipped for $10 (McKelvey 1949a). The great drop in cost of transportation prompted westward migration and the development of farmland throughout the Inland North.

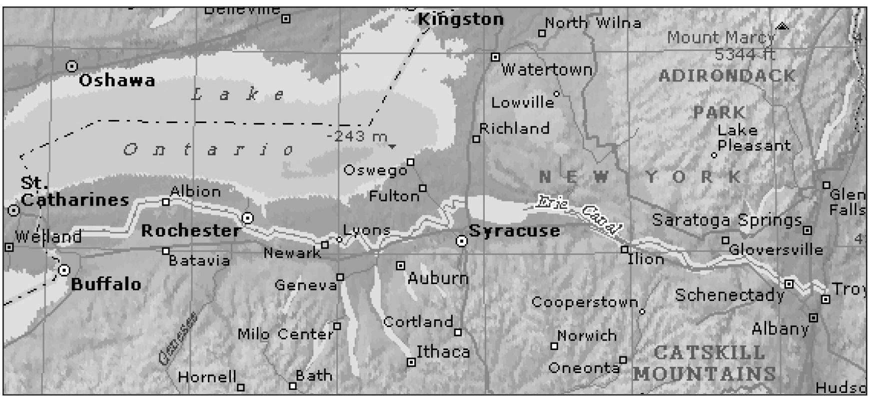


**Figure 5.17** Cities on the Erie Canal (McKelvey 1949b). Reprinted by permission of Rochester Public Library

Fresh produce and vast quantities of wheat were shipped to the metropolitan areas of the East Coast, and consumer goods were shipped west (McKelvey 1949a and b). The consequences for urban growth were correspondingly great. At the end of the War of 1812 Rochester had a population of 331, largely of New England origin. The construction of the canal required large numbers of laborers, and a number of Irish immigrants arrived, forming the section of Rochester called Dublin. From 1820 to 1830, the population grew from 1,507 to 9,207 (McKelvey 1949a). The proportion of the population drawn from New England dropped steadily (10 percent in 1845, 5 percent in 1855) with the arrival of new immigrants from Great Britain, Ireland and Germany.

The major cities in New York State, with the exception of Binghamton and Elmira, are located along the trade route established by the Erie Canal from New York City to Albany, through Schenectady, Utica and Syracuse, to Rochester and Buffalo. Today nearly 80 percent of upstate New York's population is still to be found within 25 miles of the Erie Canal. Figure 5.18 shows that the growth of Rochester followed a logarithmic increase from 1820 to 1930. But this spectacular expansion was small compared to the growth of population in surrounding Monroe County and in the seven neighboring counties from 1810 to 1830, reaching a peak in 1850. This was the type of tenfold increase that is required to defeat the principle of first effective settlement (Zelinsky 1992): that the first group arriving in an

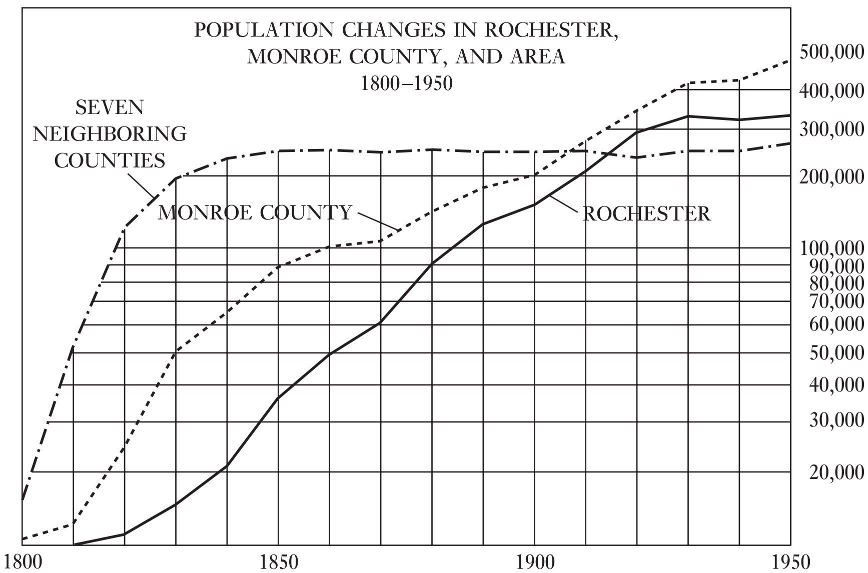


**Figure 5.18** Growth of population in Western New York State, 1800–1950 (McKelvey 1949a). Reprinted by permission of Rochester Public Library

area sets the cultural pattern for those who arrive later. It represents the type of explosive growth that Herold (1990) documented in the coal-mining towns of Northeastern Pennsylvania as the trigger for the low back merger there. But the settlement of the Erie Canal and Inland North was a far larger social movement than the migration to the coal-mining towns in the Allegheny Plateau. A much greater and more diverse migration created the population of upstate New York, and involved at least four types of short-*a* systems.

1 *The nasal system* There is general agreement that the original settlers of upstate New York were from New England. Current evidence on the short-*a* class in New England points to the dominance of the nasal system – that is, an allophonic tensing of all /æ/ before nasal consonants in both open and closed syllables, and nowhere else (ANAE, Chs 13, 16).
2 *The nasal system combined with the broad-*a *pattern* Settlers from Eastern New England introduced the assignment of a variable set of short-*a* words to the broad-*a* class: *aunt*, *can't*, *half*, *past*, etc.
3 *The split short-*a *system* It is evident that the main commercial traffic, freight and passenger, passed to and from New York City, whose new predominance as a port of entry coincided with the opening of the canal. The New York City short *a* is split into two phonemic classes, with tensing in syllables closed by voiced stops, voiceless fricatives and front nasals, along with many grammatical and lexical specifications (Trager 1930, 1934, 1942; Labov 1989b; ANAE, Ch. 13).
4 *The Celtic substrate* We must also consider the sudden admixture of large numbers of speakers of Hiberno-English, where short *a* is normally low front or low central.

The end result of such dialect mixture is very often the formation of a *koine* (Trudgill 1986: 107–10) involving leveling (elimination of marked variants) and simplification. Three such patterns of simplification of these mixed short-*a* systems are to be found: (a) no tensing, as in Montreal or generally in Great Britain; (b) the nasal system; and (c) the general tensing of all short *a*, as in (8) above. This third option is what developed in New York State. Though we cannot be certain exactly when this linguistic development occurred, it seems most likely that it happened during the population explosion in the first third of the nineteenth century and before the system was exported to the Great Lakes region in the wake of continued westward expansion.

Figure 5.19 maps the westward extension of the Northern Cities Shift. The black symbols (and black isogloss) identify speakers who satisfy the UD criterion of the NCS: that is, /ʌ/ is further back than /o/(ANAE, Chs 11, 14).[34] For these speakers, the combined effects of stages 2 and 5 of the NCS have reversed the front–back relationship between /ʌ/ and /o/ that is found in other dialects. While /o/ moves to the front, /ʌ/ shifts to the back, so that the mean F2 of /ʌ/ is less than the

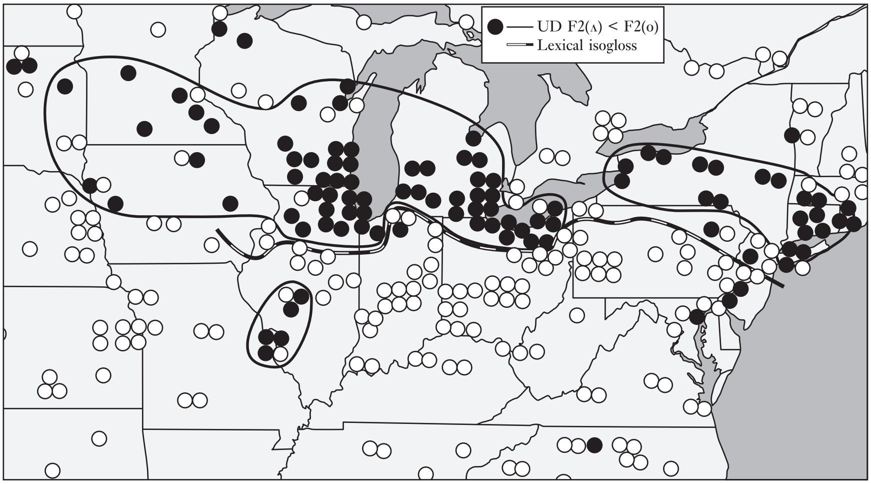


**Figure 5.19** Extension of the Northern Cities Shift to the Great Lakes region of the Inland North by the UD criterion. Black symbols and black isogloss identify speakers for whom /ʌ/ is further back than /o/. The barred black-and-white isogloss is the lexical line separating North from Midland based on DARE data

mean F2 of /o/. The black symbols are uniform throughout the Inland North as defined here. Five black symbols appear to the southwest of this area, in the narrow corridor leading from Chicago to St Louis – a diffusion of the NCS which will be discussed in detail in Chapter 15. We also see a set of four grey symbols in the Mid-Atlantic area to the east, a region with its own dynamic. Otherwise the distribution of the UD criterion is absolute: one of the cleanest divisions in North American English dialectology.[35]

Furthermore, the Southern limit of the NCS coincides with the barred black-and-white isogloss: the division between North and Midland, defined in Carver (1987) on the basis of thirteen lexical oppositions (such as Northern *darning needle* vs Midland *snake feeder*, *belly-flop* vs *belly-buster*, *stone boat* vs *mud boat*, *sawbuck* vs *trestle*, *blat* vs *bawl*). The North–Midland line extends westward from New York State, passes south of the Western Reserve in Ohio, runs close to the Northern border of Indiana, and then turns south to include the Northern third of Illinois.

The lexical features that identify the North are largely rural terms, many of them obsolete and unknown to city dwellers today. They reflect directly the agricultural practices of the mid-nineteenth century, the period when the Inland North was settled: clearing land, building stone walls and framing houses. But, as noted above, the earliest evidence of the NCS sound changes dates from the 1960s. If the triggering linguistic event took place during the upstate New York population boom of the first half of the nineteenth century, its effects must have lasted for a century

**Table 5.4** Age coefficients for five elements of the NCS in regression analysis by vowel tokens for Inland North speakers [N = 63]. All figures show younger speakers favoring the change

| | Coefficient | Probability |
|---|---|---|
| First formant of /æ/ | – | – |
| Second formant of /o/ | –12 | < .05 |
| Second formant of /oh/ | –24 | < .001 |
| Second formant of /e/ | 68 | < .001 |
| Second formant of /ʌ/ | 17 | < .10 |

before coming to the attention of linguists. This is not unlikely, if we calculate the time required for the present level of /æ/ raising to be reached. The initial tensing as /æ/ shifts to the peripheral track actually has the effect of lowering /æ/ in terms of higher F1,[36] and from studies of current sound changes in progress we can expect that the raising from low to upper mid position would take three generations.[37] The raising of /æ/ has reached its maximum in this area today, as shown by the age coefficients of Table 5.4, which is drawn from a regression analysis of vowels from sixty-three speakers in the Inland North (ANAE, Table 14.6). There is no correlation between age and the height (F1) of /æ/, even at the $p < .10$ level of significance. This indicates that the raising process has been active for some time and has reached its limiting value.

The specific hypothesis that is advanced here is that the triggering event for the general raising of /æ/ was the formation of a *koine* in Western New York State in the first half of the nineteenth century. This event was the result of a variety of contingent historical processes, so that further inquiry into its linguistic antecedents will not materially increase our understanding of the evolution of the Northern Cities Shift. That said, we continue to explore the dialectology of Western New England, the point of origin of the initial English-speaking settlement of the area, where many of the components of the NCS can be found in an incipient form (Boberg 2001). The match was struck by builders of the Erie Canal, but the timber that burned was grown in New England.

## 5.7 An Overview of Triggering Events

This chapter began with the proposition that a clear demonstration of the causal character of a chain shift required a bend in the chain of linguistic causality. It turned out that there were many such bends in the history of the sound changes in progress in North American English. They generally involve the removal of a vowel from one subsystem and its insertion into another. An improved understanding of the development of the complex English vowel system stems from the concept of the linguistic subsystem, in which the principles of chain shifting and maximum dispersion are defined (see Chapter 6). Mergers across subsystems play a particularly important role in these developments. Evidence for the reality of the subsystem concept is drawn both from phonological distribution and from phonetic differentiation, where the ability to distinguish phonetic from phonological effects is crucial.

Some of the triggering events encountered were linked with a chain of other triggering events, receding into the indefinite linguistic past with no obvious break in the chain of causality. The low back merger was linked to the eccentric composition of the long open-*o* word class, which has been a source of instability in English for many centuries. Two other cases showed sharp discontinuities in the succession of events. The fronting of /uw/ seems to have been triggered by the loss of the initial glide after coronal consonants in the oddly formed /yuw/ class; we pursued the consequences of that loss, but it did not seem fruitful to pursue its antecedents. Finally, the social and economic ferment centered on the building of the Erie Canal created sharp linguistic and social discontinuities, which triggered the revolutionary chain shifts of the Inland North in the twentieth century. We can of course probe into the mixed parentage of this new dialect, but it seems clear that a new linguistic world was born in Western New York State in the first third of the nineteenth century.

To some extent, these findings are conditioned by the complex character of the English vowel system with its sixteen phonemes, which is well out in the upper tail of the distribution of vowel inventories in the world's languages. Here the organization into subsystems plays a role that is not easily replicated in the more common-garden variety of five-vowel language. But other kinds of hierarchical organization into vowel subsystems are not difficult to find in languages with nasal vowels, glottalized vowels, creaky vowels, long and short vowels, or stressed and unstressed subsystems. Bradley (1969) describes elaborate chain shifts within and across glottal-tone and open-tone subsystems in Akha, a Lolo-Burmese language (Vol. 1, Ch. 5). Latvian dialects provide a dazzling array of chain shifts across ingliding, monophthongal, upgliding and short-vowel subsystems (ibid.). The chain shifts which characterize the early history of the British Celtic languages cross long and short, monophthongal and diphthongal subsystems (McCone 1996). Such hierarchical organization is of course even more common in consonantal systems.

The dialectology of the New World offers an attractive opportunity to study linguistic changes in progress. The events I have chronicled here are new sound changes, written on the tabula rasa of the frontier. As we follow their antecedents backwards in time, we encounter the dialectology and language contacts of the Old World, where layers of intersecting influence accumulate over the centuries. The record is blurred and many times overlaid, but it is worth deciphering. Tracing history as it is being made is exhilarating, but it is always helpful to know where we came from.