4

The Gating Experiments

The replication of the Peterson–Barney experiment in Chapter 3 showed the extent to which changes in progress produced variation in the categorization of words pronounced under formal and controlled conditions. For some dialects of American English, it has been amply demonstrated that sound changes are modified and corrected when attention is fully focused on speech in word lists and minimal pairs. The tendency to correct vernacular speech patterns appears maximal in New York City (Labov 1966), moderate in Philadelphia (PLC, Vol. 1) and quite variable in the South (Feagin 1979). On the other hand, the comparison of word lists and spontaneous speech in ANAE interviews showed that the raising of short $a$ in the Northern Cities Shift (NCS) was more advanced in word lists for seven out of the ten speakers examined, and none showed the opposite tendency (Ash 1999). Whether or not we find stylistic correction, speakers will often display variation in the form of outliers in the direction of the change in progress, especially in stressed, highly emphatic articulations. It is possible that such advanced forms would have a considerable effect on cross-dialectal comprehension.

4.1 Construction of the Gating Experiments

The Project on Cross-Dialectal Comprehension [CDC] designed a series of Gating Experiments that would test the ability of listeners from Philadelphia, Chicago and Birmingham to recognize advanced forms of the Philadelphia sound changes, the Northern Cities Shift and the Southern Shift, in words taken from the most spontaneous and emphatic forms of vernacular speech. When Ash administered the Peterson–Barney replication in Chicago and Birmingham, she asked the subject groups for volunteers to be interviewed. Since it has been found that the great majority of sound changes are led by upwardly mobile young women (Labov 1990, PLC, Vol. 2; Haeri 1996), Ash selected six to seven young women from the local colleges in each city and carried out sociolinguistic interviews in which a variety of techniques serve to reduce the effects of observation (Labov
The speakers that Ash interviewed were expressive, voluble and eloquent exponents of the local scene. High-quality recordings were made with the Nagra IV-S Stereo recorder and Sony lavaliere ECM-55 microphones.

From the Chicago interviews, Ash selected eighteen examples of advanced forms for each of the elements of the Northern Cities Shift. In each case the target vowels were extracted as the only stressed vowel in a one or two-syllable word. A larger section was then extracted, in which the target word was heard embedded in a phrase. Finally the full sentence in which the phrase appears was extracted. The same procedure was followed for Birmingham and Philadelphia. Comprehension was tested with groups of subjects at each of the three local colleges where the original recordings had been done.

In each city, subjects first heard the series of eighteen isolated words from a given city and then were asked to write down whatever word they heard. The sounds were played from a Nagra IV-S open reel tape recorder, with a Nagra III loudspeaker, which has been found to reach all areas of a typical classroom with approximately equal clarity. Subjects were advised that some of the tokens might not sound like English words, but they should write down the sounds they heard using ordinary English spelling. Each word was played three times. After the series of words was transcribed, subjects were given a fresh page with eighteen blanks and asked to transcribe the phrases containing the same words. A third transcription page then showed the full sentences, with a blank left for the phrase. Subjects were asked to fill in the blank with their understanding of the phrase, as heard in the full sentence context.

In each city, a second series of group experiments were carried out in a local high school with the population of white, upwardly mobile students oriented to college. In Chicago, experiments were carried out in Mother Theodore Guerin High School in the suburb of River Grove. In Birmingham, Fultondale High School was selected – a public school in the town of Fultondale, just north of Birmingham. In the 1990 census, Birmingham proper had a population of 264,000, with 36 percent white and 63 percent black. Fultondale had a population of 6,400, with 98 percent white and only 1.7 percent black. In Philadelphia, subjects for group experiments were recruited at Nazareth Academy, a private Catholic school in the Northeast section of Philadelphia.

### 4.2 Overall Responses to the Gating Experiments

Figure 4.1 and Table 4.1 show the overall pattern of responses to the speakers of the three cities by the six groups of subjects. The main effects are the same throughout: the expected upward steps of recognition with the increase of context from word to phrase to sentence. However, three unexpected aspects of these results have made these experiments the most effective and dramatic means for acquainting linguists as well as the general public with the extraordinary nature of the sound changes involved.
Figure 4.1 Overall pattern of responses to Gating Experiments
The first of these results consists in the uniformly low rates of success in the identification of isolated words. Combining all groups of listeners, correct identification is only 18 percent for the Chicago sound changes, 24 percent for Philadelphia, and 26 percent for Birmingham.

The second unexpected result is the high proportion of errors that remain when the full sentence is played to listeners. When the full context is supplied, a majority of the listeners identify the word for what it obviously was intended to be. But in Chicago 33 percent failed to do so. The item shown below as (1) is the word block pronounced by a Chicago speaker in a fronted form, which the great majority of listeners hear as the word black.

(1) Word: [blæ:k]
    Phrase: living on one [blæ:k]
    Sentence: senior citizens living on one [blæ:k]
When Philadelphia college students heard (1) in the word context, only 10 percent heard it as *block*. In the phrase context, 29 percent more students correctly identified it as *block*, filling in the phrase blank with “living on one block.” But the full sentence context convinced only 32 percent more to change their minds. In sum, 71 percent finally realized that this speaker was saying “block” in the same way that they said “black,” but 29 percent would not recognize this possibility. Table 4.1 shows that 33 percent of all the listeners failed to correct their original misunderstandings of Chicago speakers; 31 percent, of Philadelphia speakers; and 20 percent, of Birmingham speakers. This result supports the natural misunderstandings of Chapter 2, which show sequences of dialect-motivated errors that resist the interpretations provided by the full context of the speech situation.

The third remarkable aspect of these overall results is that the advantage of local listeners over outsiders is small. In each section of Figure 4.1, one can observe that the two groups of local subjects show a higher rate of correct responses than the others. The important point is that, whatever the consequences of sound change may be for cross-dialectal comprehension, they are not radically different for members of the speech community who listen to other members. While the data from natural misunderstanding in Chapter 2 were generated largely across dialect lines, the results of Chapters 3 and 4 point to a more general effect of change on comprehension within the community.

The low proportion of correct responses for isolated words may not be entirely the product of sound change, but may be in part caused by the well-known difficulty of extracting isolated sections from the stream of speech without affecting intelligibility. If the consonants preceding and following the vowel are not clearly identified, this will affect the perception of the vowel, which takes into account consonant transitions (Cooper et al. 1952). In fact, the proportion of errors due to imperfect perception of the segmental environment is small. Figure 4.2 shows the total number of responses according to the schema of (2).

(2) **Dialect motivated error:** misidentification of the vowel in the direction predicted by the sound change and by no other changes, for example *sacks* for *socks*.

*Consonant motivated error:* vowel correct but consonants wrong, for example *docks* for *socks*.

*Other errors:* wrong word not related to sound change, for example *besides* for *socks*.

*Blank:* no response.

*Correct:* *socks* for *socks*.

It is evident that the proportion of dialect errors is much greater than that of non-dialect errors: subjects are responding to these advanced forms in a way that is predicted by their phonetic character. Consonant-motivated errors, reflecting problems with the extraction of the syllable from context, are very low, for both
word and sentence contexts. As the dashed black line shows, dialect-motivated errors in the word context are heavily concentrated in the segment that is affected by the change in progress. Such single-segment errors are maximal in the word context and relatively low in the sentence context.

4.3 Comprehension of the Northern Cities Shift in Chicago

In (3), the various items in the Chicago section of the Gating Experiment are grouped according to their relation to six stages of the NCS (see Figure 1.4). In this and similar displays, the item in the word context will be in caps, and the phrase context underlined.

(3) Sound changes in the Chicago Gating items

1. THE GENERAL RAISING AND FRONTING OF /æ/ This is most clearly exemplified by the high front position of that [ðət], gliding to a central shwa, and less so by the upper mid position of rafts [reɪfts], strongly modified by the initial /ˈæ/ and the following consonant cluster.

- Nobody really got scared of THAT.
- Oh we went out on the RAFTS, and we went out where the boats were, and they were circling around us like that.
2 THE FRONTING OF /o/ Three items focus on this variable: block [blæk] and socks [sæks] and locks [læks].
   - Y’ hadda wear SOCKS, no sandals.
   - Old senior citizens living on one BLOCK.
   - Oh yeah, he went in the LOCKS; and he got stuck in there; and they had to tow him out.

3 THE LOWERING AND FRONTING OF /oh/ See off [ɒf] and talk [tæk].
   - To top it OFF, her nephew came on the trip also.
   - We had all these conversations and TALKS about it.

4 THE BACKING AND LOWERING OF /e/ Backing is shown in steady [stædi] and, better [bɛtər], lowering in head [hæd], said [sæd], met [met] and red [ræd]. The low realizations of /e/ are in the same region as /o/ in block and socks, but slightly fronter and not as long.
   - And I didn’t know there was such a thing as an air pocket, and we kept going up and down in the air, and uh you get to a point where you’re STEADY for a while and there’s this massive drop.
   - Mostly I write, I write BETTER than I do anything else.
   - The light is shining into his eyes, and they looked RED.
   - I dreamed about somebody that I later MET, a couple of times, like in my last year of high school.
   - My mother corrected me the other night and I don’t know what I SAID.

5 THE BACKING OF /ʌ/ This is heard most clearly in busses [bɔsəz], which is identified by almost all listeners as “bosses.”
   - I can remember vaguely, when we had the BUSES with the antennas on top.

6 THE LOWERING AND BACKING OF /i/ This is heard in rich [rɪtʃ] and in sick [sæk]. There is also one token of an extremely low /i/ in hit [hæt].
   - They were obnoxious; they didn’t speak French; they were all RICH and scummy.
   - But I never get sea-SICK; and I love the ocean.
   - He made bathtub gin here, and they used to have a maid and a telephone, and then, they repealed prohibition and then the depression HIT; so it was lean times.
Cross-Dialectal Comprehension

Figure 4.3 shows the location of the nuclei of the eighteen words in the CDC Chicago series. In addition, Figure 4.3 shows the relatively high position of /ey/ in saying [seɪ] and grain [grɪ:n], which is characteristic of the Northern dialect.

- Well the way he died, he had a heart attack, he was shoveling GRAIN, down at the docks, I think.
- And you say, “I believe in baby blue eyes,” and then sooner or later after SAYING it so many times you see two blue eyes [. . .] in your arms.

The oldest and most salient feature of the NCS is the general raising of short a in all environments, which reaches the same level as the raising before nasal consonants in many neighboring dialects. The most extreme example in the stimuli is the high ingliding vowel [ðiɛt] from an exploratory recording of 1968. The second mora is not a centering inglide, but a low front vowel of equal duration to the first. It is often heard as “the act,” “the fact” or “to be at,” reflecting a shift of syllabicity that may be a candidate for the next stage of sound change after the first mora has reached cardinal [i].

Figure 4.4 shows a strong local advantage in the interpretation of this vowel. Both Chicago groups show a significant advantage (p < .0001) in phrase and sentence
context. Here we also note a superiority of the Chicago high school listeners over the Chicago college group, a difference that is significant at the .05 level for sentence context.

In order to understand this local advantage better, we can compare the distribution of responses in the phrase context for high school students from Philadelphia and Chicago. Figure 4.5 shows the frequency of correct responses; correct vowel but wrong consonants (scared of dad, scared of cats); interpretation as a succession of two phonemes /iyæ/ (scared of the act, scared of the ice); a high front vowel /iy/ (scared of bees, scared of the . . .); blank (no response, or ?), and other. The main differences between the two groups of listeners is in the much higher rate of correct responses in Chicago and in the large bulk of non-responses for Philadelphia. About the same percent of subjects in both cities perceived the broken vowel as two phonemes. We must assume that breaking was perceived by the Chicago listeners who gave their correct responses, but it was automatically converted to the phoneme /æ/ by those who have incorporated Northern breaking into their own systems. The high proportion of non-response from Philadelphians reflects the opposite: near-total unfamiliarity with Northern breaking before voiceless stops. There was no significant improvement for Philadelphians in sentence context: percent correct rose from 4 percent to only 12 percent.

The second stage of the NCS, the fronting of block, socks, locks, also displays a strong local advantage, as shown in Figure 4.6. Here the local high school students are well ahead of local college students. The difference is strongest in the word context, and diminishes as Chicagoans reach a ceiling effect. On the other hand, 29 percent of the Birmingham high school students could not accept the idea that [bla:k] could stand for “block,” and 27 percent of the Philadelphia college students could not, either.
A similar pattern appears in Figure 4.7; the fronted *socks* is interpreted as *sacks* by the overwhelming majority of listeners. A significant degree of recognition in the word context is shown by the Chicago high school students (34 percent). The pattern for *socks* is quite different from that of *block* in one respect: there is much less information provided in the phrase context, so the recognition rate is flat from word to phrase. Here again the superior ability of the Chicago high school students to recognize the characteristic forms of their own speech is quite marked. Though the college students reached 83 percent correct in the sentence context, only 11 percent recognized the isolated *socks* – less than a third of the level for high school students.
Table 4.2 is a regression analysis of correct responses to the Chicago speakers. The largest factors are of course the negative effects of limited context: word and phrase as compared to the residual context, sentence. There is a small local advantage only for Chicago high school, not for Chicago college. The local advantage for Chicago shown in Table 4.2 holds for only ten of the eighteen items, and there is only a handful where it holds for both college and high school groups. High school students have an advantage over college students in the word context for eight of the eighteen items, and college students are ahead of high school students for only two items. It appears that there is no general local advantage in Chicago: sound change reduces communicative efficiency within the community as well as across communities.

### 4.4 Recognition of Chicago Sound Changes in the Word Context

Figure 4.8 compares success in identifying Chicago vowels in the word context across the six subject groups. In this diagram, “correct” refers to success in identifying
the vowel, including the small number of responses in which the vowel is correct but the surrounding consonants are misidentified. The Chicago high school group is significantly superior to the college group for three of the five categories. We also observe that the Philadelphia high school group shows an advantage for three vowels. On the whole, the similarities in response are much greater than the differences. The one response which stands out from the rest comes from the 37 percent of the Chicago high school students who recognized the fronted /o/ tokens correctly: the figure is almost twice as high as for the second best group.

**Figure 4.8** Percent responses with correct identification of the vowel in the word context by city and school. /æ/ = mean score for raft, that; /o/ for socks, block, locks; /e/ → ʌ for better, steady; /e/ → ə for met, said, red; /ey/ for saying, green

**Figure 4.9** Percent responses with correct identification of the word in the sentence context by city and school. (Categories on the horizontal axis as in Figure 4.8)
Figure 4.9 gives the corresponding display for the sentence context. Here the high school advantage for Chicago and Philadelphia has disappeared, and we see a strong advantage for both local groups in the first two categories. The Philadelphia high school group has the highest score in four of the five categories. On the other hand, the Birmingham high school group is at a severe disadvantage throughout.

### 4.5 The Effect of Lexical Equivalence

In the word context of the Gating Experiments, subjects were primarily trying to identify words, though they were told that, if they could not, they should try to indicate the sound they heard. Thus some subjects recorded “blatts” or “blatz” for *locks*; “broch” for *rich*; and one entry given for *that* was “dias.” It stands to reason that, when the vowel is shifted in the direction of another phoneme, listeners would tend to hear that phoneme more often if there existed a lexical equivalent with that vowel. Thus the nine items on the left are paired with known lexical items of comparable frequency, but the nine items on the right are not.

<table>
<thead>
<tr>
<th>Paired</th>
<th>Unpaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>block → black</td>
<td>rafts → ?</td>
</tr>
<tr>
<td>socks → sacks</td>
<td>that → ?</td>
</tr>
<tr>
<td>locks → lax</td>
<td>seasick → ?</td>
</tr>
<tr>
<td>better → butter</td>
<td>rich → ?</td>
</tr>
<tr>
<td>steady → study</td>
<td>off → ?</td>
</tr>
<tr>
<td>grain → green</td>
<td>talks → ?</td>
</tr>
<tr>
<td>busses → bosses</td>
<td>red → ?</td>
</tr>
<tr>
<td>met → mat</td>
<td>hit → ?</td>
</tr>
</tbody>
</table>

To check the effect of such lexical equivalences, membership in the right-hand list – unpaired – was added as a factor in the regression analysis of Chicago shown in the left-hand column of Table 4.2. A significant effect emerges, with a positive coefficient of 7.7, p < .01, with no changes in any other figures. In other words, the absence of a lexical equivalent with the shifted vowel lowers by a good 7 percent the tendency of subjects to err in that direction of word identification. However, this leaves a large majority who continue to err in that direction, that is, who refuse to assign the shifted vowel to its intended word class even though this is the only choice that makes semantic sense. Such subjects will often hear other lexical items with different segmental environments. For example, listeners who hear the lowered and backed vowel in *rich* do not record the rare word *wretch* or *retch*, but note instead *bread*, *words* or *roads*; and, for *rafis*, the most frequent responses are *rest* and *arrest*.
4.6 Comprehension of Southern Sound Changes in Birmingham

From this point on we will consider only the word and sentence contexts. From one item to another, the increase in understanding in the phrase context will vary according to the amount of context supplied and according to the extent to which it predicts the identity of the word. For example the context ______-watchers points heavily to the word “weight,” while the phrasal context “I did not _____” does not project as strongly the word “buy.” Figure 4.10 supplies the acoustic measurements of the eighteen Birmingham Gating items. The various stages of the Southern Shift are represented here. Many of these vowels exhibit complex movements, and measurements at two or three points are shown as numbered series.

1 Monophthongization of /ay/ At the lower right of Figure 4.10 there appear the purely monophthongal versions of final /ay/ in *buy* and *guy*, which do not have any lexical equivalents along with an equally monophthongal token before a voiceless consonant, *nights*, which sounds to most listeners like “nice.”

![Figure 4.10](image-url) Location of vowels of Birmingham Gating words in F1/F2 space. Numbers indicate stages in the vowel trajectories.
• And I knew the GUY.
• I did not BUY any kind of Hawaiian print.
• If he works NIGHTS at the STEEL plant, then he’ll come in and sleep a couple of hours, then go work all day.

2 LOWERING OF THE NUCLEUS OF /ey/  This vowel falls along a nonperipheral track in the direction of /ay/. It appears in weight1, located well below the midline and centralized under the influence of initial /w/, then gliding to the endpoint of weight2. This word sounds like “white” to most listeners.

• She’s on a WEIGHT-watchers diet now, so she eats a lot of cottage cheese.

3 THE LOWERING OF THE NUCLEUS OF /iy/  This vowel falls in the direction of /ey/, as seen in in upgliding beatin’1,2 and street1,2. This realization of beating sounds like “baiting” to most listeners.

• No, he started BEATIN’ me and then he said, “I let you win.”
• There’s this one STREET, called Broad Street.

Figure 4.11 shows the percent correct identification of the vowel in isolated words by the six sets of listeners for stages 1–3 of the Southern Shift, as described above. In the great majority of cases, the word is identified correctly as well; the number of cases where only the vowel is correct are minimal in this series.

Figure 4.11 displays an extraordinary advantage of the Birmingham high school subjects over all others. Though the Birmingham college students show a higher
correct score than others, the difference is nowhere a significant one, while /ay/, /ey/ and /iy/, the high school students differ from the rest at p < .00001 (by chi-square).

4 THE RAISING, FRONTING AND TENSING OF SHORT /i/  This appears at the upper left of Figure 4.10, with kids1,2 ingliding to kids3. While Birmingham subjects uniformly hear this as “kids,” Chicago listeners often hear “keys” or convert the velar onset to a labial, as “P.S.”

- I was with a bunch of KIDS.

5 SOUTHERN BREAKING OF OTHER FRONT SHORT VOWELS /e/ and /æ/ undergo “Southern breaking” (ANAE, Ch. 13), where the first part of the nucleus is relatively low and lax, moving to a high tense glide and then gliding back down, to a position not far from the origin. This can be traced in Figure 4.10 in set1,2,3, bed1,2,3, left1,2,3, lab1,2,3, tram1,2,3. The breaking is only moderate in left but strong in set, which is commonly heard as “say it.” In the polysyllable Danny the inglide is truncated, and the vowel is often heard as /iy/: “dainty, Zany, Danish.”

- Yes, and everybody’s so upSET.
- “Melanie’s downstairs.” No she’s not, she’s in the BED.”
- Where the LEFT-hand keys are? Those are numbers too, and you have . . .
- My biology class didn’t have a LAB.
- Like DANNY says some things like . . .
- Last time I went to Albuquerque it was in March, and there was snow, and we rode the TRAM.

6 THE GENERAL FRONTING OF /uw/  This is a continent-wide, on-going process in which the nucleus of /uw/ shifted, from high back to front of center. The South frequently shows an additional fronting of the glide to [ü] (ANAE, Ch. 12). This can be observed in Figure 4.10 in the trajectories of group1,2, bootleggers1,2 and bouffed1,2. These words all glide towards high front position and are often perceived as unrounded /iy/, /ey/ or /i/.

- Every once in awhile you hear about some BOOTleggers.
- You know, their hair all BOUFFED out.
- If you want to see a diversified GROUP sit in UAB cafeteria.

A substantial local advantage appears in responses to the second and third items, as displayed in Figure 4.13. The two Birmingham groups are significantly and clearly higher than others, close to 100 percent, while the four other groups are clustered around 50 percent.

Table 4.3 gives results on two items that are quite different from the chain shifts we have been considering. The first is the merger of /i/ and /iy/ before /l/. This
Figure 4.12  Percent correct identification in the word context of the Gating Experiment by city and school for the breaking of short front vowels in Birmingham speech.

Figure 4.13  Percent correct identification in the word context of the Gating Experiment by city and school for the fronting of /uw/ in Birmingham speech.

Table 4.3  Percent correct identification of Birmingham steel in the word context of the Gating Experiment by city and school.

<table>
<thead>
<tr>
<th>City Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham Col</td>
<td>5</td>
</tr>
<tr>
<td>Birmingham HS</td>
<td>4</td>
</tr>
<tr>
<td>Chicago Col</td>
<td>2</td>
</tr>
<tr>
<td>Chicago HS</td>
<td>0</td>
</tr>
<tr>
<td>Philadelphia Col</td>
<td>0</td>
</tr>
<tr>
<td>Philadelphia HS</td>
<td>0</td>
</tr>
</tbody>
</table>
merger originally took place in the South in the tense position, where “fill” sounded like “feel,” but the merger is now occurring in many areas in the lax position, so that feel sounds like fill to those who make the distinction, even in the South. (LYS, Di Paolo 1988, Di Paolo and Faber 1990).

If he works NIGHTS at the STEEL plant [. . .]

This merger of /i/ and /iy/ before /l/ is close to being complete in Birmingham. ANAE, Map 9.7 shows that /iy/ and /i/ are “the same” in production and perception for three of the five subjects, and clearly distinct for only one. Figure 4.14 shows the distribution of /i/ and /iy/ for a 67-year-old woman from Birmingham, with tokens from both spontaneous speech and minimal pairs. The total merger is evident.

Since the merger is close to complete in Birmingham, we might expect 50 percent correct from local judges in the word context, given the fact that both still and steel are well-known words. The result is quite different: almost everyone judges the production [stɪl] to represent the word still, and there are no significant differences among groups. Part of the reason is frequency: steel is registered at only 45 in the Brown corpus, while still is listed at 782. In Figure 4.14, the tokens of steel are on the back and low end of the distribution, which would favor the interpretation of a lax vowel for listeners who expect a contrast. In any case, judgments are not significantly different from listeners from Birmingham, who have the merger, and from listeners from other cities, who do not.

The second item in Table 4.4 concerns the diphthong /oy/, which undergoes monophthongization as much as /ay/, in this case in the most favored position – before /l/.
Everybody says that only children are spoiled. The results for this item are also strikingly different from any others, but in the opposite direction from responses to steel in Table 4.4. It is the only item where the local listeners show a perfect score. The nonlocal listeners are far off the mark, and high school and college groups have identical scores.

This result is what we would expect from a static situation, where members of the local community are perfectly attuned to the local dialect and outsiders are at a great disadvantage. It serves to illustrate the fact that most of our results are quite different from any such expectation.

Local advantage in the study of cross-dialectal comprehension in Birmingham is summed up in Table 4.5. The item group is distinguished from bouffed and bootlegger with the heading ruw as opposed to uw, since the results are so different. For college students, local advantage is quite variable; for high school students it is much more consistent. The superior performance of the high school students shows up in eight of the ten items, with no results pointing in the opposite direction.

4.7 Comprehension of Philadelphia Sound Changes

The sound changes operating in Philadelphia are not like the chain shifts of Birmingham and Chicago, which rotate vowels to a phonetic position equivalent to that of the unrotated vowels of other dialects. Instead, the characteristic Philadelphia change shifts phonetic qualities to an extreme position, quite different from the sounds that the out-of-state listener is familiar with. The vowel shifts are
described in some detail in Volume 2, Ch. 4: four of them are represented in the CDC stimuli, along with the vocalization of intervocalic /l/.

1 **Canadian raising of /ay/** In the 1970s, the centralization of /ay/ before voiceless consonants was a new and vigorous change in Philadelphia, one of the two male-dominated variables. Backing and rounding of the nucleus was particularly characteristic of young working-class men. The CDC items included a male speaker saying:

- Well ridin’ my BIKE [bɔˈɪk] on a rainy day, and the brakes never work when you have hand brakes.
- They stopped at a red LIGHT [lænt].
- [...] that go out lookin’ for a FIGHT [fɔt].

2 **Raising and fronting of (æh)** As in most other areas, Philadelphians have tense /æ/ before nasals in closed syllables. The extreme Philadelphian form shows a high fronted nucleus followed by an inglide, which is often hard for others to recognize.

- That’s why HALF [hɪːf] of the things, I don’t know, I can’t understand how they sell them!
- In fact, that girl got beat really BAD [bɪːd] with a chain and they put her in the hospital for that.
- The hospital nowadays, they want you to have at least HALF [hɛːf] of it down before you go in the hospital.
- There’s a BAND [bɛːnd], and they have like beer, and whiskey sours.

3 **Raising and fronting of (aw)** Older Philadelphians of the 1970s realized /aw/ as [ɔː]; younger Philadelphians moved the nucleus to upper mid peripheral position, and shifted the glide target to [ɔ].

- We have HOUSE [həʊs] parties like we had a pollyanna party here.
- She used to have eh a very LOUD [ləʊd] voice.
- Well years ago, people around here were too PROUD [prəʊd] to get it.

4 **The fronting of /ow/ in checked syllables** As in the Midland and South generally, the nucleus of /ow/ is strongly fronted in Philadelphia. It is especially unrounded, so that, when the syllable is compressed, the vowel is often mistaken for a front unrounded vowel.

- Like, I’ll tell you, MOST [mɔs] of them talk about their families.
- Yeah MOST [məʊst] of them are steady ’cause we have all trucking companies up there.
The Vocalization of /l/  As pointed out in Chapter 2, Philadelphia has an unusual extension of the vocalization of /l/, which applies freely in intervocalic position. This is a major source of miscomprehension.

- About the woman who lived in a house, they were CALLIN’ [kɔːm] her the old witch.
- So she took a RULER [ruər] and smacked my hands.
- Before I had the baby I fell down the CELLAR [seːz] steps, ‘n’ she was right there to help me.

The overall results of the Gating Experiments with Philadelphia speakers are shown in Figure 4.15 for the word context and in Figure 4.16 for the sentence context. The overall pattern seems clear. Birmingham and Chicago are not differentiated, while Philadelphia shows a strong local advantage, except for variables that are close to zero or 100 percent.

This result makes it evident that the local advantage in Philadelphia is greater than that found in Chicago and Birmingham. This was first indicated in Figure 4.1. The local advantage shown in Figures 4.4, 4.10 and 4.11 is less consistent than that displayed in Figures 4.13–4.14 and Table 4.6. This difference between the

![Graph](image)

**Figure 4.15** Percent correct identification of five Philadelphia sound changes in the word context by city and school

**Table 4.6** Significance by chi-square of advantage of Philadelphia vs other listeners in percent correct identification of Philadelphia speakers

<table>
<thead>
<tr>
<th></th>
<th>ay0</th>
<th>aeh</th>
<th>aw</th>
<th>ow</th>
<th>VIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word</td>
<td>0.001</td>
<td>&lt; .0001</td>
<td>0.0003</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Sentence</td>
<td>ns</td>
<td>0.02</td>
<td>0.002</td>
<td>&lt; .0001</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>
cities is most likely to be connected with the difference in the character of the sound changes concerned. Chicago and Birmingham are involved in chain shifts, where the younger, more advanced speakers realize a given vowel in such a way that it overlaps another vowel as spoken by the older, more conservative speakers. Thus 73 of the 89 Chicago college students heard the advanced token of *socks* as *sacks*, as compared with 28 out of the 31 Philadelphia college students; the difference is not significant. In Birmingham, 36 out of 37 college students wrote *sacks*, a result which differs from the Chicago subjects at the .05 level.

The Philadelphia sound changes are not chain shifts but radical phonetic developments of individual elements of the system, and this makes identification particularly difficult in spontaneous speech. In Figures 4.15 and 4.16, the /æh/ variable shows a significant local advantage, and it may be instructive to see what the main sources of difficulty are in the outsiders’ identification of these vowels. The fact that the tense vowels involved are phonemically distinct from the lax set in Philadelphia (Ferguson 1975, Labov 1989b) is not necessarily relevant, since raising and fronting of short /a/ is also found in the allophonic distributions of Chicago and Birmingham. Figure 4.17 locates the nuclei of the test items *bad, band, half* in a plot of all the stressed vowels in the sentences spoken by the female Philadelphian. One can observe a tight clustering of five phonemes in the upper front peripheral area: the nuclei of /iy/ in *beat; /ihr/ in beer, cheer; /eyC/ in chain; /aw/ in down, thousand, sours, how, proud; and tense /æh/ in *bad, band, baskets, half*. All of these are higher and fronter than the lax nucleus of /i/ in *this*, so that they will be heard phonetically as beginning with [i]. This tense initial is distinctly higher and fronter than the lax vowel of *this*, which is close to the unrounded nucleus of /ow/ in *go* and *most.*

![Figure 4.16](image-url)  
*Figure 4.16* Percent correct identification of five Philadelphia sound changes in the sentence context by city and school.
However, responses to the Gating item *half* do not reflect this tense initial. It is identified overwhelmingly in the word context as a lax short *i*. The word “if” is most prominent in the responses: 37 percent of the responses in Philadelphia, 52 percent in Chicago, 67 percent in Birmingham. However, there is little local advantage here. In each city only one person gave the correct response to the word “half.” The lower incidence of “if” in Philadelphia reflects the fact that Philadelphians were more likely to submit a blank response than the other listeners were.

Much of the local advantage in Philadelphia stems from the Philadelphians’ ability to recognize tensed short *a* in *bad* and *band*. Figure 4.18 a and b shows the percent responses for college students from the three cities. On the left hand, it is evident that Philadelphians are superior in their ability to identify this form: Philadelphia registers 94 percent correct, as against 58 percent for Chicago and 46 percent for Birmingham. The dominant tendency in Chicago and Birmingham is to report the tense, raised *band* as having a mid lax phoneme /e/, as in *bend, fend, end, pen*. It appears that tensed short *a* is heard as a lax vowel, despite the fact that the onset of the vowel is higher than the high front tense /iy/. We can attribute this to the general tendency in North American English to identify ingliding tokens with short vowels, no matter how long they become. Indeed the vowel of *band* is very long: 534 msec. But, as Figure 4.19 shows, the nucleus of *band* is a high front
vowel, close to *beer*; it then moves rapidly to a central inglide. It is then uniformly interpreted as a lax vowel – phonemically mid or sometimes high, as in *thin, in, pin*.

In Figure 4.18 a and b, the pattern of responses to Philadelphian *bad* adds another feature to the picture. Philadelphians are much ahead of others in the percent of correct identifications of *bad* (and words that rhyme with *bad*). Yet the correct response represents only a minority of the total (32 percent). Almost as many listeners (26 percent) hear a word with a nasal consonant (*and, band, ben, den, din, thin . . .*). In the subjective reaction tests of the LCV project, tense */æh/* was the main item to receive overt comment, and it was not uncommon for Philadelphians to refer to the “harsh nasal a” in *bad* as well as in *Camden*. A tense high front nucleus is associated with the prenasal allophone more than with any other. Again, we note that this tense ingliding form is assigned only to lax nuclei, with or without a nasal consonant following.

The tendency to hear *bad* with a nasal consonant is stronger in Chicago (45 percent), even though the difference between oral and nasal allophones of */æ/ is smaller in
The Gating Experiments

83

the Northern cities than anywhere else. The tendency is overwhelming in Birmingham (71 percent). The Birmingham short-\(a\) system is continuous. Following nasals show the most raising and fronting, but following voiced consonants show considerable shift in this direction as well. We might well conclude that the Philadelphia tense /\(\text{æh}\)/ before oral consonants is pronounced with a significant opening of the nasal passage.

These patterns of local advantage are opposed to other Philadelphian advanced forms, which are difficult for everyone to recognize. In Figure 4.15 no group has more than 6 percent success in recognizing checked /\(\text{ow}\)/ in the word context. The unrounded and truncated nucleus of /\(\text{ow}\)/ in the two instances of most was recognized as /\(\text{ow}\)/ by only two Philadelphia subjects: the great majority of responses from all three cities showed a short /\(\text{i}\)/ nucleus: miss, missed, mist. In Figure 4.16, this opaque situation in word context is translated into a strong local advantage in the sentence context. Nevertheless, we find nine of thirty-two Philadelphia college students hearing /\(\text{ow}\)/ as /\(\text{i}\)/, in transcriptions of I’ll tell you most of them... as “I tell you miss them,” “I’ll tell you listen,” or “I’ll tell him you missed him.”

Even though this token of most is fully stressed, it is a function word subject to reduction, and this may account for the truncation of the glide. This does not apply to the last item in Figures 4.14–4.16, the vocalization of intervocalic /\(\text{l}\)/ in callin’, ruler, and cellar. No group showed more than 10 percent recognition of these words in the word context, and the non-Philadelphians did not exceed 40 percent correct in the sentence context. These results mesh with the proliferation of natural misunderstandings of balance, cooler, spelling, Tell him, volleyball in Chapter 2 (items (59)–(63)). Of the thirty-two Philadelphia college students, twenty heard cellar as “sorry” and four as “sir” in the word context. They guessed at ruler in a wide variety of forms: “roar, more, walk, work, wall, roll, roy, boy, rural, raw,” and only one heard “ruler.” In the phrase context, took a ruler was heard as “took a walk” by twenty out of thirty-two, and as “to the wall” by four. The isolated word callin’ was reported most often as “coin” or “point.” In the sentence context, they were callin’ her remained opaque for 31 percent. Nine of the thirty-two subjects heard callin’ as corner, in such transcriptions as “on the corner.” The mishearing as corner is facilitated by the fact that this is a dissimilating word in Philadelphia, like quarter, and the first /\(r\)/ is regularly vocalized.

These results confirm earlier indications that the vocalization of intervocalic /\(l\)/ is very far below the level of social consciousness in Philadelphia, though it is firmly rooted in the phonological practice of that community.

4.8 Overview of the Gating Experiments

The results of the CDC Gating Experiments show major interference with the communicative function of language as a consequence of the Northern Cities Shift,
of the Southern Shift, and of the Philadelphia sound changes. The local advantage, which appears at one point or another of these investigations, is encouraging because it confirms the initial impetus for the experiments, which focused on the ability of speakers from one city to understand the output of sound changes of another city—sound changes that were alien to them and firmly rooted in that other speech community. If the members of that second community are significantly better in their ability to recognize these advanced forms, it is because they have frequently produced them, heard them and recognized them in interaction with their peers in everyday life.

At the same time, this local advantage is limited. It is significant for less than half of the items where it could be expected to appear. This is true not only for new sound changes in progress, but for well-established regional features like the monophthongization of /ay/. In many cases, local subjects fail to recognize pronunciations like [ga:] for guy, which are the normal and dominant form of their own phonetic realization. If the local advantage were everywhere strong, we could then conclude that the interference of sound change with the communicative function of language was limited to cross-dialectal communication. However, the confusion introduced by sound change affects local speakers in the same way as nonlocal speakers.

One model that has been advanced for the perception of phonemic categories would predict a stronger local advantage. The exemplar model developed by Pierrehumbert (2002) argues that perceived instances of a labeled sound are stored in episodic memory with detailed phonetic and social information. Hay, Warren and Drager (2006) investigated the ability of New Zealanders to identify a word as /ihr/ or /ehr/—given the ongoing merger of these two vowels. Their subjects’ decisions were significantly influenced by the perceived age and social class of the speaker. Storage of age information from remembered tokens should allow members of the community to interpret advanced tokens of a sound change as they are normally spoken by the younger people they know. We would expect a very large advantage for these locally embedded listeners over subjects in another city who have little or no experience with their local phonology. If our subjects have stored their daily experience in a form to which they have ready access, why is the local advantage not greater?

One avenue to an understanding of this question is to consider the number of contexts in which high school students outperformed college students—in Figures 4.4, and 4.6 through to 4.10. The most striking cases are in Figures 4.6–4.7, where local college students are well behind high school students in the word context, but recover their ground once more context is supplied. It seems likely that the loss of college students’ ability to recognize their own speech patterns is the result of more extensive contact with competing norms: the conservative patterns of older academic figures and the increased contact with nonlocal speakers, who are closer to the norms of broadcast standard. The experiment itself is carried out in an academic setting, where vernacular norms are disfavored. Our
experimenter, Sharon Ash, delivered her instructions in all three cities in her conservative Chicago dialect, without the radical rotation of /æ, o, e, a, oh/ characteristic of advanced forms. All of these factors would help to explain why local advantage is so limited.

One might also explain the high error rates of the word context as a product of the experimental methodology. We normally do not hear words in isolation, excerpted from the stream of speech. But this methodology is the appropriate way of testing the phonological efficiency of the system, in which the alternation of a single distinctive feature should be enough to trigger the interpretation of the morpheme, phrase, and sentence. ⁷

Furthermore, the results of the Gating Experiments are consistent with the view of cross-dialectal comprehension derived from the study of natural misunderstandings. Dialect differences lead to confusion, and language change compounds it. Even those with the most intimate knowledge of cross-dialectal relations fail to apply that knowledge in the rapid interchanges of everyday life. The view of the speaker-listener that emerges from these studies is quite remote from that of the sensitive agent who is said to monitor, store and retrieve dialectal information from the accumulated memories of previous experience. Rather this speaker-listener comes across as a more simple-minded individual, whose reactions are dominated by the salient categories of the moment, who hears what he or she expects to hear.

Given the limitations of the machinery for processing dialect differences, we return to the ever-puzzling questions of the causes of language change.