

Transmission and Diffusion

William Labov, University of Pennsylvania

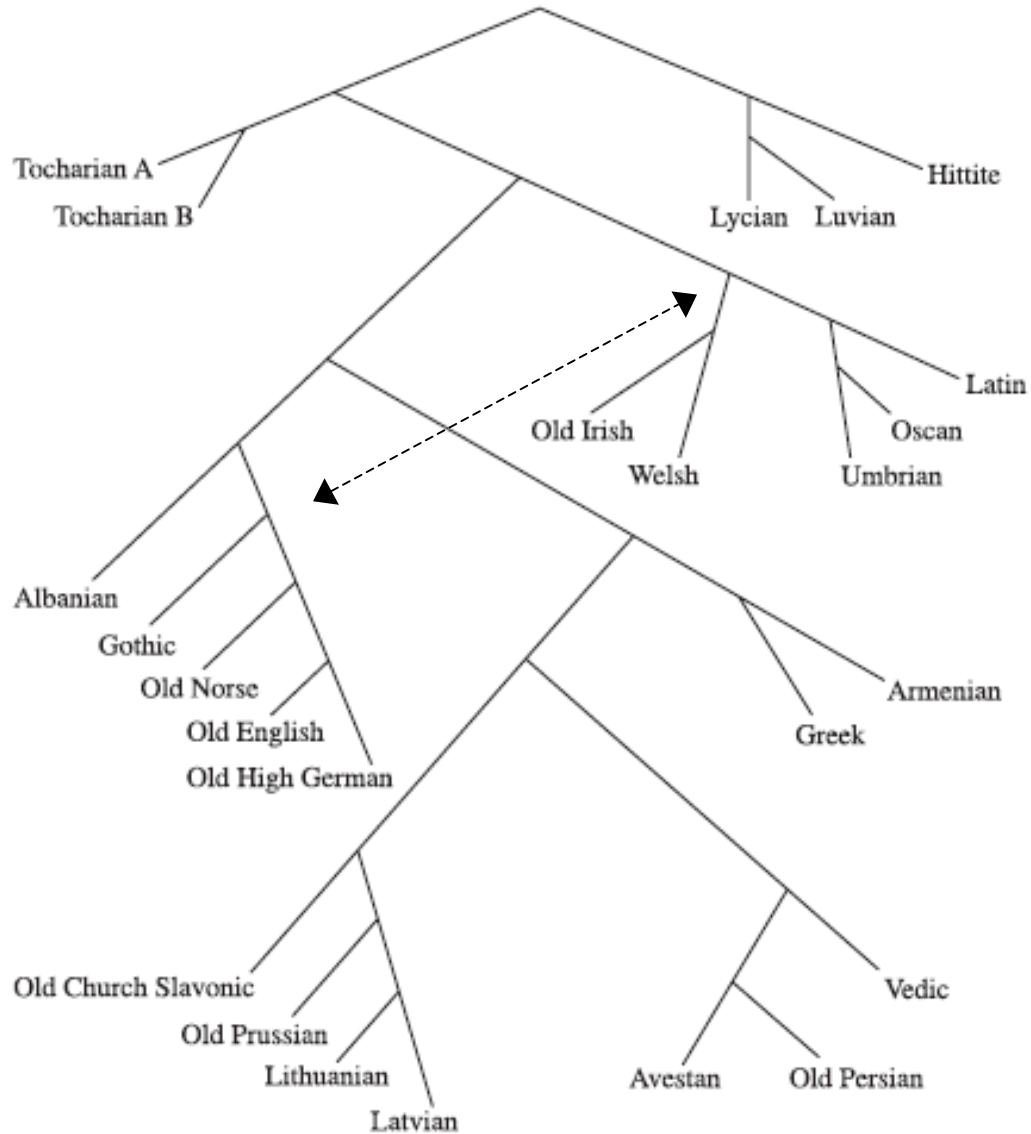
Throughout the history of linguistics, two major models of linguistic change have co-existed in an uneasy relationship.¹ The family tree model has been the principal guide and major output of the comparative method. Yet all linguists agree that there are some situations where the effects of a wave model must be recognized, registering the influence of distinct terminal branches of the tree on one another. Such wave effects are seen most clearly in communities with extended periods of bilingualism, in the formation of pidgins and creoles, and the major Sprachbund areas in which features spread across family trees that are not related in any other way. In the most recent reconstruction of the Indo-European family tree (Figure 1). Contact effects may appear as inextricably embedded in the reconstruction of normal linguistic development. Ringe, Warnow and Taylor 2002 [hereafter RWT] present their current best tree for Indo-European as Figure 1, with the Germanic languages branching from the major node that includes Balto-Slavic and Indo-Aryan. Yet as suggested by the dashed arrow (my addition to the diagram), Germanic shares many characters with the Italo-Celtic branch that split much earlier from the main I-E development. The authors find that this situation points to the modification of the family-tree descent characters by later contact:

This split distribution of character states leads naturally to the hypothesis that Germanic was originally a near sister of Balto-Slavic and Indo-Iranian. . . that at a very early date it lost contact with its more easterly sisters and came into close contact with the languages to the west; and that that contact episode led to extensive vocabulary borrowing at a period before the occurrence in any of the languages of any distinctive sound changes that would have rendered the borrowings detectable. –p. 111.

¹ The work supported here is largely based on the research for the Atlas of North American English (Labov, Ash & Boberg 2005). Support is gratefully acknowledged from NSF under grants BNS91-11637, SBR 92-22458 and SBR 98-11487, and from NEH under grant RT-21599-94. I am indebted to Gillian Sankoff for many important contributions from her work on language change across the lifespan. The work of Don Ringe and his associates on family tree modeling and cladistics is an essential basis for the argument advanced here. For the key association between the weakening of linguistic change in outward diffusion and adult language learning, I am indebted to an intervention of Miriam Meyerhoff at a workshop on linguistic change in progress at the 2003 Summer Institute at East Lansing. Daniel Johnson has provided a number of valuable insights and corrections. Daniel Johnson has provided a number of valuable insights and corrections. GFUY

It would seem then that any general view of language descent must be prepared to integrate the two models of language change, and distinguish their effects.

Figure 1. Best Indo-European family tree (Ringe, Warnow & Taylor 2002), with indications of shared characteristics of Germanic with Balto-Slavic and Italo-Celtic branches



Defining transmission and diffusion

We begin with RWT's formulation of *linguistic descent*, the basic concept that defines the family tree model:

A language (or dialect) Y at a given time is said to be descended from language (or dialect) X of an earlier time if and only if X developed into Y by an unbroken sequence of instances of native-language acquisition by children. P. 63

The unbroken sequence of native-language acquisition by children is here designated linguistic *transmission*. The continuity of dialects and languages across time is the result of the ability of children to replicate faithfully the form of their parents' language, in all of its structural detail, preserving the distance of the branches of the family tree. But linguistic descent can be preserved even when this replication is imperfect, that is, when language changes. This is the normal type of internal language change, termed "change from below," which is responsible for increasing distances between the branches over time. Such internal changes are generated by the process of *incrementation*, in which successive cohorts and generations of children advance the change beyond the level of their caretakers and role models, and in the same direction over many generations (Labov 1994: Ch. 14). Incrementation begins with the faithful transmission of the adult system, including variable elements with their linguistic and social constraints (Labov 1989, Roberts 1993). These variable elements are then advanced further in the direction indicated by the inherited age vectors.² The incrementation of the change may take the form of increases in frequency, extent, scope or specificity of a variable. Though internal changes may simplify the system (as in mergers), they frequently maintain structural contrasts (as in chain shifts) or increase it (as in splits).³

When entire communities move, they carry with them the agents of transmission and incrementation. Describing the development of new colonial dialects, Trudgill infers that "most of the complicated work leading to the eventual establishment of a new, single norm will be carried out by children under the age of eight. . . hence the deterministic nature of the process, and the similarity of outcomes from similar mixtures." (2004:28)

² It has been argued that branches of a family tree can become differentiated by random drift after separation (Hockett 1958). The general rates of lexical replacement (Dyen and Guy 1973, Guy 1982) ensure that separated languages or dialects will eventually drift apart. However, language changes move with such speed (from one end of the vowel space to the other in three or four generations), and with such clear directionality that random drift seems an implausible mechanism. Furthermore, studies of change in progress show differentiation of dialects in close contact with each other (e.g., across the North/Midland line, ANAE Ch. 11). RWT argue that the principles of descent used in their analysis will apply even when there is no "clean separation."

³ Halle 1962 argued that linguistic change is the result of children's imperfect learning in another sense: that late additions to adults' grammar are re-organized by children as a simpler model, which does not exactly match the parents' original grammar. Although Lightfoot (1997, 1999) argues for this model as a means of explaining completed changes, such a process has not yet been directly observed in the study of changes in progress.

We also observe changes that diminish the distances between branches of the family tree. This may happen spontaneously, when parallel branches converge through independently motivated changes, but more often it is the result of contact between the speech communities involved and the transfer of features from one to the other. This transfer across branches of the family tree is here designated *linguistic diffusion*.

Structural diffusion

In discussions of the linguistic consequences of language contact, the question of structural borrowing is regularly brought to the fore. There is no question about structural transmission: if structures were not transmitted across generations, there would be no continuity in language. The issue is entirely about what can happen in diffusion.

RWT argue for a strong linguistic constraint against structural diffusion. They state that the essential condition for the family tree model is that morphosyntactic structures are faithfully transmitted across generations, and are *not* transferred from language to language in normal linguistic development. Thomason and Kaufman 1988 contend that social factors can override linguistic constraints, discounting the impact of any structural factors. Moravcsik (1978) proposes five general principles that delimit language borrowing; but see Campbell (1993) for a critical overview of the validity of such constraints. Hock and Joseph note that “structural elements usually do not diffuse through borrowing” but are the cumulative results of changes in pronunciation and lexical borrowing (1996:14). Winford 2003 concludes, “The case for direct borrowing of structure in any of these [bilingual] situations has yet to be proved” (p. 64). With the exception of Thomason and Kaufman, contributors to this debate agree that there are limitations on what types of linguistic patterns can be transmitted across languages. In a meticulous review of the literature on structural borrowing, Sankoff concludes that the notion of a “cline of borrowability” must be supported

Though most language contact situations lead to unidirectional, rather than bidirectional linguistic results, conditioned by the social circumstances, it is also the case that linguistic structure overwhelmingly conditions the linguistic outcomes. Morphology and syntax are clearly the domains of linguistic structure least susceptible to the influence of contact, and this statistical generalization is not vitiated by a few exceptional cases. (Sankoff 2001).

Close investigation of cases of structural borrowing has shown that they are actually consequences of lexical borrowing:

On the other hand, lexicon is clearly the most readily borrowable element, and borrowing lexicon can lead to structural changes at every level of linguistic structure (Sankoff 2001)

The borrowing of preposition-final constructions into Prince Edward Island French, carefully studied by King (2000) is the prototypical case; it is cited by RWT to

support their position that structural borrowing has proved to be an illusion in the few cases that have been studied in sufficient sociolinguistic detail. If this is the case, the contrast between transmission and diffusion is absolute: one copies everything; the other is limited to the most superficial aspects of language: words and sounds.

Accounting for the difference between transmission and diffusion.

It is proposed here that the contrast in patterns of transmission within and across languages is the result of two different kinds of language learning. On the one hand, transmission is the product of the acquisition of language by young children. On the other hand, the limitations on diffusion are the result of the fact that most language contact is largely between and among adults. It is proposed here that structural patterns are not as likely to be diffused because adults do not learn and reproduce linguistic forms, rules and constraints with the accuracy and speed that children display.

This hypothesis is informed by recent sociolinguistic studies that have greatly refined our understanding of the extent of changes in language learning ability that take place at the end of the critical period (see the recent reviews of Scovel 2000, G. Sankoff 2002). The period of decline in language learning ability extends from roughly 9 to 17 years of age. The experiments of Johnson and Newport 1979 showed that subjects who had acquired a second language after 17 years of age could no longer reproduce the syntactic judgments of native speakers. Oyama 1973 and Payne 1976 showed that children who arrived in a speech community after the age of 9 did not acquire the local pattern with any degree of precision. However, many recent studies show that adults do have the capacity to change their linguistic systems to a significant degree after this critical period (Sankoff 2004). Real-time replications consistently show some adult movement in the direction of the change (Labov 1994, Ch. 4). The real-time re-studies of Montreal (Sankoff et al. 2001) found a shift from apical to uvular /r/ for about a third of the adults. At the same time, it was observed that no adults showed the total conversion of uvular /r/ that was characteristic of many pre-adolescents.

Diffusion in dialect geography

The evidence on the differentiation of family tree and wave model will be drawn from dialect geography, which provides simultaneous records of both diffusion and transmission. The differentiation of regional dialects yields a fine-grained model of family tree evolution. Dialect geography also focuses our attention upon diffusion, since the distribution of features across contiguous dialects leads to the inference that some have spread in a wave-like process of diffusion from one dialect to another. With the advent of quantitative studies in the 1960s, this process of diffusion can be observed in some detail.

Striking examples are found in Trudgill's 1974 study of the Norwegian dialects of the Hemnesberget peninsula. Figure 2 shows the outward diffusion of the lowering of /æ/ in the middle age group of Trudgill's study. The increasing numbers

indicate both incrementation of the variable in the cities that are the points of origin and the geographic diffusion from them to the next largest cities and ultimately to the small villages of the countryside.

The data from Figure 2 were originally used to support the gravity model of diffusion in which the influence of one city on another is proportional to their population sizes and is inversely related to the square of the distance between them.⁴ But it also illustrates the striking difference between the two types of language change. The map does not focus upon the main city of Larvik. But the increase of the index in the area immediately surrounding Larvik implies, it had a level of over 240, and for the middle aged speakers, over 280. This increase in the magnitude of lowering reflects incrementation as the generating process in the city of origin.⁵

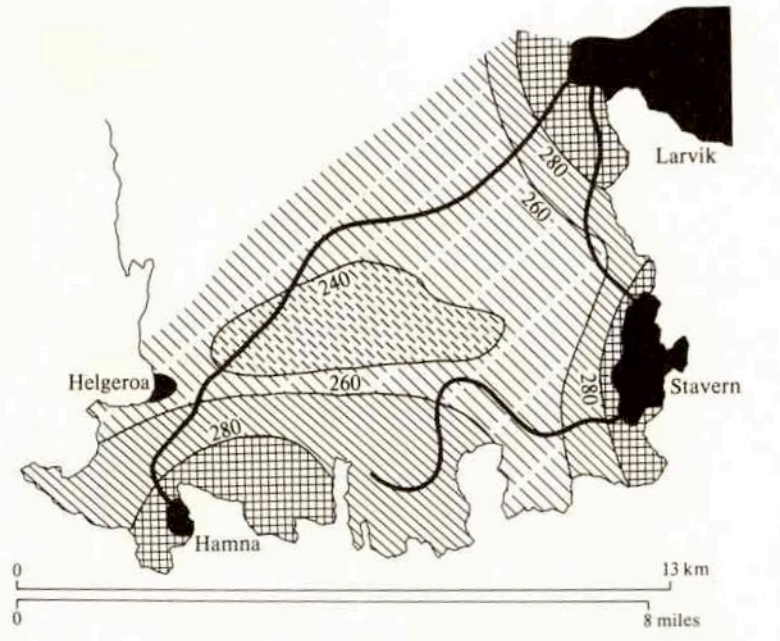
Figure 2 also illustrates the opposite process. As the linguistic variable spreads from its originating center, it expands in a weaker, not a stronger, form. It appears that the cities of Larvik and Stavern have values of the (æ) index higher than 280, while successively lower values of 280, 260 and 240 appear for regions more distant from the main cities. Viewed as a process of diffusion from the city centers, it is a wave of continuous weakening as each new level of /æ/ lowering diffuses outward. It is also possible to see Figure 2 as an array of incrementation, where each surrounding area exhibits incrementation at its own level, and the only difference between the big city and the small town is the time at which the process was initiated.

I will not try to resolve this issue. But if we ask why a change diffuses outside of the community in a weaker form, the answer is that it is copied from adults who have a relatively conservative form to begin with, and acquired by adults who change their own speech in a relatively slow and inaccurate manner.

⁴ Trudgill's gravity model described the Hennesberget development and the spread of non-standard features from London. It has not been as successful in other cases (Callary 1975, Boberg 2000). The more general "cascade" model in which change proceeds from the largest to next largest city in an area has proved more general, but other studies indicate that it is only one of many possible models of territorial diffusion (Bailey, Winkle and Sand 1993).

⁵ For other variables, it may be the frequency or the scope that is incremented.

Figure 2. Lowering of /æ/ on the Brunlanes peninsula. Speakers 25-59 years old. [Trudgill 1974, Map 3.8]



The Diffusion of (an) from Teheran to Ghazvin

The nature of this adult contact is illustrated in the study of the urban dialect of Teheran by Modaresi (1978). One of the sociolinguistic variables he studied was the raising of /a/ to [o] and [u] before nasals, as in the shift of name of the capitol city from [teran] to [terun]. This variable shows regular social stratification in Teheran, where the higher the social status of a group, the lower the frequency of (an) raising. Modaresi also studied the small city of Ghazvin, ancient capital of the province of that name, about 150 km from Teheran.

Figure 3 shows the percent raising of /an/ to /un/ by age and style for Ghazvin and Teheran. Both cities show sharp stylistic stratification and a regular advance of the variable. The solid lines show the values for Teheran, and considerably behind them, dashed lines show the values for Ghazvin.

Figure 3. Percent raising of (an) by age and style in the Farsi of Teheran and Ghazvin.

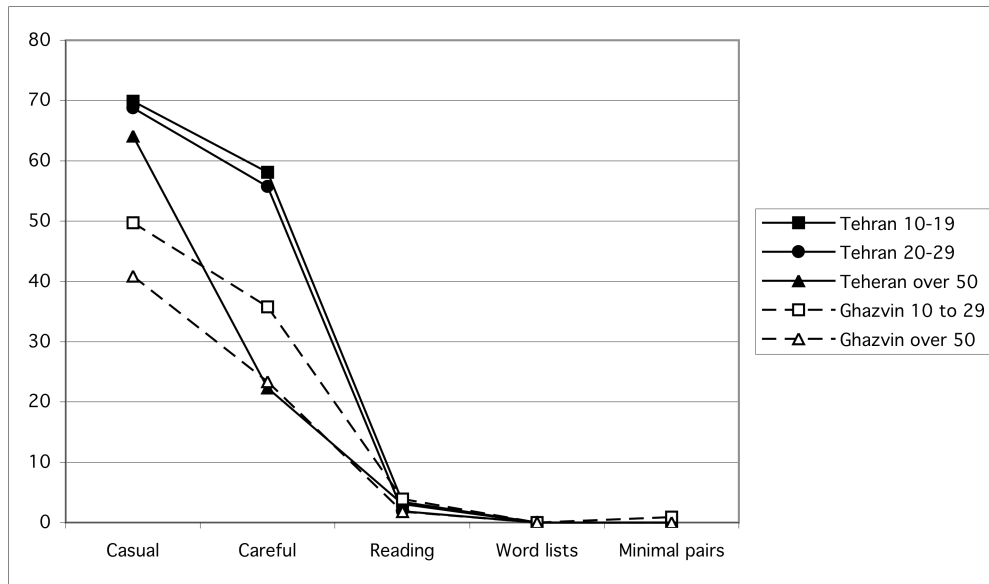
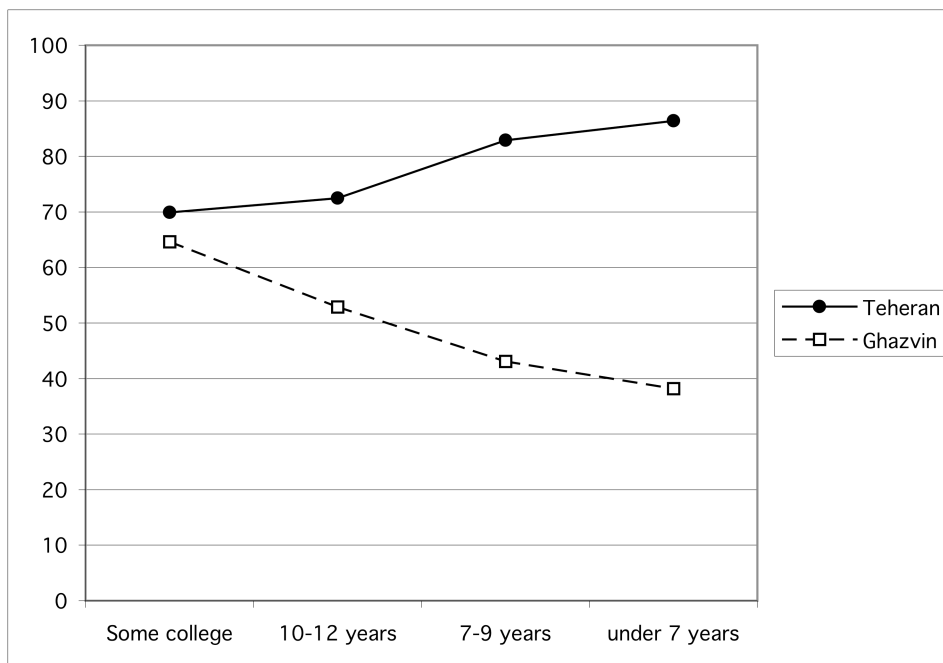


Figure 4 shows this variable by social class, registered by years of education completed. Ghazvin is only slightly behind Teheran for those with some college, but the difference increases with lower educational levels. Furthermore, the two communities show opposite directions of stratification: the more education that citizens of Teheran have, the less they raise /an;/ to /un/. In contrast, the more education citizen of Ghazvin have, the more they raise /an/ to /un/. This diagram makes sense only if we infer that the contact between Teheran and Ghazvin is primarily through more educated adults, and that the variable spreads downward in Ghazvin at a low rate through a network of adult contacts.

Figure 4. Raising of (an) by education in the Farsi of Teheran and Ghazvin.



That is not to say that incrementation will also not take place among children in Ghazvin. But they will most likely have inherited the new variable through the filter of adult diffusion. These examples from dialect geography support the notion that the diffusion of linguistic variables from place to place is carried forward by adults, from whom we expect less advanced rather than more advanced forms of the variables. In Iran, we observe some tendency for misperception of the social value of the variable.

Let us now return to the question of whether structural features of a linguistic variable are transmitted in such diffusion. The lowering of (æ) in Norway and the raising of (an) in Iran are typical of the many simple output rules that we find in studies of sound change in progress. In order to pursue the question of whether structural features can be transmitted, we will need to consider more complex patterns than the lowering of /æ/ or raising of (an). The studies to follow will consider the diffusion of a grammatically conditioned split (the New York City short-*a* split) and a complex rotation of five vowels (the Northern Cities Shift).

The diffusion of the NYC short-*a* system.

The studies to follow will draw upon findings of the recently completed Atlas of North American English (Labov, Ash and Boberg 2005, hereafter ANAE), a study of linguistic change in progress in all urbanized areas of North America.⁶ The first variable to be considered is the diffusion of the NYC short-*a* system to four neighboring areas.

All North American dialects show a differentiation of the short-*a* class into tense and lax forms (ANAE: Ch. 13).⁷ There are five basic types:

- a. *The nasal system*. All short-*a* before nasal consonants are raised and fronted (*man, manage, span, Spanish*) while all others remain in low front position.
- b. *Raised short-a*. All words with historical short-*a* are raised and fronted to mid and high position. Found only in the Inland North..
- c. *Continuous short-a raising*. Short-*a* words are variably raised and fronted, with vowels before nasal codas leading and vowels before voiceless stops and words with obstruents/liquid onsets (*glass, brag*) remaining in low front position..
- d. *Southern breaking*. Breaking of short-*a* into a low front nucleus, palatal glide and following inglide in the Southern dialect area.

⁶ The data for ANAE was gathered from 1992 to 1999 through telephone interviews with 768 speakers; 440 were analyzed acoustically. Support was provided by NSF under grant BNS91-11637, SBR 92-22458, NS SBR 98-11487, and from NEH under grant ART=21599-94.

⁷ Montreal may be the sole exception: see Boberg 200?.

- e. *Split short-a systems.* A phonemic split between tense and lax short-*a* is found in New York City and the Mid-Atlantic states, with distribution dictated by phonological, grammatical, stylistic and lexical conditions.

One form of the type (e) distribution is specific to New York City and its immediate environs. It was first recognized by Babbitt in 1896 in its present form.⁸ Babbitt found older speakers as a raised and fronted phonetic variant of New England broad-*a*, and described by Trager on the basis of his Newark, NJ speech pattern (1930, 1934, 1942).⁹ As indicated in Figure 5, short-*a* in the New York is tensed in syllables closed by voiced stops, voiceless fricatives, and front nasals. This basic paradigm yields tense *cab, bad, badge, flag, ham, man, half, bath, pass, cash*, but lax *cap, cat, catch, back, bang, tavern, rather, hazard, azure, pal, carry*. While the degree of raising and tensing is a sociolinguistic variable, the basic division into tense and lax classes is general in spontaneous speech, to the extent that it is not corrected by the effects of formal observation (Labov 1966).

Figure 5. Codas that condition tensing of short-*a* in New York City

p	t	č	k
b	d	ǰ	g
m	n		ŋ
f	θ	s	š
v	ð	z	ž
	l	r	

⁸ Babbitt observed older New Yorkers with a higher vowel in broad-*a* words than others, but for the majority, all words before front nasals, voiced stops and voiceless fricatives were tensed equally, except for function words (p. 461).

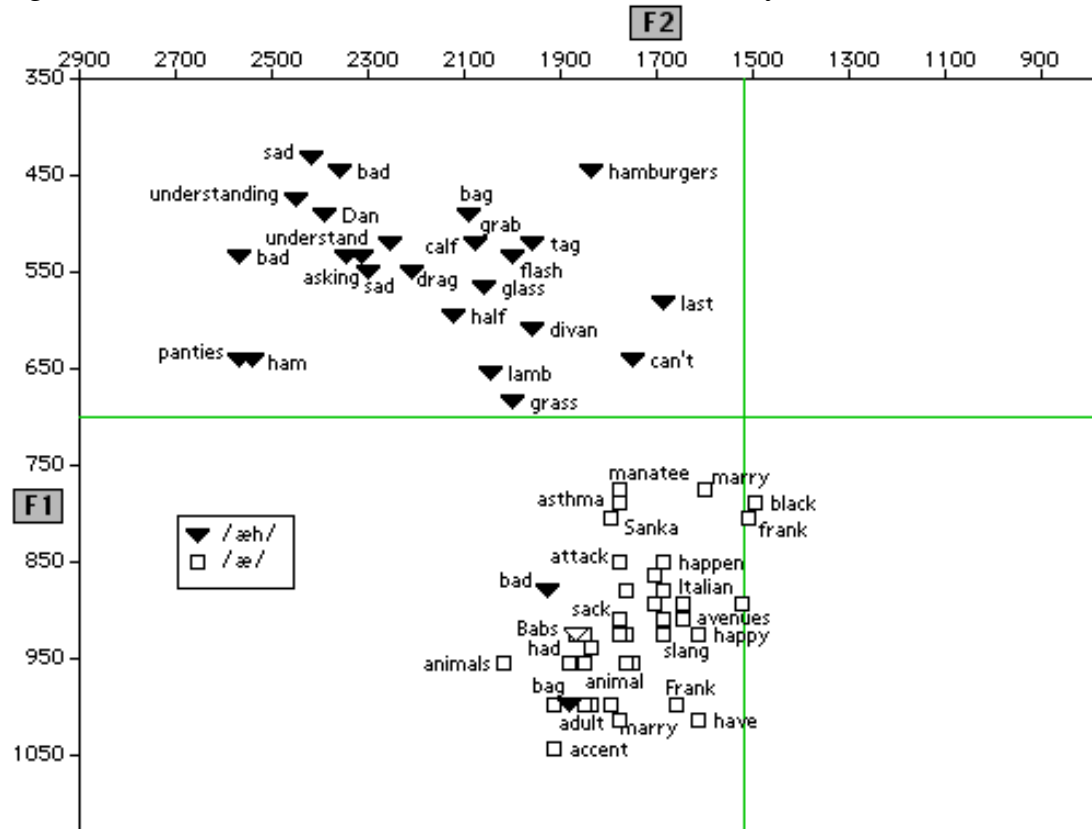
⁹ Newark, along with Jersey City, Hoboken and Weehawken, is fully representative of the NYC system.

To this basic condition there are added a number of specific conditions:

- a. Function word constraint: Function words with simple codas (*an, and, I can, had*) are lax while corresponding content words are tense (*tin can, hand, add*), while *can't* with a complex coda, remains tense. This preserves the contrast of tense *can't* vs. lax *can* in environments where the /t/ is elided or neutralized.
- b. Open syllable constraint: Short-*a* is lax in open syllables, yielding tense *ham, plan, cash* but lax *hammer, planet, cashew*).
- c. Inflectional boundary closing: Syllables are closed by inflectional boundaries, so that tense forms include *planning* as well as *plan, staffer* as well as *staff*, There is considerable variation before voiced fricatives (*magic, imagine, jazz*).
- d. Initial condition. Initial short-*a* with codas that normally tense are lax (*aspirin, asterisk*) except for the most common words (*ask, after*).
- e. Abbreviations: Abbreviated personal names are often lax (*Babs, Cass*).
- f. Lexical exceptions: There are a number of lexical exceptions: e.g., tense *avenue* is normally tense as opposed to lax *average, savage, gavel*, etc.
- g. Learned words: Many learned or late-learned words with short-*a* in tense environments are lax: *alas, carafe*.

Figure 6 shows the characteristic distribution of /æ/ and /æh/ for a Telsur speaker from New York City, Nina B., 42. Two members of the tense class (*bad, bag*) have undergone correction to the /æ/ class during the Telsur interview. Otherwise, we observe a clear phonetic separation of the two classes. The tense /æh/ class includes short-*a* before voiced stops in closed syllables (*sad, bad, bag, tag*), nasals (*panties, ham, understanding, hamburgers, can't, divan*), voiceless fricatives (*asking, glass, flash, calf*). In the lax category are corresponding words with short-*a* in open syllables (*animal, animals, manatee*), function words (*have*), and environments that are always lax, including following velar nasals (*Frank, slang*). The word *avenue* is not tense here; it is not clear if this represents a correction or is an exception to the exception. Four other examples of *avenue* used by the Telsur speakers from New York City fall squarely into the tense distribution.

Figure 6. Short-*a* distribution of Nina B., 42, New York City, TS 495



The dialect of New York City is confined to the city itself and several neighboring cities in northeastern New Jersey (*Weehawken, Hoboken, Jersey City, Newark*).¹⁰ The NYC short-*a* split follows the same distribution throughout this area, and as far as we know, has been stable through most of the twentieth century. The recently completed *Atlas of North American English* shows that the New York City pattern has also diffused to four other communities, along the paths shown in Figure 7.

¹⁰ The steady outflow of New Yorkers to the suburbs of Bergen County, NJ and Westchester, NY, has not effectively modified the basic vernacular of those communities. The eastward line of demarcation in Long Island has not been well defined in any recent studies.

Figure 7. Diffusion of the New York City short-*a* pattern to four other speech communities.



Diffusion to Northern New Jersey

I was born in Rutherford, New Jersey, a small residential, *r*-pronouncing town studded with Dutch farm houses, just outside of the New York City speech community. Though the local dialect that I acquired was an *r*-pronouncing dialect, the short-*a* system generally conformed to the descriptions of the NYC short-*a* system given above.¹¹ But there was a striking difference in the absence of the function word

¹¹ There were a number of differences in areas of lexical diffusion, like /oh/ vs. /a/ in *walrus*, *wash*, *moral*

constraint. A very common utterance for all residents of this Northern New Jersey area was, “Did you say C-A-N or C-A-N-T?” since the vowel is tense in both words and the /t/ is often neutralized by a following apical obstruent. Tense vowels are found in *am*, *and*, *an* as well. I originally cited this as an example of how the advance of sound change can override functional constraints, but in the perspective of the present study, it appears as a first example of the loss of structural detail in the diffusion of the NYC short-*a* system to dialects in which it is in contact.

Cohen 1970 is a detailed study of short-*a* systems in New York City and in the adjacent areas of Northern New Jersey. He finds that the area closest to New York, between the Hackensack and Hudson Rivers, replicated the NYC features outlined above, with no more variation than we find in the city itself. In the area between the Hackensack and Passaic Rivers, including Rutherford, there is a striking tendency to lose the functional constraint before nasals, so that *can*, *am*, *an*, *and* are tense. Variable tensing is found in open syllable word types like *planet*, *fashionable*. Beyond the Passaic River, the short-*a* systems are radically different from New York City.¹²

The Telsur project extended the original ANAE sample to study small towns in the area between New York City and Philadelphia, two speakers from North Plainfield, NJ, were interviewed. North Plainfield is a residential community of 20,000, located 28 miles southwest of New York City, and 18 miles from Newark, the nearest full representative of the NYC dialect. One of the Telsur subjects was Alex O., an 81 year old retired tool and die maker who was interviewed in 2001.. He clearly has the basic New York City system. Vowels in closed syllables before voiced stops are tense (*cab*, *bad*, *glad*) and voiceless fricatives (*rash*).¹³ The open syllable constraint is intact (tense *Canada*, *classics*), and as in NYC, inflectional boundaries close the syllable (*banning*). The lexical exception *avenue* is tense as in NYC. The crucial difference from NYC is the absence of the functional constraint before nasals as shown in the tense position of *can* and *am*.

The second North Plainfield speaker studied is, a younger man, Michael O., 58 years old in 2001. The NYC system is preserved, in its basic outlines before nasals, voiced stops and voiceless fricatives,¹⁴ but with further loss of structural detail. In his speech we observe the tensing of *can* and *am*, with the same phonetic positions as with Alex O. The loss of the functional constraint has become more general: *had* is now included. The lexical exception *avenue* is now lax. The open syllable constraint is severely weakened: *camera*, *damage*, *Janet*, *planet*, *Spanish*, *Catholic* are tense, though *manage* and *castle* are lax.

In sum, the diffusion of the NYC system to north central New Jersey shows a preservation of the basic phonetic conditioning, but a loss of a number of structural constraints characteristic of that system.

¹² ANAE interviews carried out in the 1990s in Passaic and Paterson show a uniform nasal system, with tensing before all and only all nasal consonants.

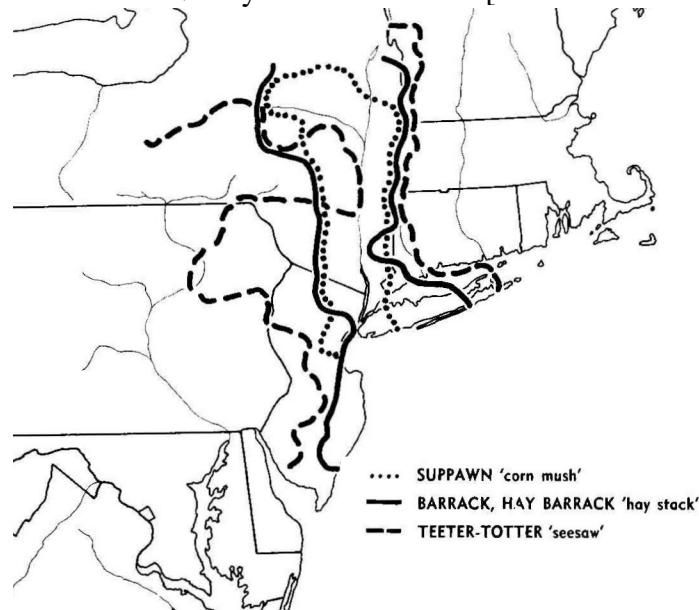
¹³ One of the basic NYC conditioning factors, vowels before /g/, has dropped out. As we move away from New York City, this is the first environment which drops out of the tensing group, so that *bag* and *flag* are often lax while *cab* and *bad* are tense.

¹⁴ /æ/ before /g/ is tense for this speaker.

Diffusion to Albany,

Albany was actually settled before New York City, the second inhabited place in the colonies--settled by Henry Hudson in 1609. It had a long and separate history during and after the Dutch period. But the construction of the Erie Canal from 1810 to 1827 led to a steady flow of population from New York City to Albany and westward. It is not surprising then to find a number of lexical maps from the *Word Geography* of Kurath 1949 that display an affiliation between New York City and the Hudson River valley. Figure 8 traces the distribution of three vocabulary items from New York city up the Hudson Valley: the rural terms *suppawn* for 'corn meal,' *barrack* for 'hay cock', and the children's word *teeter-totter* for 'seesaw'. Of these, *teeter-totter* is the only one likely to be found in an urban environment. It was used regularly by NYC subjects in the Labov 1966.

Figure 8. The Hudson Valley as a dialect area. [from Kurath 1949: Figure 13].



The short-*a* distributions in New York State outside of the Hudson Valley do not resemble the New York City system. Most of these cities have type b, the wholesale raising of short-*a* characteristic of the Inland North. New England is dominated by the nasal pattern (type a). But in Albany, the two Telsur speakers show a striking resemblance to the NYC pattern, the situation illustrated in the short-*a* distribution of John E. (Figure 8).¹⁵

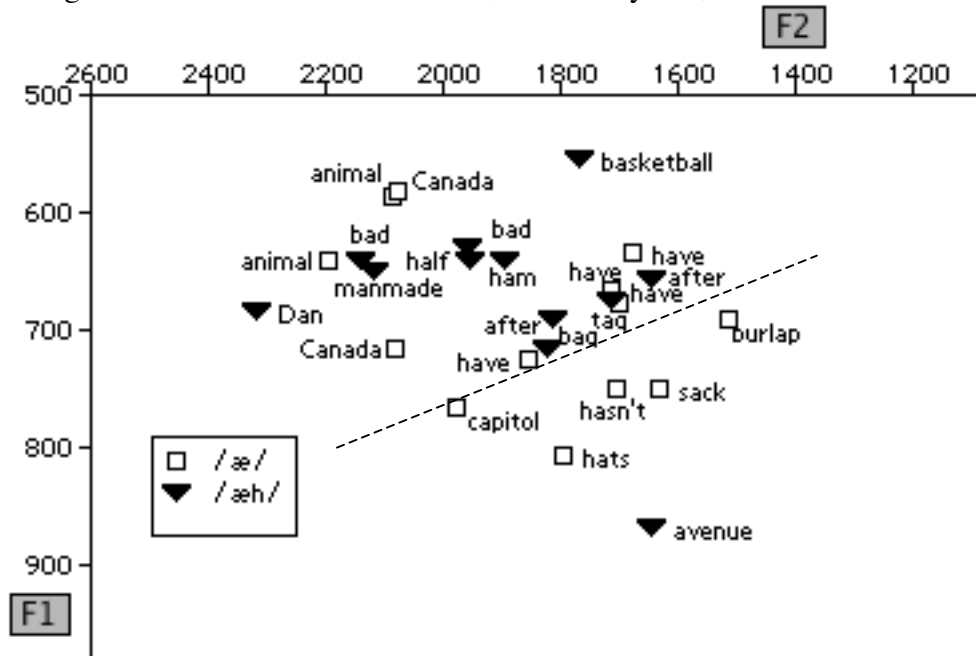
Anyone familiar with the sound of the New York City system will recognize Albany as a close relative. The back vowel /oh/ in *law* and *coffee* is not only raised to

¹⁵ John E, was an engineer in a local Albany firm. He was 46 years old when interviewed in 1995.

upper mid back position, but also shows the type of rounding (“pursing”) that is specific to New York City. The tensed short *a* has an extremely front nucleus which rises to upper mid and lower high position. As in New York, rounding affects the complex configuration of voiced stops, voiceless fricatives and front nasals. However, a close examination of the specifics of the Albany system shows some marked departures from NYC.

In Figure 8, the division into solid triangles and empty squares represents the New York City system, so that empty squares in the upper left region and solid triangles in the lower right are deviations from the NYC system. The dashed line indicates the division between the areas that are perceptually tense and perceptually lax. Two tokens each of *Canada* and *animal* in the tense area indicate the absence of the open syllable constraint. Three tokens of the auxiliaries *have* are clustered in the lower part of the tense area, along with *after*, registering the absence of the function word constraint. The word *avenue*, which normally has a tense vowel in NYC, is lax here. Albany has a complex allophonic distribution.

The diffusion northward of the short-*a* system represents a transportation of the phonetic basis for the NYC split, but not the split itself. The opposition of closed versus open syllables is lost, and with it, the grammatical opposition between tense *planning* and lax *planet*. What remains is the separation of the tokens into a bimodal distribution determined by the unusual phonetic constraints that are found in NYC—voiced stops and voiceless fricatives.

Figure 8. Short-*a* tokens of John E., 46. Albany NY, TS 353

Diffusion to Cincinnati

The city now known as Cincinnati was first settled in 1787, when Congress opened to settlement the land between the Allegheny Mountains and the Mississippi River.¹⁶ Benjamin Stites was a native of Scotch Plains, not far from the town of North Plainfield. He first became acquainted with the Cincinnati region during the French and Indian wars, and conveyed his enthusiasm for settlement to John Cleves Symmes, a native New Yorker who moved to New Jersey at the age of 28, became a New Jersey congressman and like Stites, fought in the Revolutionary War. Symmes and associates purchased 330,000 acres between the Great Miami and Little Miami Rivers. Shortly afterwards, a party of 26 settlers headed by Stites arrived.¹⁷ His children Benjamin Jr., Elijah and Hezekiah were all prominent in the early history of the area; Benjamin Jr.'s wife is said to have been the first white woman in Cincinnati. This initial settlement grew rapidly. Following the Principle of First Effective Settlement (Zelinsky 1993) it is likely that the original English dialect of Cincinnati was based on the speech of residents of New York and neighboring regions of New Jersey.

¹⁶ Further information on the settlement of Cincinnati can be drawn from a number of internet sites:

<http://library.cincymuseum.org/cinfaq7menu.htm>

<http://www.ohiohistorycentral.org/ohc/history/path/people/symmesjc.shtml>

<http://www.rootsweb.com/~njmorris/passaicvalley/stites.htm>

¹⁷ Stites named the city Losantiville; in 1790, two years later, it was renamed Cincinnati.

The Telsur survey included three speakers from Cincinnati. In addition to the four Telsur speakers interviewed in Cincinnati, Boberg and Strassel interviewed 15 more, and analyzed their short-*a* pattern in some detail (Boberg and Strassel 2000, ANAE Chapter 19). While other Midland cities show either a nasal system or a continuous pattern of raising, the traditional Cincinnati system closely resembles that of NYC, with a tense class of short-*a* before nasals, voiced stops and voiceless fricatives and a residual lax class. While the Mid-Atlantic region of Baltimore, Wilmington and Philadelphia limits tensing before voiced stops to only three words—*mad, bad, glad*—Cincinnati has tensing before all voiced stops except /*g*/. While the Mid-Atlantic region limits tensing to codas with front voiceless fricatives, Cincinnati resembles NYC in tensing *cash, ash, hashbrowns*. It should also be noted that the five oldest Cincinnati subjects interviewed by Boberg and Strassel had uniform tensing before voiced fricatives, an environment that is variable in NYC.¹⁸

We also find in Cincinnati the same type of deviations from the NYC pattern as in North Plainfield and Albany. It is that the open syllable constraint is missing: The Telsur subjects show tense *Catholic, passive, fascinated, davenport, Canada, Spanish, cabin, family*.¹⁹ In addition, the function word *and* is found in the tense group, reflecting this loss of this grammatical constraint.

It is not clear whether the resemblance between the Cincinnati and NYC short-*a* patterns is based on the original settlement from the NY/northern New Jersey area or is a later development. The earliest account we have of the NYC system is Babbitt 1896. If the short-*a* split is based on the British broad-*a* split, as Ferguson 1975 first suggested, the NYC system may date from the end of the 18th century, when the first settlers left for the Cincinnati region. If the NYC system does date back to that period, it is also possible that it had already diffused to New Jersey, and that the Cincinnati settlers transported the type of weakened system shown by the North Plainfield speakers today.

On the other hand, the pattern may have been transmitted in the 19th century, when the two cities were industrial rivals.

Cincinnati was the largest manufacturing center in the West in the 1860s and ranked third nationally, behind New York and Philadelphia. The city's factories produced a wide variety of goods, but by mid-19th century four types of manufacturing had emerged as undisputed major enterprises: pork packing, garment making, metalworking and furniture building.

--Cincinnati History Museum, EarlySettlementgallerygui 2.pdf

¹⁸The larger sample interviewed by Boberg and Strassel indicates that Cincinnati is retreating from the traditional short-*a* system. The speakers they interviewed over 50 years of age were completely consistent; those from 31 to 50 years old were consistent only before nasal consonants; otherwise, short-*a* was tense before the other tensing environments only 60% of the time. Speakers under 30 years of age showed tensing in the non-nasal environments only 25% of the time. Cincinnati then follows the general shift of Midland short-*a* towards the nasal system, in which tensing takes place before all nasals and only before nasals

¹⁹Boberg and Strassel report tensing before voiced fricatives as well, which as noted above are variable in NYC. Only one token in Lucy M.'s system bears on this—*davenport*.

It is also possible that the Cincinnati pattern was an independent development in the nineteenth century. The existence of an industrial rivalry does not guarantee an intimate exchange between the two communities.

The next case will show a resemblance to New York City in a broader range of phonetic phenomena, and more evidence of commercial relationships that led to intimate social intercourse with New York City.

Diffusion to New Orleans

Though the city of New Orleans is located in the southern United States, it has long been recognized that its dialect does not show the configuration of other cities in the Southern States. The *Atlas of North American English* defines the South by the monophthongization of /ay/ before voiced obstruents, the initiating stage of the Southern Shift. Such monophthongization is found only marginally in New Orleans. There is no trace of the 2nd and 3rd stages of the Southern Shift, which involve the reversal of the relative positions of the short vowels and front upgliding vowels. New Orleans does fall within the larger Southeastern super-region, characterized by the fronting of /ow/ and resistance to the low back merger (ANAE: Map 11.11).

Many observers have noted a resemblance between the speech of New Orleans and that of New York City. For example,

There is a New Orleans city accent. . . associated with downtown New Orleans, particularly with the German and Irish Third Ward, that is hard to distinguish from the accent of Hoboken, Jersey City, and Astoria, Long Island, where the Al Smith inflection, extinct in Manhattan, has taken refuge.

-A. J. Liebling, *The Earl of Louisiana* (NY: Simon and Schuster, 1961)

Like most public observations of city dialects, Liebling is wide of the mark in attributing the accents of both cities to geographic sub-divisions, and wrong in thinking that the similarity of dialects is due to similar immigration patterns. But the perception of similarity is based on reality. It is well known that New Orleans has the palatalized form of the *r*-less mid central vowel [əɪ] in *work*, *thirty*, etc that forms the main stereotype of older New York City speech,²⁰ This is also characteristic of a large area of South Carolina and eastern Georgia (Kurath and McDavid 1961). However, New Orleans displays another feature that is not found anywhere else in the South: the raising of /oh/ in *law*, *cost*, *hawk*, etc. to mid back and lower high position. Outside of New Orleans, raised /oh/ of this type is found only in a continuous belt of cities from southwestern Connecticut to New York, Philadelphia and Baltimore.

When we turn to the short-*a* system, the parallels between New Orleans and New York City are even more striking. Figure 9 displays the short-*a* distribution of Sybil P., a 69-year-old resident of New Orleans, interviewed in 1996.²¹ Again, the solid triangles and empty squares superimpose the NYC system on the New Orleans system, so that similarities and differences are immediately visible. Three black

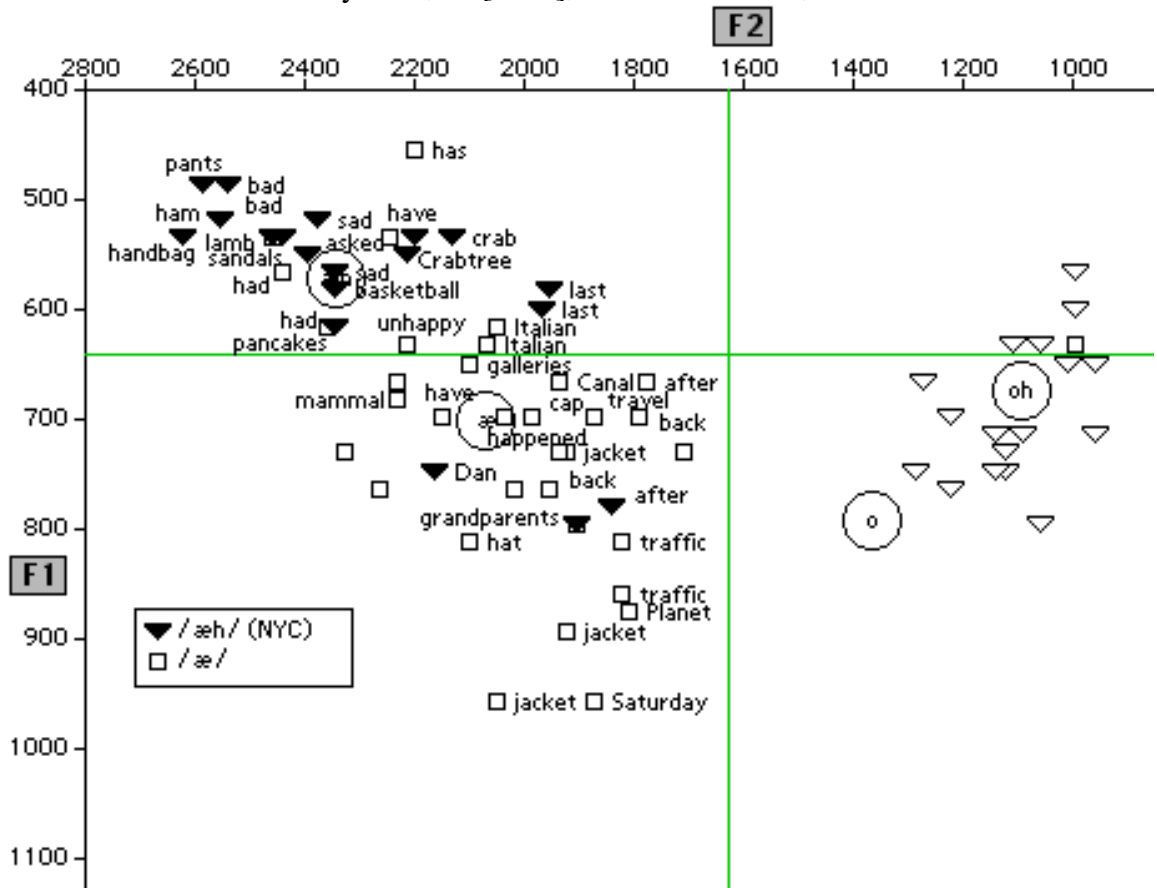
²⁰ Labov 1966 reports that this stigmatized *r*-less feature was rapidly disappearing among younger speakers. However, close attention to the *r*-colored form used by New Yorkers shows a continuing trace of palatalization.

²¹ Sybil P. was of German/Italian background, and had worked as a secretary in a bank.

triangles appear in the lax distribution: *Dan, grandparents, after*.²² In the tense distribution we find short-*a* before nasals, voiced stops /b/ and /d/ (*bad, sad, crab, Crabtree*), and voiceless fricatives (*asked, basketball, last*). The general rule excluding function words is absent: *has, have* and *had* are all tense. This also suggests that as in Cincinnati, the distribution has been generalized to include voiced fricatives /z/ and /v/. On the other hand, the constraint against tensing in open syllables is present here, as shown in lax *mammal, planet, travel, traffic*.

Figure 9 also shows the clear separation of /o/ and /oh/ in the New Orleans system, clearly differentiated from the general Southern system in which the nuclei of /o/ and /oh/ are in identical positions, and /oh/ is differentiated by a back upglide. The mean F1 of /oh/ is 677 Hz, comparable to the raised /oh/ of the Mid-Atlantic States, defined by the criterion F1(oh) < 700.

Figure 9. Short-*a* distribution of Sybil P., 69 [1996], New Orleans LA, TS611



²² Like many such abbreviations, *Dan* can be assigned the tense/lax status of the full form *Daniel*; the glide /y/ only variably closes the syllable in NYC, as in *spaniel, annual*. With an initial *gr-* and two following syllables, *grandparents* is frequently lower than all other tense vowels, *After* is exceptionally tense in NYC; in New Orleans, it follows the general rule of lax realization of word-initial /æ/ in polysyllables.

A younger New Orleans speaker studied by Telsur is Elizabeth G, who was 38 years old when interviewed in 1996.²³ Again, the distribution of tense vowels matches the NYC system, including short-*a* before nasals, voiced stops (*dad, bad, sad, grabbing*) and voiceless fricatives (*ask, grass, glass, master, past*). Again the class of function words is tense, and not lax (*have*). The status of the open syllable constraint is severely weakened. The word *internationally* is clearly tense, and *ceramic* is in an intermediate position. On the other hand, *Canada* and *catholic* are clearly in the lax set.

As a further example of the weakness of the open syllable constraint in New Orleans, one may consider the speech of Dr. John (Mac Rebennack), a prominent representative of New Orleans musical tradition who grew up in the Third Ward of the city at mid-century. In a broadcast of March 16, 2005, Dr. John showed the following pattern of tense and lax short-*a*.²⁴

Tense [closed syllable]	<i>answer, fancy, hand, bad, dad</i>
Tense [open syllable]	<i>piano (2), classical, daddy, fascinate [2], Manny</i>
Lax [closed syllable]	<i>that, cats, fact, that's, at</i>
Lax [open syllable]	<i>Allen</i>

Dr. John's tensing pattern includes nasals, voiced stops and voiceless fricatives, as in New York City, but open syllable words are treated in the same way as closed syllables.

As in Cincinnati, the local pattern is receding. Two other New Orleans speakers analyzed acoustically are 38 and 44 years old; both show the nasal short-*a* system, as in other Louisiana cities, Shreveport and Baton Rouge

The history of New Orleans points to a clear and remarkable connection with New York City. While Cincinnati was an industrial rival of New York in the middle of the 19th century, the city of New Orleans had intimate and complementary relations, as the port of shipment for the cotton trade financed by New York bankers.

From 1803 until 1861, New Orleans' population increased from 8,000 to nearly 170,000. . . By 1830, New Orleans was America's third largest city, behind New York and Baltimore. . . During the Pre-Civil War period, a scarcity of capital in New Orleans forced seekers of large-scale investment to look to New York, London, or Paris.

--McNabb and Madero, *A History of New Orleans*

Berger 1980 summarizes the evidence for close relations between New Orleans and NYC in the middle of the 19th century.

In the ante-bellum period, roughly between 1820 and 1860, financial, commercial and social relations between the city and the

²³ Elizabeth G. was a teacher, of French/Irish/German background.

²⁴ This broadcast is currently available at

<http://www.amroutes.com/programs/shows/20050316.html>

South were at fever pitch: New York banks underwrote the plantation economy, cotton was shipped routinely from New Orleans, Charleston, Savannah and Mobile to be trans-shipped to England, and Southern planters regularly combined business with pleasure in the Big Apple of the 1800s.

Berger cites Foner's judgment as to the predominance of New York City in New Orleans:

"...down to the outbreak of the Civil War, New York dominated every single phase of the cotton trade from plantation to market" (Foner 1941).

Berger's purpose was to buttress the case that the NYC palatalized mid-central vowel is derived from New Orleans, the opposite direction of influence than the one proposed here for the short-*a* pattern.²⁵ The gravity model and the historical facts both argue for a greater direction of influence from the larger city. We find many descriptions of commercial and social relations between New Orleans and New York in the five-volume history of *The Older Merchants of New York City* by John Scoville (1885), but the typical pattern involves movement of New Yorkers to New Orleans. Thus in the description of the prominent Seixas merchant clan, founded by Benjmain Seixas in 1780, we read: "Madison [Seixas] is in New Orleans, and a partner in the large firm of Glidden and Seixas." (Vol II, p. 127)²⁶

In histories of New Orleans, New York City bulks large. Korn's history of *The Early Jews of New Orleans* deals with social and business relations from 1718 to 1812. References to New York City are found on 55 pages, more than any other city.²⁷

The detailed linguistic resemblances between New York City and New Orleans then involve the two pivot points that have been found to determine the main directions of development of North American dialects: the status of short-*o* and the status of short-*a*. As in New York, the New Orleans raised /oh/ insures the separate status of short-*o*. As in New York, New Orleans divides short-*a* into two classes, separating tense vowels before front nasals, voiced stops and fricatives in closed syllables from voiceless stops and liquids. The two systems differ in the absence of grammatical conditioning on the split of short-*a* in New Orleans.

In these four cases of diffusion of the NYC short-*a* pattern, phonetic conditioning by the following segment is the common thread. The voiced velars are excepted from the voiced stops, and tensing before voiceless fricatives is sometimes generalized to voiced fricatives. The closed syllable constraint is lost, and with it the

²⁵Both directions are of course possible, and it is plausible that palatalization of *work*, *third*, etc. is derived from the South, as PEAS shows that it is widely used in several Southern areas

²⁶Among the bankers closely related to New Orleans were many representatives of the large Sephardic Jewish families. Scoville underlines the importance of the Jews in many places: The Israelite merchants were few then [1790], but now? they have increased in this city beyond any comparison. There are 80,000 Israelites in the city. It is the high standard of excellence of the old Israelite merchants of 1800 that has made this race occupy the proud position it does now in this city"

²⁷ Korn's book refers to Charleston on 43 pages, Savannah 5, Boston 6.

closing of the syllable by inflectional boundaries, and the general laxing of function words is abandoned as well. The end result may be that more vowels are tensed as the only the most superficial aspects of the short-*a* tensing are transmitted.

Transmission of Optimality constraints

Variable ordering of optimality constraints provides an economical and perspicuous way of relating the various short-*a* tensing systems. The following constraints on the tensing of short-*a* appear to be available to North American English dialects. Tense short-*a* is here represented as /æh/, indicating that members of the historical /æ/ class are shifted into the long and ingliding sub-system along with /ah/ in *father* and /oh/ in *law*. The constraints take one of two forms: inhibiting a tense form in a given environment (*æh. . .) or inhibiting a lax form (*æ...).

- *æh[+voc]: no tensing before resonants (*pal, carry*)
- *æh[-cont,-voi]: no tensing before voiceless stops (*cap, bat, back*)
- *æ#: no laxing before Class 2 inflectional boundaries (*manning, passes*)
- *æh.: no tensing before syllable boundaries (*manner, castle*)
- *æ[+cont,-voi]: no laxing before voiceless fricatives (*pass, cash, half*)
- *æh[+G]: no tensing in function words (*can, am, an, had, has*)
- *æ[-cont,+voi]: no laxing before voiced stops (*cab, bad, bag*)
- *æh[+vel]: no tensing before velars (*bag, bang*)
- *æ[+nas]: no laxing before nasals (*ham, man, bang*)
- *æh: No tensing
- *æ: No laxing.

In the Inland North, the last constraint dominates and obviates all others, although their effects may be echoed in the phonetic differentiation of the tense forms. In the the nasal system, widespread in New England, the Midland and the West, the *æ[+nas] constraint dominates all others, followed by the general constraint against tensing *æh. The New York City system will be generated by the following tableau (1):

(1) Short-*a* system of NYC

		*æh [+cont]	*æh [-cont, -voi]	*æ#	*æh.	*æh [+G]	*æ [+cont, -voi]	*æ [-cont ,+voi]	*æh [+vel]	*æ [+nas]
	bæht		*!							
☞	bæt									
	bæhk		*!						*	
☞	bæk									
	kæhn									
☞	kæn									*
	kæhn [aux]					*!				
☞	kæn [aux]									*
	mæh.nər				*!					
☞	mæ.nər									*
	mæh.n#ing				*					
☞	mæ.n#ing		*!							*
	hæhd					*!				
☞	hæd							*		
	pæhs									
☞	pæs							*!		
	kæhʃ								*	
☞	kæʃ							*!		
	fæh.ʃən				*!					
☞	fæ.ʃən							*	*	
	bæhg								*	
☞	bæg						*!			
	bæhng								*!	
☞	bæng									*
	pæhl	*!								
☞	pæl									

The highest ranking constraints exclude any tensing before resonants or voiceless stops: this is an invariant feature of the NYC system. The next three register grammatical and structural constraints on tensing. The closing of the syllable by inflectional boundaries is ranked higher than the open syllable constraint, yielding tense *mann*ing, *pass*ing as against *manner*, *passive*. The function word constraint is not crucially ordered in respect to these two, but it is ranked higher than the constraint against lax vowels before voiced stops, since NYC has lax *had*. The lowest ranked constraints are crucially ordered to yield tense *bag* but lax *bang*. Despite the fact that a following nasal is the strongest factor in tensing /æ/, the constraint against lax vowels before nasals is the lowest ranked in the series: *æh. and *æh[+G] both stand in the way of tensing before nasals in open syllables and function words.

The following tableau (2) shows the North Plainfield system, focusing on only those elements that differ from NYC. The constraint against lax vowels before nasals is here raised to dominate the function word constraint. The constraint against tense vowels before velars is also raised to one rank higher than that which forbids lax vowels before voiced stops.

(2) Vowel system of Northern New Jersey outside of the NYC core

	*æh [+cont]	*æh [-cont -voi]	*æ#	*æh.	*æ [+nas]	*æh [+G]	*æ [+cont -voi]	*æh [+vel]	*æ [-cont +voi]
☞ kæhn									
kæn					*!				
☞ kæhn [aux]						*			
kæn [aux]					*!				
☞ hæhd						*!			
☞ hæd									*
mæh.nør				*!					
☞ mæ.nør					*				
☞ mæh.n#ing				*!					
mæ.n#ing			*!		*				
☞ fæh.šøn				*!					
☞ fæ.šøn							*		
bæhg								*!	
☞ bæg									*
☞ bæhng								*	
bæng					*!				

Tableau (3) shows the re-ranking of constraints that will produce the younger New Orleans version of the NYC system. The open syllable constraint is shifted downward so that it is dominated by both the constraint against lax nasals and lax voiceless

(3) Short-a system of New Orleans

	*æh [+cont]	*æh [-cont -voi]	*æ#	*V [+nas]	*æ [+cont -voi]	*æh.	*æh [+vel]	*æ [-cont +voi]	*æh [+G]
☞ kæhn									
kæn				*!					
☞ kæhn [aux]									*
kæn [aux]				*!					
☞ hæhd [aux]									*
☞ hæd [aux]								*!	
☞ mæh.nør						*			
mæ.nør				*!					
☞ mæh.n#ing						*!			
mæ.n#ing			*!	*					
☞ fæh.šøn						*!			
☞ fæ.šøn					*				
bæhg								*!	
☞ bæg									*
☞ bæhng							*		
bæng				*!					

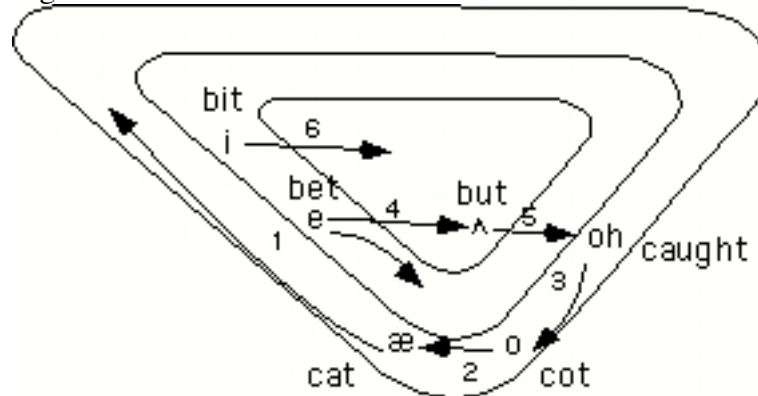
fricatives, so that *manner* and *fashion* are both tense. The function constraint is now last ranked, below the constraint against a lax vowel before voiced stops, so that the auxiliary *had* is tense as well as *can*.

The downward shift in the ranking of the grammatical and open syllable constraints can be viewed in two ways. The net result of these changes is that more forms are tensed—the scope of the tensing process increases. This may represent a recognition of greater relative importance of the influence of a following nasal. However, a more plausible interpretation of tableaux 1-3 is that the language learners do not recognize the way in which the grammatical and syllabic constraints operate in the system they are borrowing from. To put it another way, the more concrete phonetic effects are more salient than the more abstract structural effects. This is consistent with the proposition that the main agents in language contacts are adults.

Diffusion of the Northern Cities Shift

The Northern Cities Shift [NCS] is the rotation of six vowels shown in Figure 10. The first five stages of the shift follow the logic of chain shifting. The NCS was triggered by the general tensing and raising of all short-*a* words to mid and high position. The absence of vowel tokens in low front position led to a shift of the short-*o* class space: short-*o* shifted frontward and short-*e* shifted downward. This is followed by the fronting of short-*o* and the lowering of long open-*o*. Short-*e* is then lowered and backed, and wedge moves back to the position formerly occupied by long open-*o*.

Figure 10. The Northern Cities Shift



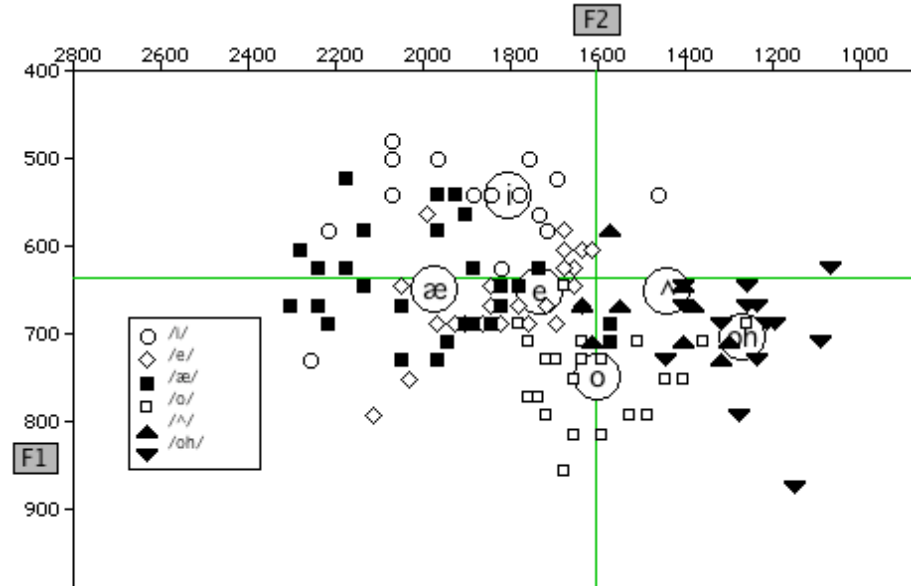
The NCS develops incrementally in all cities of the Inland North, including Syracuse, Rochester, Buffalo, Cleveland, Toledo, Detroit, Flint, Grand Rapids, Kalamazoo, Gary, Chicago, Kenosha, Milwaukee and Madison. These cities were the products of a steady westward settlement from New England, in which the original patterns of the Yankee cultural hearth were preserved and strongly reinforced. The Eastern New England folkways characterized by Fisher placed a strong emphasis on the building of cities were differentiated from other cultural streams by high persistence of the population (75-95%) and low internal migration (1989: 814-15)

The uniform development of the NCS throughout the Inland North appears to be the result of the continuation of this pattern, in which entire communities were shifted westward (Frazer 1993, Carnes and Garraty 1996, Labov 2004). We can attribute the uniformity of the phonology of the Inland North to the continuity of transmission within the family over the past century and a half, in which sound changes are steadily incremented by child language learners.

The extraordinary uniformity of the vowel systems in cities of the Inland North may be contrasted with the wide variety of systems found in the Midland. Widely different patterns and directions of change are to be found in Philadelphia, Pittsburgh, Columbus, Cincinnati, Indianapolis and St. Louis (ANAE Ch. 19). This linguistic heterogeneity may be correlated with the westward migration of a cultural pattern that contrasts with the Yankee pattern just described. The Quaker settlers moving westward from Philadelphia placed a strong emphasis on the creation of farm communities, while the other component of Midland settlement—the back country population of the Upland South—created even smaller units of isolated households. Quaker populations showed moderate persistence (40-60%) and Upland South even lower (25-40%).

The linguistic boundary separating the NCS of the Inland North from Midland vowel patterns is the sharpest division in North American phonology. However, the city of St. Louis, located squarely in Midland territory, has recently developed many of the elements of the NCS. St. Louis has long been known to display a mixture of Northern, Midland, and Southern features (Murray 200?) but recent decades have witnessed a strong shift to Northern phonology. The most characteristic St. Louis merger of /ahr/ and /ɔhr/ in *are* and *or*, *card* and *cord*, *barn* and *born* has all but disappeared among younger speakers, who display instead the general merger of *or* and *ore*, *cord* and *cored*, etc. Figure 17 shows the typical modern St. Louis vowel system, for a 35-year-old man, of mostly German ethnic background, interviewed in 1994. One can observe the general raising of /æ/ to lower mid and upper mid, so that there are no tokens in low front position. The consequent fronting of /o/ is evident: over half of the tokens are front of the midline at 1600 Hz. We also see the backing of /e/, so that F2 of /e/ and /o/ are separated by less than 200 Hz. Some backing of /ʌ/ can be seen as well. The class of /oh/ is still in mid-back position; lowering is found only a few tokens.

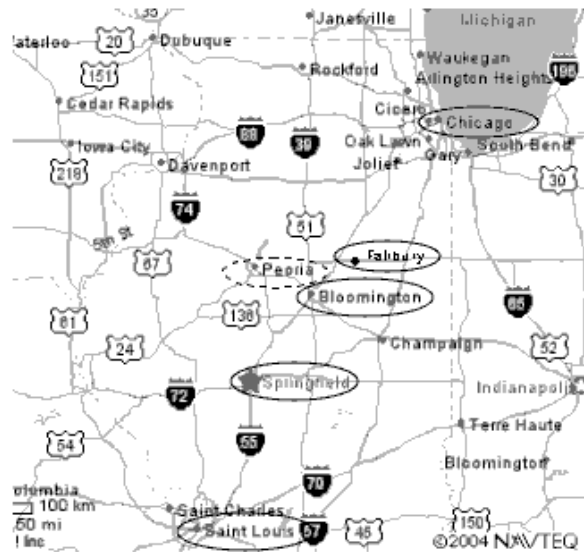
Figure 11. Northern Cities Shift in the vowel system of Martin H., 35 [1994], St. Louis MO, TS111.



The development of the NCS in St. Louis cannot be considered a local phenomenon, independent of the chain shift dominating the Inland North. All relevant ANAE maps show diffusion along a narrow corridor extending from Chicago to St. Louis along Route I-55 (Figure 12). The ANAE data for this corridor is based on speakers from three cities along the interstate highway (Fairbury, Bloomington, Springfield), along with four speakers from St. Louis. The city of Peoria is not far from I-55, but it is not on the direct route.

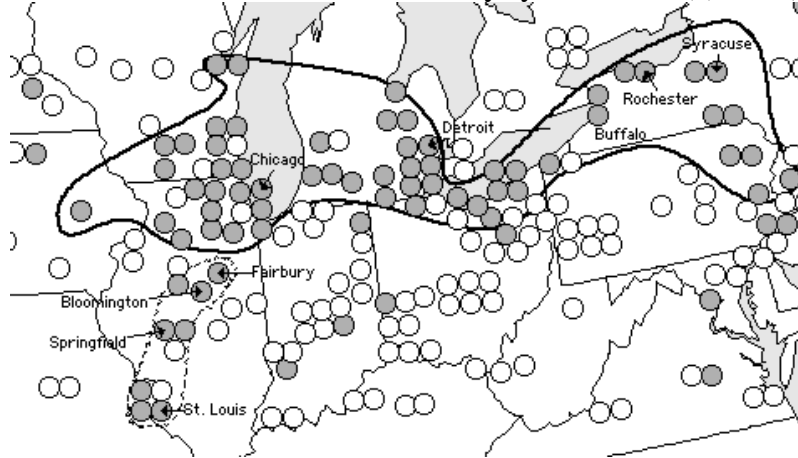
Linguistic diffusion of the NCS along this corridor will be the topic of this section.

Figure 12. The corridor along Route I-55 from St. Louis to Chicago



Since the NCS is a complex rotation of vowels, the measurement of any one vowel tells us little about the progress of the shift. ANAE developed three structural relations among NCS vowels in order to map the distribution of the chain shift. The ED criterion measures the extent to which the backing of /e/ is accompanied with the fronting of /o/. For most North American dialects, /e/ is a front vowel and /o/ is a back vowel, with an F2 difference of about 1000 Hz. For those speakers most fully engaged in the NCS, /e/ is almost aligned with /o/ along the front-back dimension, with F2 differences of less than 375 Hz. The Inland North—the region defined by the shift—is most clearly delineated by the ED criterion. As Figure 13 shows, 67 of the 77 speakers within the isogloss show this trait, a homogeneity of .85. A similar proportion St. Louis corridor do so—six out of nine—and one speaker just outside the corridor, in Peoria.

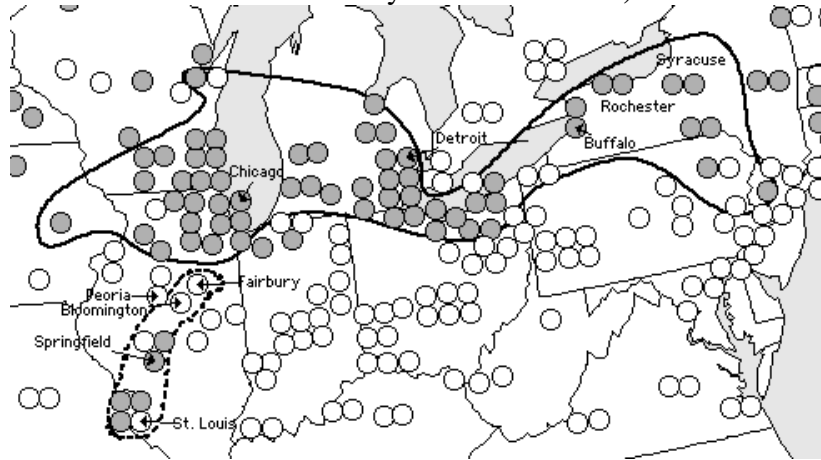
Figure 13. The ED measure of the advance of the Northern Cities Shift: in the Inland North and the St. Louis corridor Grey symbols = $F2(e) - F2(o) < 375$ Hz.



A second measure even more clearly how the St. Louis corridor clearly differentiated from its Midland neighbors. Figure 14 maps the UD measure of the relative backness of /ʌ/ and /o/. Grey symbols mark all speakers for whom /ʌ/ is further back than /o/. Of all measures of the progress of the NCS, this yields the sharpest differentiation between the Inland North and the Midland. There no grey symbol in the Midland outside of the St. Louis corridors. Homogeneity of this UD measure within the Inland North is even greater than for ED: .90. If we consider the predominance of the UD measure in the more narrowly defined Inland North—as shown by the solid black isogloss, representing the consensus of defining features—homogeneity rises to .95 (53 out of 56). Only five out of the nine grey in the St. Louis corridor are marked.²⁸

²⁸ The difference in homogeneity between the St. Louis corridor and the Inland North is significant at the .0001 level, with Yates' correction for small numbers.

Figure 14. The UD measure of the advance of the Northern Cities Shift in the Inland North and the St. Louis corridor [grey symbols =UD measure: $F2(\Lambda) < F2(o)$. Solid isogloss = the Inland North as defined by the ED measure.].



Figures 13 and 14 clearly illustrate the diffusion of the NCS along I-55 from Chicago to St. Louis. However, the NCS along this corridor is not the same linguistic phenomenon as in the Inland North itself; there is reason to believe that the central chain shift mechanism, triggered by the general raising of short-*o*, is not driving the shift in the St. Louis corridor.

Figure 15 is a map of the same region displaying speakers for whom the NCS is complete—who show all relevant criteria. In addition to the ED and UD criteria, we have:

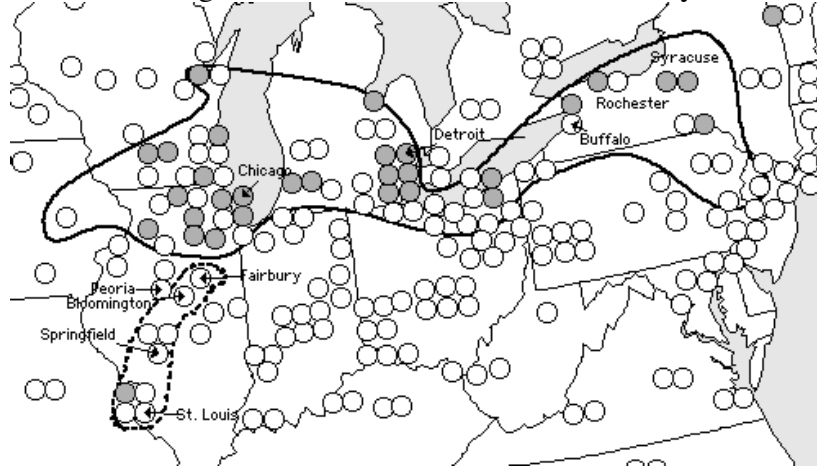
AE1: general raising of /æ/ in non-nasal environments, $F1(\text{æ}) < 700$ Hz.

O2: fronting of /o/ to center, $F2(o) < 1500$ Hz.

EQ: The reversal of the relative height and fronting of /e/ and /æ/: $F1(e) > F1(\text{æ})$ and $F2(e) < F2(\text{æ})$

As Figure 15 shows, this full version of the NCS is particularly characteristic of the largest cities: Detroit, Rochester, Syracuse, Chicago (but not Cleveland). On the other hand, the St. Louis corridor shows only one such speaker: Martin H. of Figure 11.

Figure 15. Speakers who show all criteria of the Northern Cities Shift: AE1, O2, EQ, ED and UD. Solid isogloss = the Inland North as defined by the ED measure.



The other eight St. Louis speakers in the St. Louis corridor show an approximation to the NCS rather than the consistent pattern of Figure 14. Five speakers in the corridor meet the AE1 criterion; but only two are marked for O2, and only 1 for EQ. The inference to be drawn from Figure 15 is that the new vowel patterns of St. Louis are not structural consequence of the general raising of short-*a*, but rather the borrowing of individual elements of the NCS from the Inland North region centered on Chicago.

The geographic distribution of the various stages of the NCS in the Inland North and the St. Louis corridor, has shown that there is much more variation in the corridor. The speakers St. Louis are generally in advance of the speakers in the smaller cities along Route I-55. This would not seem much different from the view of diffusion obtained in the Brunlanes peninsula by Trudgill (1974). In the cascade model, the change moves from the largest city to the next larger, and so on down, rather than moving steadily across the geographic landscape in the contagion model (Bailey et al. 1993). But the St. Louis corridor—including St. Louis—is marked by irregularity in both structure and age distribution.

To the extent that the NCS is the result of the incrementation of sound changes by successive generations of children, we should see a clear relationship between age and the advancement of the shift. The ANAE study of the NCS in the Inland North as a whole shows significant age coefficients at the .01 level for the raising of /æ/, the fronting of /o/, the backing of /e/ and the backing of /ʌ/ (Labov, Ash & Boberg 2005: Ch. 14). To make a close comparison with the nine subjects of the St. Louis corridor, nine speakers from northern Illinois, within the Inland North, are selected in Table 1. A check mark displays whether each speaker satisfies the criterion for the four systematic measures of the NCS displayed in Figures 17-20 (AE1, EQ, ED, UD) and O2, the fronting of /o/. It is apparent that the shift is more advanced in Northern Illinois, but the crucial question is its trajectory in apparent time. Each speaker is ranked for degree of advancement within its region by the number of criteria satisfied and this ranking is then correlated with the age of the speaker. While the speakers from Northern Illinois show a sizable *r*-correlation of .74 with age, a small negative correlation of -0.21 appears for the St. Louis corridor. A

significant regression coefficient for age on ranking of .08 is found for Northern Illinois, indicating that a difference of 50 years between two speakers would project an to a shift of 4 units in the rankings. No significant regression coefficient is found for th St. Louis corridor.

This result indicates that the advancement of the NCS in the St. Louis corridor is not the result of incrementation by children within the speech community but rather the result of the influence of the Inland North pattern on adults. The conversion of the St. Louis system to that of the Inland North may eventually lead to the participation of young children in the process and further incrementation within the community, but the present situation seems to reflect a slower and less regular shift among adults.

Table 1. Stages of the Northern Cities Shift found in nine speakers of Northern Illinois and nine speakers in the St. Louis corridor, with ages, rank ordering and correlation of age with rank.

Northern Illinois	AE1	O2	EQ	ED	UD	Age	Rank
Sterling IL	✓	✓	✓	✓	✓	34	1
Elgin IL SS	✓	✓	✓	✓	✓	19	1
Elgin IL RS	✓	✓	✓	✓	✓	42	1
Joliet IL	✓	✓	✓	✓	✓	30	1
Rockford JG		✓	✓	✓	✓	37	2
Belvidere IL	✓		✓	✓	✓	33	2
Hammond IN	✓	✓	✓			45	3
Rockford IL VS	✓				✓	65	4
Lena IL	✓					47	5
r-correlation							0.741
age coefficient							.08*
St. Louis Corridor							
St. Louis MH	✓	✓	✓	✓	✓	48	1
St. Louis JH2	✓	✓		✓	✓	57	2
Springfield AK	✓			✓	✓	60	3
Fairbury IL	✓			✓		25	4
Bloomington	✓			✓		27	4
Springfield KR				✓		32	5
Springfield WK					✓	67	5
St. Louis JH					✓	53	5
St. Louis RM				✓		38	5
r-correlation							-0.21
age coefficient							n.s.

Diffusion of the NCS structure.

Though Optimality Theory proved useful in examining the diffusion of the NYC tensing system to other dialects, it is not easily adapted to the analysis of

diachronic style shifts especially those which involve a complete rotation, like the NCS (see MacMahon 2002). The structural relations that might have been transmitted across the St. Louis corridor can be seen in the schema (4) below, abstracted from Figure 10. This follows the lead of Chomsky and Halle 1968 in reducing the trinary relation of high-mid-low to \pm high, \pm low. The same procedure is extended to the front/back relationship, recognizing the existence of the central position at which /e/ and /o/ converge.²⁹ The schema of (4) shows the NCS as a shift from the initial position common to most North American dialects to a rotated system in which each of five vowels now bears a different relation to others in phonological space. This is the type of structural shift that would have to be transmitted to speakers of the St. Louis dialect if they could be said to have borrowed the Northern Cities Shift as it is realized in the Inland North.

One example of how the NCS is realized in St. Louis is given as (5), the structural shifts evident in the vowel system of RM, the last speaker in Table 1. Instead of a general movement of /æ/ to mid position, Rose M. shows a split between pre-nasal vowels and all others: only the allophone /æN/ moves to mid front position. /e/ moves back, as in (4), but /ʌ/ does not, and as a result, there is considerable overlap between /e/ and /ʌ/. Though there is a slight phonetic shift forward of /o/, the mean remains well to the back of center, and the margin of security between /o/ and the main body of /æ/ tokens remains quite large.

The diffusion of the NCS to this particular speaker is reflected in the acquisition of one of the five sound shifts involved: the backing of /e/. This is not a general characterization of what St. Louis speakers do. There is a great variety of selection from the NCS pattern, as opposed to the relatively uniform rotation found in the Inland North.

(4) The Northern Cities Shift as a structural rotation

	+front -back	-front -back	-front +back		+front -back	-front -back	-front +back
+high, -low				=>			
-high, -low	e	^	oh		æ	e	^
-high, +low	æ		o			o	oh

(5) Elements of the Northern Cities Shift in the system of Rose M., St. Louis

	+front -back	-front -back	-front +back		+front -back	-front -back	-front +back
+high, -low				=>			
-high, -low	e	^	oh		æN	e, ^	oh
-high, +low	æ		o			æ	o

²⁹ The higher level distinction that is variably realized as peripherality, tenseness or length, is not shown here, though it is a crucial part of the mechanism of the NCS.

Linguistic diffusion as an adult-driven process

In the spread of NYC short-*a* system and the Northern Cities Chain Shift, we observe the factors that differentiate the diffusion of linguistic change across communities from the transmission of sound change within the speech community. At the outset, it was argued that change from below is driven by the continuous process of incrementation by children, who acquire and develop linguistic structures with the speed, accuracy and faithfulness of first language learners. Contact across communities is primarily through adults. As summarized in the first section, recent studies of language change across the lifespan show us that adults are capable of changing their language, but at a much slower rate than children. And transmission across adults is relatively coarse: it loses much of the fine structure of the linguistic system being transmitted.

How then can we account for the remarkable uniformity of the NCS across the Inland North? The history of this settlement area indicates that it is not the result of adult diffusion but rather the migration of whole communities westward, in which entire cohorts of children, parents, kin and communal groups moved together. In his history of the westward migration, Richard Lyle Power points out that

Mass migrations were indeed congenial to the Puritan tradition. Whole parishes, parson and all, had sometimes migrated from Old England. Lois Kimball Mathews mentioned 22 colonies in Illinois alone, all of which originated in New England or in New York, most of them planted between 1830 and 1840 (Power 1953: 14).

The Yankee migration to the Inland North continued the cultural pattern of New England settlement described by David Hackett Fischer (1989) as a largely urban movement with a stronger emphasis on the nuclear family than is found in other competing traditions.³⁰

. In contrast, the settlement of the Midland proceeded by individual families and isolated individuals, and no such uniformity is to be found across Midland cities. The commercial contacts between New York City and New Orleans did not involve the migration of whole communities with their children, but rather the transplantation of individual adult speakers. The diffusion to St. Louis of the uniform, communally created Inland North dialect was not accomplished by a communal migration. Rather, we must suppose a regular traffic of adults along the corridor now centered on Route I-55. Our knowledge of inter-city movement is still too limited to allow us to describe the main agents of this diffusion. But whatever adult linguistic context is involved leads to a re-organization of the pattern, often due to a partial misperception of the structure being borrowed.

The diffusion of mergers and splits

The argument so far has not considered the one type of structural diffusion that is most frequent and most prominent in historical linguistics and dialectology:

³⁰Mean family size for New England settlements was 7 as compared to 3 for the Virginia Tidewater South and 5 for the Quaker oriented settlements of the Delaware Valley (Fischer 1989:815).

the geographic expansion of mergers. Herzog's corollary (Herzog 1965, Labov 1994) states that mergers expand at the expense of distinctions; there is no shortage of empirical evidence of such expansion. Though the expansion of a merger is not conventionally considered to be structural borrowing, it is just that. The recipient dialect recodes its lexicon to match the categories of the donating dialect. In this case, both adults' and children's learning ability point in the same direction: towards the loss of the structural distinction.³¹ There is nothing in the language learning ability of adults that prevents them from collapsing the distinction between two categories, and when this happens, one does not see the lexical and structural irregularities we have been observing in the diffusion of the short-*a* system and the spread of the NCS.

The case for inhibiting structural borrowing must therefore be re-stated. It is not any structural borrowing that is inhibited, but rather the acquisition of new grammatical constraints. In rule-based generative systems, this means the acquisition of a rule that operates within the phonological cycle. In constraint-based systems, it means raising the ranking of a grammatically defined constraint over the ranking of a phonetically defined constraint. In both systems, it is unlikely that a community will borrow a new lexical division of an intact category—that a split will be faithfully diffused. Britain's account of the complexities of the /u - ʌ/ split in the Fens shows the irregular result of a rare case of expansion of the split where the two-phoneme system is favored by social prestige. The diffusion of the NYC short-*a* system also represents the expansion of a split, since there is good reason to believe that New Yorkers treat /æ/ and /æh/ as two distinct lexical categories,³² while the recipient dialects had only /æ/. This split does not involve a complete re-assignment of the lexicon, but there are many sub-sections of the phonetic categories that are lexically specified. What is diffused then is the pattern of phonetic conditioning, not the two lexical categories.

³¹ It appears that the process proceeds faster among children. The Philadelphia LVC project interviewed adolescents at a Pottsville recreational park in 1977, and Herold (1990) returned to the same site eleven years later. The percent of those judging *cot* and *caught* the same jumped from 17 to 100% among girls, and from 29 to 67% among boys.

³² The most important evidence appears in the partial acquisition of the Philadelphia short-*a* pattern by children of New York City parents. They approximate the NYC system much better in selecting the three lexical items *mad*, *bad*, *glad* than in acquiring the general Philadelphia rule that short-*a* is always lax before back consonants (*cash*, *rash*, *smash*, etc.) (Payne 1976, Labov 1994).

Conclusion

This report began with the observation that both family tree models and wave models are needed to account for the history and relatedness of language families. Family tree models are generated by the transmission of changes internal to the system of the speech community, while the wave model reflects the effects of diffusion through language contact. We then considered the general consensus of a strong constraint against the diffusion of language structure in language contact. The main thrust of the paper is to advance an explanation for this difference in attributing internal developments to the incrementation of change by children in their formative years, and assigning the major effects of diffusion to changes in adult linguistic systems. If this is the case, it follows that the results of language contact will be slower, less regular, and less governed by structural constraints than the internal changes that are the major mechanism of linguistic diversification in the family tree model. The difference will still be a matter of degree, since recent studies of language change across the lifespan have shown that adults do participate in ongoing change, more sporadically and at a much lower rate than children.

The main body of the paper applies this thinking to the study of dialect diffusion, focusing on two cases found in the data of the *Atlas of North American English*. There are indications that the complex short-*a* tensing system of New York City has diffused outward to four different areas. The resulting systems resemble that of New York City in its most superficial outline—the phonetic conditioning of tensing by the following segment—but differ from the original model in the absence of grammatical conditioning, the open syllable constraint and specific lexical exceptions. The Northern Cities Shift developed simultaneously in all areas of the Inland North. The chain shifting mechanism operates with a high degree of consistency, linking the movements of five vowels in an over-all rotation. But the transmission of the system along the St. Louis corridor produces a more irregular result, indicating that the individual sound changes are diffusing individually rather than as a system.

Migration of individual families does not create the social setting for systematic language change. The process of incrementation that underlies systematic change requires a community of child language learners. It appears that intact linguistic systems are transmitted from place to place when entire communities migrate, enabling an unbroken sequence of acquisition by successive generations of children. When language forms are transmitted by contact of single adults or individual families, less regular transmission can be expected. The cases studied here suggest one reason why structural borrowing is rare: the adults who are the borrowing agents do not recognize the structural patterns in the system they are borrowing from.

There must of course be limitations to this general association of child language learning with the family tree model and adult language learning with the wave model of change. The logical place to look for exceptions is a community where large numbers of children share bilingual language histories. The exogamous communities of the Vaupes basin originally studied by Sorensen (1967) and Jackson (1975) are such a likely site, and Aikhenvald (2002) has made a case for extensive structural borrowing across dialects and language families in this region. Communities with long histories of multilingualism, like the Kupwar studied by Gumperz and Wilson (1971), would provide the social setting in which children are engaged in extensive language contact.³³ Further studies of such communities may add to our appreciation of the large-scale consequences of changes in linguistic competence across the lifespan.

³³ Granted that King 2002 argues that the convergence documented by Gumperz and Wilson could be the result of lexical rather than structural borrowing.

References

- Aikhenvald, Alexandra Y. 2002. *Language Contact in Amazonia*. New York: Oxford U. Press.
- Bailey, Guy, Tom Wikle, Jan Tillery and Lori Sand. 1993. Some patterns of linguistic diffusion. *Language Variation and Change* 5:359-390.
- Boberg, Charles. 2000. Geolinguistic diffusion and the U.S.-Canada border. *Language Variation and Change* 12:1-24.
- Boberg, Charles and Stephanie M. Strassel. 2000. Short-a in Cincinnati: a change in progress. *Journal of English Linguistics* 28:108-126.
- Callary, R. E. 1975. Phonological change and the development of an urban dialect in Illinois. *Language in Society* 4:155-170.
- Campbell, Lyle. 1993. On proposed universals of grammatical borrowing. In Aertsen, Henk, & Jeffers, Robert J. [Eds], *Historical Linguistics 1989: Papers from the 9th International Conference on Historical Linguistics 1989*. Rutgers University, 14-18 August 1989. Amsterdam, The Netherlands: John Benjamins Publishing Co., pp 91-109.
- Cohen, Paul. 1970. The tensing and raising of short (a) in the metropolitan area of New York City. Columbia U. Master's Essay.
- Fischer, David Hackett 1989. *Albion's Seed: Four British Folkways in America*. Oxford: Oxford University Press.
- Hock, Hans and Brian Joseph 1996. *Language History, Language Change and Language Relationship* Berlin: Mouton/de Gruyter.
- Jackson, Jean 1974. Language identity of the Colombian Vaupés Indians. In Richard Bauman & Joel Sherzer (eds.), *Explorations in the Ethnography of Speaking*. Cambridge: University Press. Pp. 50-64
- Gumperz, John and Robert Wilson 1971. Convergence and creolization: A case from the Indo-Aryan/Dravidian border. In D. Hymes (ed.), *Pidginization and Creolization of Languages*. Cambridge: Cambridge U. Press. Pp. 151-168.
- Johnson, Jacqueline S. and Elissa L. Newport. 1989. Critical period efforts in second-language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology* 21: 60-99.
- Kurath, Hans. 1949. *A Word Geography of the Eastern United States*. Ann Arbor: University of Michigan Press. 88 pp. & 163 full-page maps.
- Labov, William, Sharon Ash and Charles Boberg. 2005. *Atlas of North American English: Phonology and Sound Change*. Berlin: Mouton/de Gruyter.
- Labov, William. 1994. *Principles of Linguistic Change. Volume 1: Internal factors*. Oxford: Basil Blackwell Publishers.
- Labov, William. 2001. *Principles of Linguistic Change. Volume 2: Social factors*. Oxford: Blackwell.
- MacMahon, April. 2002. On not explaining language change: Optimality Theory and the Great Vowel Shift. In Hickey, Raymond (ed.), *Motives for Language Change*. Cambridge: Cambridge U. Press. Pp. 82-98.
- Modaresi, Yahya 1978. A sociolinguistic investigation of modern Persian. University of Kansas dissertation.

- Oyama, Susan. 1973. A sensitive period for the acquisition of a second language. Harvard University dissertation.
- Ringe, Donald, Tandy Warnow and Anne Taylor. 2002. Indo-European and Computational Cladistics. *Transactions of the Philological Society* 100:59-129.
- Sankoff, Gillian. 2002. Linguistic Outcomes of Language Contact. In J. Chambers et al. (eds.), *The Handbook of Language Variation and Change*. Malden, MA: Blackwell. Pp 638-668.
- Sankoff, Gillian. 2004. Adolescents, young adults and the critical period: two case studies from "Seven Up". In *Carmen Fought, ed., Sociolinguistic Variation: Critical Reflections*, Oxford & New York: Oxford University Press, pp.121-139.
- Scovel, Thomas. 2000. A Critical Review of the Critical Period Research. *Annual Review of Applied Linguistics* 20: 213-223.
- Sorensen, Arthur. 1967. Multilingualism in the North West Amazon. *American Anthropologist* 69:670-84.
- Thomason, Sarah and Terrence Kaufman. 1988. *Language Contact, Creolization, and Genetic Linguistics*. Berkeley: U. of California Press.
- Trudgill, Peter. 1974. Linguistic change and diffusion: description and explanation in sociolinguistic dialect geography. *Language in Society* 3:215-246. Reprinted as Ch. 3 of *On Dialect*, 1984.
- Weinreich, Uriel, William Labov and Marvin Herzog. 1968. Empirical foundations for a theory of language change. In W. Lehmann and Y. Malkiel (eds.), *Directions for Historical Linguistics*. Austin: U. of Texas Press. Pp. 97-195.
- Weinreich, Uriel. 1968. *Languages in Contact: Findings and Problems*. The Hague: Mouton. [Originally published as Publications of the Linguistic Circle of New York, no. 1, 1953.].
- Winford, Donald. 2003. *An Introduction to Contact Linguistics*. Oxford: Blackwell.
- Babbitt, E. H. 1896. The English of the lower classes in New York City and vicinity. *Dialect Notes* 1:457-64.
- Berger, Marshall D. 1980. New York City and the ante-bellum South: the maritime connection. *International Linguistic Association* 31(1): 47-53.
- Carnes, Mark C. and John A. Garraty. 1996. *Mapping America's past: a historical atlas*. New York: H. Holt.
- Dyen, Isidor and Jucquois Guy. 1973. *Lexicostatistics in genetic linguistics II: proceedings of the Montreal Conference*. Montreal: Centre de recherches mathématiques, Université de Montréal.
- Foner, Philip S. 1941. Business & slavery: the New York merchants and the irrepressible conflict. Chapel Hill: The University of North Carolina Press.
- Frazer, Timothy C. (ed.),. 1993. "Heartland" English. Tuscaloosa: U. of Alabama Press.
- Greenberg, J., C. Ferguson and E. Moravcsik. 1978. *Universals of Human Language*. Stanford: Stanford U. Press.
- Guy, Jacques B.M. 1982. Bases for New Methods in Glottochronology. In Halim, Amran et al (eds.), *Papers from the Third International Conference on Austronesian Linguistics, vol 1: Currents in Oceanic*: 283-314. Pacific Linguistics, C-74.
- Halle, Morris. 1962. Phonology in generative grammar. *Word* 18:54-72.

- Herold, Ruth. 1990. Mechanisms of merger: The implementation and distribution of the low back merger in Eastern Pennsylvania. U. of Pennsylvania dissertation.
- Herzog, Marvin I. 1965. *The Yiddish Language in Northern Poland*. Bloomington & The Hague. (= IJAL 31.2, Part 2).
- Hockett, Charles. 1958. *A Course in Modern Linguistics*. New York: MacMillan.
- King, Ruth. 2000. *The lexical basis of grammatical borrowing: a Prince Edward Island French case study*. Amsterdam & Philadelphia. Benjamins.
- Korn, Bertram W. 1969. *The Early Jews of New Orleans*. Waltham MA: American Jewish Historical Society.
- Kurath, Hans and Raven I. McDavid, Jr. 1961. *The Pronunciation of English in the Atlantic States*. Ann Arbor: U. of Michigan Press.
- Labov, William. 1966. *The Social Stratification of English in New York City*. Washington D.C.: Center for Applied Linguistics.
- Labov, William. 2004. Yankee cultural imperialism and the Northern Cities Shift. Paper given at Modern Language Association Annual Meeting, Philadelphia.
- Liebling, A. J. 1961. *The Earl of Louisiana*. NY: Simon and Schuster.
- Lightfoot, David W. 1999. *The development of language : acquisition, change, and evolution*. Oxford & Malden, Mass.: Blackwell Publishers.
- Lightfoot, David. 1997. Catastrophic change and learning theory. *Lingua* 100:171-192.
- Payne, Arvilla. 1976. *The acquisition of the phonological system of a second dialect*. University of Pennsylvania dissertation.
- Power, Richard Lyle. 1953. *Planting corn Belt Culture: The Impress of the Upland Southerner and Yankee in the Old Northwest*. Indianapolis; Indiana Historical Society.
- Roberts, Julia. 1993. *The acquisition of variable rules: t,d deletion and -ing production in preschool children*. U. of Pennsylvania dissertation.
- Sankoff, Gillian, Hélène Blondeau and Anne Charity. 2001. Individual roles in a real-time change: Montreal (r>R) 1947-1995. In Hans van de Velde & Roeland van Hout (eds.), *'r-atics: Sociolinguistic, phonetic and phonological characteristics of /r/*. *Etudes & Travaux* 4. Pp. 141-158.
- Scoville, John. 1870. *The Old Merchants of New York City. by Walter Barrett, clerk. 5 vols*. New York: Carleton.
- Trager, George L.. 1930. The pronunciation of 'short A' in American Standard English. *American Speech* 5:396-400.
- Trager, George L.. 1934. What conditions limit variants of a phoneme? *American Speech* 9:313-315.
- Trager, George L.. 1942. One phonemic entity becomes two: the case of 'short a'. *American Speech* 17:30-41.
- Trudgill, Peter. 2004. *New-Dialect Formation: the inevitability of Colonial Englishes*. Oxford: Oxford U. Press.

Zelinsky, Wilbur. 1993. American Social and Cultural Geography. In Cayton, M.K., E.J. Gorn & P.W. Williams (eds.), *Encyclopedia of American Social History*. New York: Charles Scribner's Sons.j