CHAPTER 58

TOWARD A UNIFIED THEORY OF CHAIN SHIFTING

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1. Introduction

Chain shifts play a major role in understanding the phonological history of English—from the prehistoric chain shift of Grimm's Law that separates the Germanic languages from the rest of Indo-European, to the Great Vowel Shift that is often taken to define the boundary between Middle English and Early Modern English, to the ongoing chain shifts in Present-Day English that are used to establish the geographical boundaries between dialect regions. A chain shift may be defined as a set of phonetic changes affecting a group of phonemes so that as one phoneme moves in phonetic space, another phoneme moves toward the phonetic position the first is abandoning; a third may move toward the original position of the second, and (perhaps) so on. Martinet (1952) introduced the argument that chain shifts are caused by a need for phonemes to maintain margins of security between each other—so if a phoneme has more phonetic space on one side of it than on others, random phonetic variation will cause it to move toward the free space but not back toward the margins of security of phonemes on the other side. Labov (2010: chapter 6) gives a lucid exposition of the cognitive and phonetic arguments underlying this account of chain shifting.

Despite their value as a descriptive device for the history of English, however, the ontological status of chain shifts themselves is a matter of some doubt. Is a

chain shift actually a unitary and structured phenomenon, such that, within the grammar of a community undergoing such a shift, the movement of each phoneme causes and/or is caused by the movements of the phonemes surrounding it, following the Martinet model outlined above? Or is it, to use the metaphor suggested by Lass (1992), a mere "constellation"—a set of independent phenomena (i.e., phonetic shifts of individual phonemes) treated as a structured set only by pattern-seeking humans?

A 20-year-old exchange between Stockwell and Minkova (1988a, 1988b) and Lass (1988, 1992) addresses this issue. As is well known, the Great Vowel Shift (GVS) is the phenomenon or set of phenomena whereby the Middle English long monophthongs rose to become the upgliding diphthongs of Present-Day English—thus /eː/ > /iy/;[1] /oː/ > /uw/; /ɛː/ > /ey/ > /iy/; /ɔː/ > /ow/; /aː/ > /ey/—and the ME long high vowels "fell off the top" to become ultimately /iː/ > /ay/ and /uː/ > /aw/. This has the profile of a chain shift: the ME upper-mid vowels move into the positions vacated by the former high vowels, and the lower-mid and low vowels move up in their wake (with the merger of ME /ɛː/ and /eː/ as modern /iy/ postdating the GVS proper).

Stockwell and Minkova, however, argue against the traditional characterization of the GVS as a coherent event. Among other criticisms, they point out that many dialects underwent some of the vowel changes but not others, so it cannot be the case that the different shifting vowels mutually cause each other's movement in a strict sense. They argue also that the maintenance of margins of security cannot play a major role in controlling the course of sound change, since phonemic mergers are quite frequent.

Lass (1992) concedes that the full set of changes described as the GVS might not be a single phenomenon, but contends that the relationship between the raising of ME /oː/ and /eː/ and the diphthongization of ME /uː/ and /iː/ is still that of a unitary chain shift (or rather, two parallel unitary chain shifts). He finds that, in dialects where ME /oː/ failed to raise, /uː/ failed to diphthongize, and argues that this correlation suggests a causal relationship between the two changes. So although the raising of the lower-mid and low vowels decades later may be outside the scope of the chain shift proper, the high and higher-mid vowels do (according to Lass) form a coherent chain-shift system.

My aim in this chapter is to consider this fundamental question—is a chain shift a single event, or merely a collection of formally unrelated sound changes that happen to take place in a structured-seeming way?—in light of recent research on change in progress in North American English. In other words, does one phoneme move in phonetic space *because* of movement in the phoneme(s) adjacent to it, or do they merely move *at the same time*? One vehicle for exploring this question will be the contrast between transmission and diffusion of linguistic change, as discussed

1 For Present-Day English vowel phonemes, I use the notation of the *Atlas of North American English* (*ANAE:* Labov, Ash, and Boberg 2006). The phonemes /iy uw ey ow ay aw/ are those in *fleece*, *goose*, *face*, *goat*, *price*, and *mouth*, to use Wells's (1982) lexical sets.

by Labov (2007): "transmission" is the acquisition of linguistic features by children from their elders in the same community, whereas "diffusion" is the acquisition of features by adults as a result of contact with adults from other communities.

2. The Northern Cities Shift as a chain shift

There is fairly convincing evidence in Present-Day American English that chain shifts do authentically exist. In several dialect regions where /o/ (as in *lot*) is backing toward merger with /oh/ (as in *thought*), it is reported that /æ/ is backing toward the position being vacated by /o/ (Durian, n.d.). This is exactly the type of movement predicted by the classical model of chain shifting; if chain shifts were merely constellations, we would expect the backing of /æ/ to be no more likely in regions with the low back merger than in regions without it.

However, the backing of /æ/ in response to that of /o/ is a simple one-step chain shift. This chapter will focus on a better parallel for the GVS, a major apparent chain shift in progress involving at least five phonemes: the Northern Cities Shift (NCS). This shift exists in the "Inland North" dialect region in the United States, stretching at least from Green Bay, Wisconsin to northeastern New York (*ANAE*; Dinkin 2009).

What is now known as the Northern Cities Shift was first described by Fasold (1969) as a chain shift in Detroit involving fronting and raising of /æ/ as in *trap*, fronting of /o/, and lowering and fronting of /oh/. Labov, Yaeger, and Steiner (1972) expanded this to a broader geographical area including Chicago and central and western New York State, and added the lowering and/or backing of /e/ as in *dress*; Eckert (1988) added the backing of /ʌ/ as in *strut*. Thus, the overall apparent pattern of the NCS as a chain shift, displayed in Figure 1, is clear: /æ/ leads the chain, and each phoneme after it appears to be moving toward the starting position of one or more[2] of the other phonemes involved in the shift.

But does this apparent pattern represent an underlying structural unity? That is, do the movements of the individual phonemes have systematic dependencies on

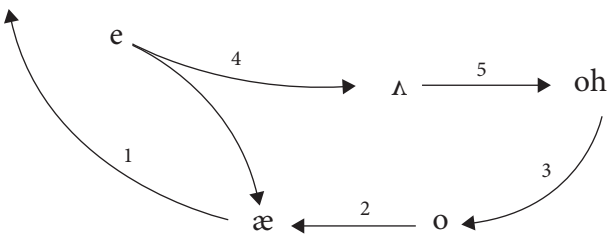

Figure 1. The NCS

2 For some speakers and communities, /e/ is moving toward the starting position of /ʌ/; for others it is moving toward that of /æ/.

each other, or are they a set of independent sound changes that merely happened to take place at roughly the same time in generally the same communities? Gordon (2000: chapter 6) explores this question on the basis of data from small Michigan towns and answers it with "a resounding 'maybe.'" *ANAE* says this:

> It is clear that the raising of /æ/ and the fronting of /o/ were the initial movements,[3] though both the geography and real time are ambiguous in regard to their ordering. There is a great deal of irregularity from speaker to speaker in the lowering of /oh/: logically, it would be the third stage in a pull chain, but there are many speakers with back /e/ and some backing of /ʌ/ who have not lowered /oh/. Again, the logic of a pull chain would argue that the backing of /ʌ/ would precede the backing of /e/, and the geographic area of /ʌ/ backing is much broader than that for the backing of /e/. However, there are many speakers who show stressed tokens of /e/ pressing hard against the /ʌ/ frontier, with no accompanying backing of /ʌ/. (*ANAE*: 191)

In other words, although Figure 1 appears to show a neat system where everything moves into the space abandoned by the phoneme ahead of it, the actual distribution of the individual shifts is not so clear-cut, with some shifts taking place despite the absence of those that supposedly trigger them, or vice versa. These anomalies are not all easily explained away in the context of a unitary shift.

3. Diffusion of the NCS

Labov (2007) suggests a partial resolution to this dilemma by exploring the notion of diffusion of a chain shift. Transmission and diffusion, although both modes by which linguistic change is advanced and propagated, differ in their effects, as Labov argues—since "adults do not learn and reproduce linguistic forms, rules and constraints with the accuracy and speed that children display", and diffusion is driven by contact between adults, communities to which a linguistic innovation has diffused will not accurately reflect the more abstract structural patterns that are faithfully transmitted within a single community.

Labov discusses a case in which the NCS is known to have undergone diffusion: the so-called St. Louis corridor. Central Illinois and St. Louis historically belong to the Midland dialect region; but as a result of the influence of Chicago, an Inland North city, NCS features have diffused southwest along Interstate 55 to St. Louis. NCS features now coexist there with traditional Midland dialect features, often in the same speakers. Labov shows that, whereas in northern Illinois younger speakers tend to have more complete NCS than older speakers, along the St. Louis corridor there is no such correlation. This indicates that the presence of the NCS in the St. Louis corridor is the result of adult-driven diffusion: the changes are not being advanced by

3 Gordon (2000), however, argues that the lowering of /oh/ was the first movement.

younger speakers pushing forward the innovations beyond their elders; instead, the speakers with most advanced NCS features are between the ages of 48 and 60.

To observe the result of diffusion of the NCS in more detail, we look to New York State. The data described below are derived from a study (Dinkin 2009) of 119 speakers from various communities in Upstate New York, selected with the aim of finding the boundary of the NCS. As shown in Figure 2, Upstate New York can be divided into four major dialect regions on the basis of these 119 speakers' NCS participation (plus data from *ANAE*). A speaker's "NCS score" is defined as the number of these five criteria (Labov 2007) that the speaker satisfies:

- **ED**: /e/ less than 375 Hz fronter than /o/
- **UD**: /o/ fronter than /ʌ/
- **EQ**: /æ/ both fronter and higher than /e/
- **AE1**: /æ/ higher than 700 Hz (i.e., F1 is less than 700 Hz)
- **O2**: /o/ fronter than 1500 Hz

The four regions defined by NCS scores are the Inland North core, where nearly all speakers sampled showed full NCS (scores of 4 or 5); the Inland North fringe, where speakers with full NCS exist but are not the majority; the Hudson Valley, with some limited presence of NCS features; and the North Country (not discussed in this chapter), where the low back merger dominates and the NCS is largely absent.

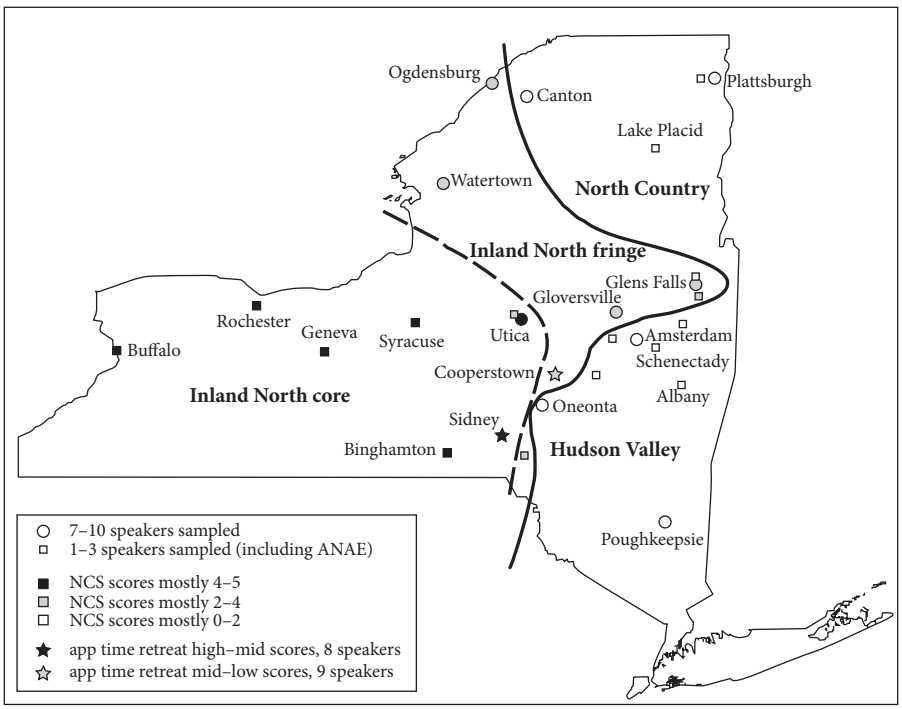

Figure 2. Dialect regions of Upstate New York, based on Dinkin (2009). Symbol size and shape represents sample size; color represents NCS advancement. Stars indicate communities retreating from NCS.

The Inland North core and fringe are united not only by the common presence of the NCS but also by shared settlement history: communities in the Inland North fringe and core were founded principally by migrants from southwestern New England (or other Inland North communities), mostly in the late eighteenth and early nineteenth centuries. The Hudson Valley differs from the Inland North in that a large portion of its early settlers were of Dutch origin, dating back to New York's history as the Dutch colony of New Netherland.

ANAE attributes the origin of the NCS to the population boom in the early nineteenth century in the Inland North core, driven by the construction of the Erie Canal; in this region nearly all speakers sampled have NCS scores of 4 or 5. The Inland North fringe did not experience this population boom directly, although it shares settlement history with the Inland North core. Repeating on the fringe the calculation carried out by Labov (2007) on the St. Louis corridor reveals no correlation between age and NCS score, suggesting that, like the St. Louis corridor, the Inland North fringe received the NCS as a result of diffusion through adult contact rather than incrementation of change through transmission (Dinkin 2009: §4.5.3).

As Table 1 shows, the Hudson Valley has a relatively low incidence of NCS features compared to the Inland North core and fringe regions to which it is adjacent. On the other hand, it still has a high incidence of NCS features compared to North America as a whole: it has more participation in the NCS than typical communities outside the Inland North do, though substantially less than the Inland North itself. Given the Hudson Valley's geographical adjacency to the Inland North, and its differing settlement history, it seems most likely that NCS features have diffused from the Inland North to the Hudson Valley, just as they have from the Inland North to the St. Louis corridor.

The fact that NCS scores in the Hudson Valley are relatively low, however, indicates that the NCS has only diffused there with partial success.[4] By looking at the distribution of individual NCS features in the Hudson Valley and the Inland North fringe in more detail, we can get a closer look at in what respects this diffusion has succeeded and in what respects it has failed.

Table 1. NCS scores of various regions in *ANAE* and Dinkin (2009)

NCS scores	*ANAE* **Inland North** (*n* = 61)	**Inland North fringe** (*n* = 40)	**Hudson Valley** (*n* = 33)	*ANAE* **elsewhere** (*n* = 385)
5	36%	0%	0%	1%
4	26%	38%	0%	1%
3	16%	20%	9%	3%
2	16%	40%	70%	9%
1	5%	2%	18%	21%
0	0%	0%	3%	66%

4 By comparison, even the nine *ANAE* speakers in the St. Louis corridor include two with NCS scores above 3.

Table 2. Distribution of NCS features in various regions

NCS criteria	*ANAE* Inland North (n = 61)	Inland North fringe (n = 40)	Hudson Valley (n = 33)	*ANAE* elsewhere (n = 385)
UD	93%	100%	88%	15%
ED	84%	100%	82%	13%
EQ	66%	33%	0%	3%
AE1	84%	42%	9%	17%
O2	46%	20%	9%	5%

Table 2 shows *why* NCS scores of about 2 dominate in the Hudson Valley: not because each speaker satisfies some arbitrarily chosen pair of criteria, but because two NCS criteria are broadly satisfied in the Hudson Valley at Inland North–like levels, while the remaining three are virtually absent: the Hudson Valley resembles the Inland North very closely with respect to UD and ED, indicating apparently totally successful diffusion of the Inland North pattern, but it resembles non–Inland North regions with respect to EQ, AE1, and O2. We can describe the Inland North fringe in similar terms: it resembles the Inland North core very closely in UD and ED, and is midway between the Inland North and other regions with respect to EQ, AE1, and O2. Thus, if the NCS in the Inland North fringe is the result of diffusion, some features have diffused into it completely while others are still in progress or have been arrested after diffusing to only a minority of community members.

Of course, features such as UD and ED are not themselves individual components of the NCS, but rather only categorical criteria whose purpose is to estimate how advanced an individual is in the NCS as a whole. Several of these criteria are defined in terms of comparing the positions of two NCS phonemes; according to Labov (2007), such structural relationships between phonemes are not a possible object of diffusion. So to understand what is actually undergoing diffusion here, it is necessary to look at the individual vowel phonemes.

Table 3 shows how individual vowel shifts of the NCS are reflected in various sets of communities. The portion of the Inland North in New York State (including the fringe) has backer /e/ and /ʌ/ than the rest of the Inland North. The Inland

Table 3. NCS vowel means in various regions

vowel means	non-NY Inland North (n = 53)	NY Inland North core (n = 18)	Inland North fringe (n = 40)	Hudson Valley (n = 33)	*ANAE* elsewhere (n = 385)
/o/ F2	1498 Hz	1508 Hz	1459 Hz	1421 Hz	1310 Hz
/e/ F2	1758 Hz	1633 Hz	1651 Hz	1724 Hz	1847 Hz
/ʌ/ F2	1364 Hz	1315 Hz	1328 Hz	1324 Hz	1470 Hz
/æ/ F1	659 Hz	640 Hz	708 Hz	766 Hz	767 Hz

Note: "Inland North core" includes communities from *ANAE* in addition to Dinkin (2009) communities; "non-NY Inland North" includes only *ANAE* data.

North fringe has somewhat less fronted /o/ and less raised /æ/ than the core (but still substantially more fronted and raised than non–Inland North communities). The Hudson Valley is even more of a hybrid in this regard: it is indistinguishable from the Inland North in the backing of /ʌ/, and although its mean /e/ is not as back as the nearby Inland North fringe and core in New York State, it is at least as back as the /e/ of the Inland North's Midwestern centers. With respect to mean /æ/, however, the Hudson Valley appears identical to *non*–Inland North communities. So if we interpret the presence of NCS features in the Hudson Valley as the result of diffusion from the Inland North core and fringe, we find Labov's (2007) hypothesis corroborated: in the *diffusion* of a chain shift, the movements of the individual phonemes do not drive each other; each phoneme is treated independently by speakers in the recipient community. Thus, regardless of whether the NCS originated with the raising of /æ/ driving the fronting of /o/ in a pull chain or with the fronting of /o/ driving the raising of /æ/ in a push chain, in Hudson Valley communities to which the NCS diffuses, the relationships between the various NCS components can be disregarded; some shifts can have their full effect while others are effectively absent.

This observation allows us to begin to unify the perspectives on chain shifts taken by Stockwell and Minkova (1988a, 1988b) and by Lass (1988, 1992): a chain shift can simultaneously be in some communities (i.e., those in which the shift originates) a unitary phenomenon wherein the movements of the phonemes all depend on each other, while in other communities (i.e., those to which it diffuses) being a set of independent movements which happen to take place at roughly the same time. Thus, Stockwell and Minkova's citing of regions of England in which some GVS shifts took place but not others does not in principle vitiate the traditional model of chain shifting—the conclusion is merely that those may be regions to which the GVS diffused, rather than ones where it originated as a chain shift. Although this high-level theoretical analysis of the nature of chain shifts obviously does not enable us to answer specific historical questions about the structure of the GVS, it does give us a paradigm under which these two analyses of the GVS might not be totally incompatible; they may both apply, but at different levels of focus.

4. Diffusion and symmetry

Preston (2008) observes a striking pattern in the results of diffusion of the NCS within Michigan: there is a greater degree of overall symmetry in the vowel system in speech communities to which the NCS has diffused than among those in which the NCS is thought to have arisen organically. Figure 3 demonstrates this symmetry in a rural mid-Michigan community: the diffusion of the NCS into this community produces a vowel system with a remarkable degree of phonological symmetry: four degrees of height, neatly paired front/back and tense/lax vowels

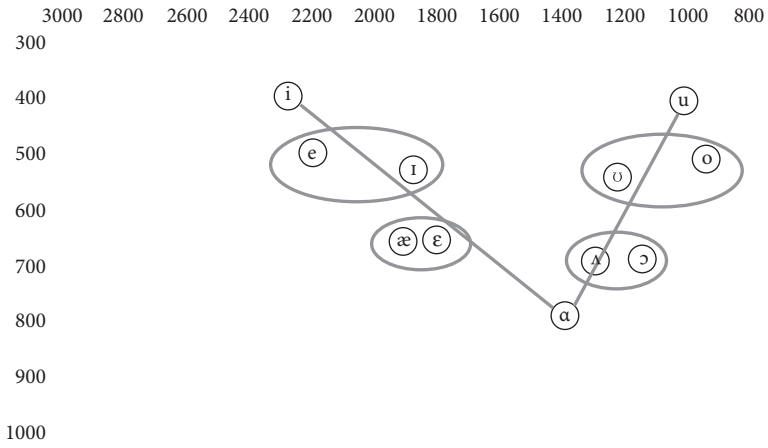

Figure 3. A chart from Preston (2008; used with permission), showing the overall means of certain vowels from a rural Michigan community studied by Ito (1999), with Preston's phonological systematization. Preston's notation for vowel phonemes is reproduced.

at each of the two intermediate heights, and long monophthongs at each of the three corners of the vowel space. Among core NCS speakers in the Detroit area, however, Preston finds that the vowel space is much less organized, with no good way of grouping phonemes on phonetic grounds into neat parallel and symmetric natural classes.

The apparent diffused-NCS regions in New York State conform to Preston's prediction as well. Figure 4 shows the same 11 phonemes in Gloversville, an Inland

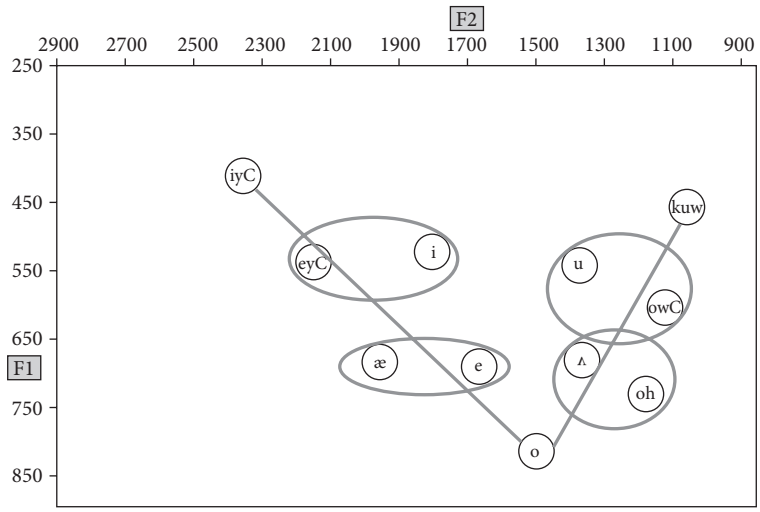

Figure 4. The symmetrical vowel system of Gloversville, NY, in the Inland North fringe (Dinkin 2009). The symbols "iyC", "eyC", and "owC" are those used in Plotnik (Labov 2005) to represent those phonemes when followed by a consonant; "kuw" denotes the phoneme /uw/ when not preceded by a coronal consonant.

North fringe city, having more or less the same distribution as in Figure 3. Figure 5 shows these phonemes in Amsterdam, a Hudson Valley city. Here we see a distribution of the vowel phonemes that is no less symmetrical than Figure 4, even though Gloversville's mean /æ/ is substantially raised and Amsterdam's is not. By contrast, the Inland North core, shown in Figure 6, has mean /æ/ raised even further, too high to be a plausible tense counterpart of lax /e/ or front counterpart of back /oh/. Thus, in communities where the NCS originated as sound change driven through incrementation by children, it seems that there is less pressure for its overall result to be a well-organized phonological system than in communities to which it diffused. Preston explains this in terms of Labov's (2007) observation that, since adults are less able to faithfully acquire and reproduce *complex* linguistic patterns than children are, the result of adult-driven diffusion is more likely to be structurally simple and unmarked than that of child-driven incrementation.

Preston's observation may have relevance for the GVS as well. Even Lass (1992) concedes that the shifts which raised ME /ɛː/, /aː/, and /ɔː/ postdated the original movements of /eː/, /iː/, /oː/, and /uː/ by enough decades that they may not have been part of the same unitary chain-shift process. Stockwell and Minkova (1988a) describe this second-stage GVS as more "a history of mergers" than a history of chain-shift–style pushing and dragging, inasmuch as ME /ɛː/, /aː/, and /ɔː/ all achieved their modern positions in part through mergers with preexisting diphthongal phonemes. Moreover, according to Stockwell and Minkova, the fact that ME /ɛː/ and /eː/ eventually merged in the standard dialects as modern /iy/ calls into question the entire theoretical underpinning of chain shifting: if chain shifts happen as a result of the maintenance of margins of security between adjacent

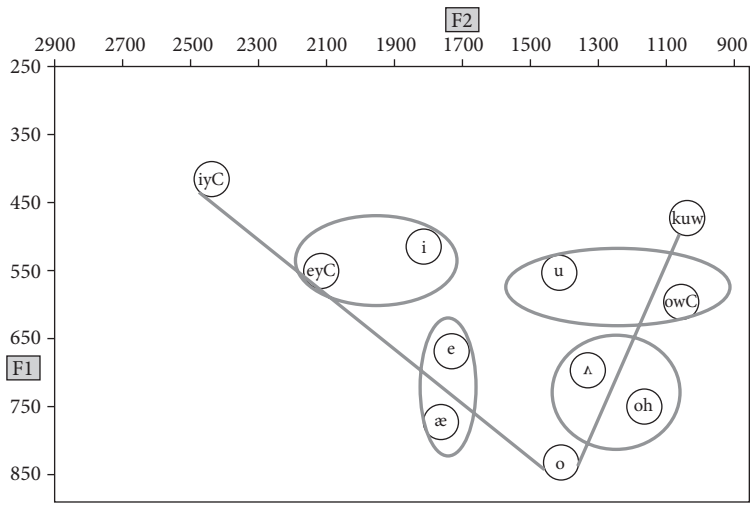

Figure 5. The symmetrical vowel system of Amsterdam, NY, in the Hudson Valley (Dinkin 2009)

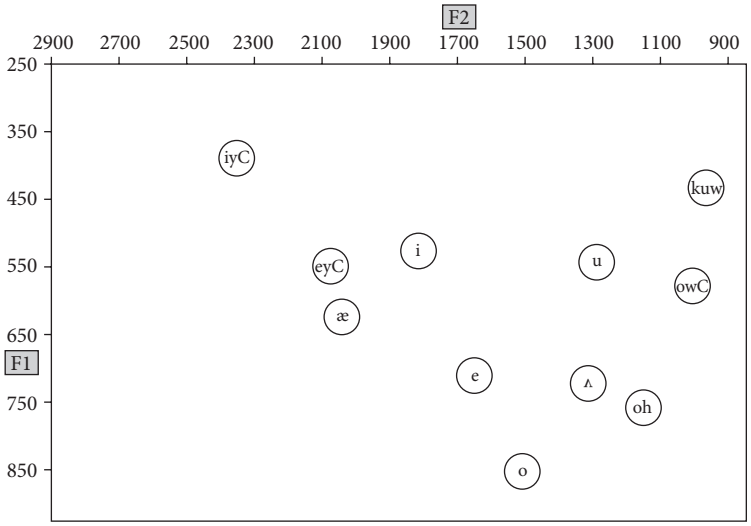

Figure 6. The vowel system of the Inland North core in New York State (data from *ANAE*)

phonemes, it should not be possible for two phonemes involved in the same chain shift to merge with each other.

But let us compare the conditions of the English long vowel system before the initiation of and after the completion of the full GVS. ME had a highly symmetrical system, with matching front/back pairs at every vowel height except low: /iː/ and /uː/, /eː/ and /oː/, /ɛː/ and /ɔː/, and a single low vowel /aː/ at the bottom of the vowel triangle. Modern English after the completion of the second-phase GVS *also* had a highly symmetrical long-vowel system, with three degrees of height and a matching pair of front and back upgliding diphthongs at each tier: /iy/ and /uw/, /ey/ and /ow/, /ay/ and /aw/. Not all dialects achieved this particular six-phoneme symmetrical structure, of course; but it became the common ancestor of modern American English and standard British English;[5] and without some merger among the post-GVS front vowels, such symmetry would not have been possible. According to Smith (2007: 134–38), the presence of merged ME /eː/ and /ɛː/ reflexes in post-GVS vowel systems was in fact the result of diffusion—in particular, the acquisition of GVS features by speakers from East Anglia, a region in which this merger had already taken place prior to the GVS. Moreover, Smith discusses an earlier case of diffusion of the GVS, to the so-called "Mopsae", socially and geographically mobile individuals who were likely to hypercorrect when adopting new prestige linguistic features; these speakers also introduced a new merger to the post-GVS system, in this case between reflexes of ME /ɛː/ and /aː/. In other words,

5 As late as Jones (1909), the tense vowels in standard British pronunciation are still described as possessing exactly this matching front/back structure.

two different cases of adult acquisition of innovative features both led to symmetrization of the vowel space, as predicted by Preston (2008), one of which eventually became the long-term trans-regional standard. The occurrence of merger between GVS vowels does not vitiate the principle of the margin of security, since these mergers took place as part of adult-driven diffusion of the GVS, not transmission.

Finally, to return to New York State, we can see something similar happening there—movement toward merger between phonemes that are involved in a chain shift, contrary to the hypothesis that the presence of a chain shift implies that merger should be prevented. *ANAE* describes the NCS as one of several features that can create "stable resistance" to the low back merger. However, there is in fact movement toward the merger in apparent time in almost all Upstate regions, including the Inland North core (Dinkin 2009, 2011): speakers born after about 1960 have /o/ on average about 100 Hz backer in F2 than speakers born before 1960. This is a movement of /o/ directly contrary to that of the NCS, and toward merger with /oh/, calling into question the "stability" of the resistance to merger that *ANAE* attributes to the NCS. This backing of /o/ exists only in the New York State component of the Inland North—in the Midwestern region of the Inland North, the NCS fronting of /o/ appears perfectly stable. One possible reason for this is that the New York component of the Inland North is overall closer to more communities where the low back merger is complete than is the Midwestern component of the Inland North; therefore New York State is more subject to diffusion of the merger from those communities than the Midwestern component as a whole. In that case, what we see here is movement toward a merger in spite of the chain-shift structure surrounding it, as a result of diffusion as the merged phonology becomes a trans-regional standard.

5. Conclusion

Recent research on the NCS gives us an overall model for the life cycle of chain shifts. In the community in which a chain shift originates and is advanced through incrementation in children's language acquisition, it is a unitary phenomenon in which each phoneme's movement acts in concert with the movements of the phonemes surrounding it. As it spreads to new communities, the uniformity is broken down, and the individual phonemic shifts are no longer treated as bearing the same structural relationships to each other as in the originating community. Meanwhile, diffusion from other communities—at least diffusion of a merger—can tamper with the structural unity of the chain shift in the originating communities as well. Furthermore, if the result of the shift then becomes mainstream or standardized in a broad area beyond its originating community, it may take on a more phonetically symmetric and simplified form, possibly undergoing mergers in order to achieve this. Thus, the question of what the internal structure of a chain shift is depends on what stage in its evolution the question is being asked of, and which communities.

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