GEOLINGUISTIC DIALECT DIFFUSION: DATA BEARING ON THE WAVE AND GRAVITY MODELS

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1. INTRODUCTION

This paper will examine some aspects of the failure of either of the two contending models for the process of geolinguistic diffusion, known as the 'wave' and 'gravity' models, to be unequivocally supported by recent data (Boberg, 2000). The specific phenomenon of interest in that paper was geolinguistic diffusion across the Canada/U.S.A. border, largely south to north. The conclusion drawn was that, in the face of the apparently conflicting evidence, the gravity model, being inherently superior, must be preferred, but would have to have a new term inserted in it to take account of a 'border effect'. There may be merit in the idea of a border-effect term, but it is the contention of this paper that one of the factors involved is the erroneous assumption that lexical items diffuse geolinguistically between separated communities by the same dynamic as phonetic phenomena This assumption has of course, the corollary that the same model should apply to both. It is also held to be mistaken.

2. BACKGROUND

2.1 Geographical Dialectal Diffusion

The phenomenon involved here is dialectal inter-community diffusion. By this term I refer to the observation that, when two separate linguistic communities speak two different dialects of the same language, then a feature, characteristic of one dialect (a lexical item, the pronunciation of a lexical item, or a phonetic/phonological linguistic behaviour pattern) may turn up in the speech of the speakers of the other dialect. This can occur even when the communities are separated by some distance, as long as modes of communication exist between them. That this happens is a commonplace of both folk and scientific sociolinguistics (Boberg, 2000). In order to consider this process in isolation, one must of course assume migration of individuals between communities to be negligible.

3. THE MODELS

3.1 The Wave Model

Sometimes, when dialectal diffusion occurs (or even inter-language diffusion), historical or other circumstance makes it possible to identify the *source* community for a particular feature. Out of this circumstance there arose the 'wave' model, whereby a dialect feature (lexical or otherwise) spreads like a wave across the surrounding terrain. Nearby communities would be affected before more distant ones would. The process is visualized as continuing until whatever force is causing it is dissipated, or until it comes up against a barrier (sociological or geographical). This model says nothing about the general factors that encourage or discourage diffusion, although individual researchers may have speculated or even asserted the role of various factors in various cases. Historical linguistics has made considerable use of the wave model, e.g., in describing the inter-language diffusion of lexical items among tribes of the pacific northwest coast (Hess, 1979).

3.2 The Gravity Model

In contrast to the wave model, sociolinguistics gave rise to an 'urban hierarchy' model, whereby a dialectal feature (lexical or otherwise) spreads by 'leap-frogging' between urban centers and only reaches the surrounding rural terrain after descending the urban hierarchy to the village level (Chambers and Trudgill, 1998: 166). This is the so-called 'gravity' model, which is widely accepted today. This model was adopted by Trudgill (1974) in the context of dialect diffusion studies dealing with the diffusion of speech innovations appearing first in London, England, and diffusing over time to cities to the north of London, such as Norwich, Ipswich, etc. It seemed to fit that data reasonably well (Trudgill, 1974).

The gravity model asserts the existence of four relationships between inter-community diffusion and independent sociological variables, namely that rate of diffusion should be:
1. Directly proportional to the product of the populations of the two communities.
2. Inversely proportional to the square of the distance between the communities.
3. Preponderantly in a direction from the larger community towards the smaller.
4. Directly proportional to the degree of pre-existing similarity between the two dialects.

The gravity model is usually expressed in the form of a mathematical equation, although, since the units are variously either arbitrary, non-standardized or non-existent, it is more accurately described as a statement of proportionality.

4. THE PREDICTIONS

4.1 The Wave Model's Prediction

The classic wave model's prediction for the Canadian/American situation would be that areas near the border should experience heavy diffusion effects which would become lighter as one looks at areas further away from the border, with numbers of people in centers of population playing no role. Pre-existing similarity would also play no role in the predictions.

4.2 The Gravity Model's Prediction

Because the gravity model is mathematical, its output is in the form of an index of influence, a number that may range from zero to very high values.

The predictions of the gravity model have been properly worked out in Boberg (2000)[1] for the influence of various major American cities on various Canadian ones. For reasons of brevity, and, since the calculations in question represent straightforward grinding out of numbers from a formula, I do not show the details of Boberg's calculations for the influence of American cities on Canadian cities, but present the predictions in a form adapted from Boberg (2000). The predictions are as follows:

Major Canadian urban centers should be the focuses of heavy influence from American urban centers, and the closer the Canadian centers are to specific American ones the heavier should be the influence of the dialect on the speech of the Canadian centers. Around such centers in Canada, diffusion of the features in question should spread

[1] With one minor exception: if we are going to use the total populations of the cities, then we ought to use, as the distance between them, a value that is relevant to the average person in those communities. That value would be the center to center distance. Boberg used a distance of 1 kilometer for the distance between Detroit and Windsor, which is, I imagine, the width of the Detroit River. A center to center value would be somewhere between 5 and 10 kilometers; that would considerably reduce the extreme nature of the gravity prediction. The problems with the gravity model are severe enough not to require exaggeration.

secondarily by further leap-frogging to intermediate centers, and eventually into the countryside. In more specific terms, an American feature found in, say, Detroit, should be universal in Windsor, common in Toronto, uncommon in Montreal English, and then spread in widening circles around Toronto and Windsor into southern Ontario. Since the process of diffusion we are dealing with is not complete, the evidence should provide a synchronic 'snapshot' of the process in progress.

5. THE DATA

5.1 Boberg's Data

The data is also taken from Boberg (2000). In the paper referred to, Boberg presented two blocks of data: one regarding the distribution in Canada of a typically American pronunciation of a list of words of apparently foreign origin, drawn from earlier work (Boberg, 1997). Hereafter I will refer to this distribution as PWFO. For the reader's interest, I give this list as Table 1 at the end of this paper. In addition to this, Boberg discusses data regarding the appearance in Canadian speech of vowel sounds characteristic of speech in American centers in the area south of Ontario. Again, for reasons of brevity, I do not present the details of the distribution as Boberg found it. Instead, as I have no quarrel with his assessment, I refer the reader to the paper in question. Boberg summarizes the data in these words:

"[The distribution of foreign word pronunciations]... *shows that the regional results do not conform to the predictions of the gravity model"* and *"... they do in fact appear to provide more support for a wave model of diffusion rather than for the gravity model*"(Boberg, 2000:18).

"[The distribution of American vowel sounds in Windsor]...*at least at the level of the phonetics and phonology of the vowel system, the massive influence of Detroit predicted by the model is simply nonexistent."*(*ibid*: 18)

5.2 Additional Data

It will be suitable at this point to introduce some additional data, showing a similar distributional pattern for lexical items to that found by Boberg for PWFO. I refer, first, to Nylvek (1982). Nylvek conducted a survey of American linguistic influence in the province of Saskatchewan, to which Boberg refers (Boberg, 2000: 17). There, the distribution of American lexical items was too concentrated toward the north of the area studied to support the classical wave model and too general in rural areas to support the gravity model. However some support for the gravity model was found in respect of non-lexical material. Secondly, in Chambers (1995) we find a study of the distribution of certain traditionally Canadian lexical items in Canada versus the corresponding American items. His results are that the distribution in Canada of the American terms is general throughout the 'Golden horseshoe' area of southern Ontario, although strongly age-graded, i.e., the American usages are much more strongly represented in the young than in the old. This distribution could be construed as weak support for a wave model, but not for a gravity model.

6. DISCUSSION

6.1 Sociolinguistic Considerations

In view of the fact that the gravity model is generally regarded as a 'state of the art' model for the process of geolinguistic diffusion (Chambers and Trudgill, 1998), it is sensible to ask why it fails in the given context. Boberg suggests, in the context of both the PWFO and phonetic parts of his data, that an extra term representing a 'political border' effect needs to be added to the 'equation'. My response to the problem is that, although there are improvements that can be made to both models, one of the reasons for the conflict with this data is because we are not distinguishing the diffusion of lexical material from the diffusion of non-lexical material. The conflation in question has been common in dialectology from the beginning. No one, to my knowledge, has seriously questioned the assumption that lexical and non-lexical diffusion obey the same dynamic, and thus, the same model should be appropriate. Nonetheless, it has long been recognized that lexical items diffuse far more readily than do phonetic behaviour patterns (Boberg, 2000).

My belief is that lexical items diffuse much more readily via television and radio(where these media exist), while phonetic patterns, especially vowel sounds, diffuse more readily via interactive channels, such as face-to-face conversation. Different models apply to the two cases. In terms of the two models mentioned, it is my contention that lexical material diffuses according to a modernized version of the wave model, while non-lexical features diffuse according to a modified version of the gravity model. As for the pronunciations of 'foreign' words, to whose distribution Boberg draws our attention, I will claim that they diffuse like lexical material.

Channels of human communication can be divided into those that are uni-directional and those that are bi-directional. It is my belief that the linguistically important difference between them is that the uni-directional channels, (e.g., television, radio) facilitate linguistic adoption on an essentially conscious, quasi-cognitive basis. If a term is used that seems suitable, especially if the speaker has prestige, and after a number of hearings, it may be picked up. Thus lexical material can easily diffuse thereby. It is difficult to imagine a person switching from, say, "chesterfield" to "couch" entirely unconsciously. First, they would have to have noticed the usage of the term, realized that it meant the same thing, recognized to what group the speaker belonged, examined their own feelings regarding that group (envy, disdain, etc.), and finally decided that it was or was not a usage with which they would rather not be associated. The first time they use the term, it may appear to occur unconsciously, but the individual in question will almost always betray by a smile or laugh, their awareness of their adoption of a non-local term. Contrast this with face-to-face conversation and telephone conversation, where, to maintain the social contact, the listener must pay attention to the *meaning*, leaving any diffusion that is to occur to unconscious processes. Such processes, I contend, are likely to affect only phonetic material, e.g., a slight shift from a pure /ʌ/ toward an /a/ beginning for a diphthong (a Canadian yielding to American pressure to abandon 'Canadian raising') can quite naturally occur without conscious thought. The ubiquitous and embarrassing phenomenon of unconscious imitation of a vowel or even a consonant in the speech of a stranger with whom one is conversing (often, it seems, a Scot) also testifies to this.

6.2 Implications from other disciplines

This communication channel distinction that I am drawing is not new. In a number of sub-disciplines of sociology it has been recognized. I refer to persuasion theory, communication theory, influence theory, the theory of the diffusion of innovations, advertising theory, political opinion theory, etc. Persuasion theorists (Fotheringham, 1966; Petty and Cacioppo, 1986) speak of 'central' and 'peripheral' channels to persuasion. A central channel is conscious and cognitive in character, while a peripheral one is unconscious. Attempts to persuade via peripheral channels are easily forgotten, easily reversed, and gradual in any effect on behaviour, while persuasion by central channels is marked by sharp changes in behaviour, resistance to reversal, and persistence over time (Petty and Cacioppo, 1986). I suggest that this is the same distinction I am drawing, with lexical material diffusing via central channels, while phonetic material diffuses via peripheral channels.

An additional circumstance lending credence to this distinction is the observation that the great period of acquisition of lexical items, sometimes estimated at 15 words per day during childhood roughly coincides with the use of a communication channel which is largely uni-directional, or , at any rate, highly asymmetrical.[2]

In the field of applied linguistics, where the nature of UG and the critical period hypothesis have been vigorously debated (Birdsong, 1999), the modern consensus (Eubank and Gregg, 1999; Flege,1999) seems to be that no critical period exists for lexical material, hence acquisition of vocabulary is at most, only slightly affected by UG., while there plainly is a role for UG and at least one critical period (perhaps more than one) for other aspects of language, including acquisition of the basic phonological/phonetic patterns of the language. Since dialectal diffusion of lexical material is largely a post-puberty phenomenon, the idea that diffusion of phonetic material (such as 'Canadian raising') may diffuse differently, and by different channels, ~~than does~~ from lexical material, for which there is no critical period, is supported.

[2] I am grateful to Wyatt Michael for pointing this out to me.

Another line of enquiry, the psychological study of learning, has postulated a distinction between 'implicit' and 'explicit' memory. The characteristics found for these varieties (Ellis, 1994) again correlate nicely with, respectively, learning of phonetic material and of lexical material. That dialectal diffusion depends on some kind of act of learning by the recipient of the diffusion should need no underlining.

If this is right, how does it impact the matter of the models? It is my belief that the wave model, suitably updated to take account of television and radio will be found to account quite well for the geolinguistic diffusion of lexical items, while the gravity model, also updated (possibly with a 'border' term) will account for non-lexical material.

So, what about the pronunciation of those words of foreign origin? Aren't they phonetic? It is my belief that the answer is no. They are tied tightly to the corresponding lexical entry. These are words typically acquired with an awareness of their 'foreign' origin; their pronunciation is thus acquired at the same time as the lexical entry itself. It is noteworthy that they vary widely in how sharply they contrast across the border. Some are almost exclusive in one country, while the other pronunciation is of low frequency in the other; others show a strong mutual contrast. They may not constitute a unitary phenomenon.

It is appropriate to ask why we are observing this difference now, when Trudgill in England in 1974, did not. I believe the answer lies in this, that social intercourse by face-to-face conversation was still predominant in the area, the era, and the class that Trudgill dealt with. The BBC in that era still clung to the practice of using only received standard pronunciation and vocabulary. The speech Trudgill was studying was not received standard, and many of his subjects did not speak it. Thus the only channel that was playing a major part in the process he was investigating was face-to-face conversation.

7. CONCLUSION

In short then, my position is that the contrast between the relatively pervasive Canadian acceptance of American lexical material, and the sturdy resistance to sounding like Americans can best be accounted for in general by the different properties of the different communication channels along which lexical and non-lexical material preferentially diffuse. The details of how the two models need to be modified to take account of a political border (as well as other shortcomings) are legitimate questions still.

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APPENDIX

Table 1:
Boberg's list of 'foreign' words (adapted from Boberg (2000))
(The vowels where the contrast occurs are underlined, and the given pronunciations are the American ones)

	% /a:/ for Americans	% /æ/ for Canadians
panorama	*18*	*94*
Pakistani	*21*	*91*
Iraq	*28*	*93*
pajamas	*58*	*85*
plaza	*75*	*84*
Colorado	*86*	*74*
Vietnam	*86*	*56*
taco	*88*	*52*
Slavic	*89*	*85*
Mazda	*93*	*82*
macho	*93*	*32*
llama	*94*	*71*
pasta	*95*	*81*
lava	*95*	*77*
drama	*95*	*75*
average:	74.2	75.4
standard deviation:	28.6	17