

THE INTERPLAY BETWEEN
DIACHRONIC LINGUISTICS AND DIALECTOLOGY:
SOME REFINEMENTS OF TRUDGILL'S FORMULA

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0. ABSTRACT

The purpose of this paper is twofold: in the first place it will be demonstrated how a formula evaluating the influence of one dialect on another, as suggested by Trudgill (1974), can be used for diachronic linguistic ends. In the second place, we will propose two refinements of Trudgill's formula.

First, some examples of the use of dialect borrowing as an explanation in diachronic linguistics are given. In the second section Chen's vehement criticism of explanations which rely on dialect borrowing will be discussed and it will be shown how it should be possible to give more content to the label "dialect borrowing". The third section is devoted to Trudgill's investigation and to the formula for explaining the influence one dialect has on another, which was the result of his examination.

In the fourth section the result of a survey similar to Trudgill's carried out in the dialect area around Amsterdam, are given and the allied refinements of Trudgill's formula are proposed.

The fifth and last section deals with possibilities for further research and the uses of diachronic linguistics of formulas such as the one proposed here.

1. DIALECT BORROWING AS A MEANS OF LANGUAGE CHANGE

Since the invention of exceptionless sound changes, scholars have been needing an explanation of the persistent exceptions.*

The most successful and according to Bloomfield (1933:479) the only explanation of exceptions to sound changes is dialect borrowing: the spread of a form from one dialect to other dialects. General remarks

on dialect borrowing appear already in Paul (1880:399), but the romanist Schuchardt (see Vennemann and Wilbur [1972]) was the major propagandist for the use of dialect borrowing as an explanation for linguistic change. The notion of dialect borrowing as an explanatory tool for the spread of dialect phenomena was developed only in the first decennia of the twentieth century, essentially in the work of German and Dutch dialectologists.

Frings (1926) could only account for the spread of a number of words in Rhineland (Germany) by assuming influence from Cologne.

In Debus (1962) we can find far more examples of the spread of certain dialect phenomena around German cities, examples which can only be explained satisfactorily with the aid of dialect borrowing.

Kloeke (1927), a Dutch dialectologist, also made a strong case for dialect borrowing as the most important factor in language change. He tried to demonstrate that the Dutch dialect areas as defined by currently important isoglosses (for example, the palatalization and diphthongization of West Germanic *û*) are the result of borrowing from a southern dialect in the 16th and 17th century (see Bloomfield 1933: 328). As far as we know, the most basic claim, viz. that dialect borrowing must play some role in a theory of language change, has not been refuted, despite much criticism of details.

2. CRITICISM OF DIALECT BORROWING AS AN EXPLANATION OF LANGUAGE CHANGE

The use of dialect borrowing for explanatory ends has been criticized by Chen (1973:462ff.). His closing argument against the use of dialect borrowing as an explanatory tool is the most important one:

Lastly, there is one more reason why 'dialect mixture' has been used as a favourite cover-symbol for exceptions to sound laws, namely it is in most cases almost impossible to rule out the possibility of dialect borrowing. Spatially speaking, geographical distance cannot serve to factor out interdialectal loans; we have known cases of saltatory sound changes and lexical interference

especially between distant urban centers. Temporally, the absence of evidence of cross-linguistic or cross-dialectal interference at any point in time cannot be adduced as proof that such interference could not have taken place before or after that point in time.

The arguments against dialect borrowing presented by Chen are methodological in character: dialect borrowing is less successful as a scientific means of explanation because it cannot be refuted. Nevertheless, a theory of language change must contain a theory of dialect borrowing, for it can be proved from some well-attested changes that dialect borrowing does indeed exist.

To set some bounds to the term dialect borrowing will not be a very easy task. Several difficulties are mentioned in Chen (1973), such as the alleged influence of town A on another town B, with a great distance between A and B, while no influence can be attested in the regions between A and B. We know of course of these cases, but don't think that it is useful to try to explain everything at once. The preferable strategy seems to be, as in other sciences, one of beginning with a very simple case: for example, the influence of the dialect of a big town on the dialects of its surroundings during a limited period. The reasons for doing so are the following:

1. In detailed investigations, for example Debus (1962), it has been proved that certain large towns have influenced the dialects of their surroundings.
2. In most cases there is no mutual influence between the town and its surroundings; it is "one-way traffic" influence.
3. By choosing the right location for the survey, it is possible to limit the number of surrounding dialects.

We cannot but hope that the results of studying more or less simple cases will make it possible to explore later the complex and intricate ones.

3. TRUDGILL'S FORMULA

The first step towards a better definition of the label "dialect borrowing" has been taken in Peter Trudgill (1974). This article shows, on the basis of dialect investigations in Norway and East England, how recent developments in theoretical geography can be applied to linguistic geography and how this can lead to more adequate explanations for the geographical spread of certain linguistic facts. Since our explanation relies in large part on Trudgill's, it is necessary to discuss his article in more detail.

Trudgill carried out his Norwegian research in Brunlanes, a small rural peninsula on the south coast of Norway; he explored the influence of the rather big town Larvik on the other towns of this peninsula. For his investigation, Trudgill used a technique of division of the dialect area which for some time has been successfully employed by geographers to describe and explain, for example, technical innovations. He divided the landscape under investigation into areas of uniform size and shape, forming in this case a hexagon grid.

Subsequently, he selected at random one named locality in each cell and recorded casual speech (as defined in Labov [1966]) of members of the population of different ages in each locality.

In examining the influence of Larvik on the other cities of the peninsula, he looked for only one linguistic phenomenon, the realization of the /æ/, which was originally realized as [ɛ] on the whole peninsula, but as [a] in Larvik.

The different variants of the phoneme /æ/ were set on a value scale in the manner of Labov (1966), the individual scores for its pronunciation were calculated for each informant, and then the average scores for each cell were worked out for three different age groups: 24 years old and younger; between 25 and 69; older than 69.

On the base of these data three different maps for the three age groups could be constructed with isoglosses indicating greater or less influence from Larvik.

Next Trudgill tried to explain why the influence from Larvik was as it was for the three different age groups, making use of a formula, the gravity model, often used by geographers to investigate the interaction between two centers.

The gravity model has the following form:

$$1. \quad M_{AB} = \frac{P_A \cdot P_B}{(d_{A-B})^2}$$

where M_{AB} is the interaction between A and B, P is the population in thousands, and d_{A-B} is the distance between A and B.

Since Trudgill was not interested in interaction, but merely in the influence of one center on another, and since he assumed that interaction consisted of influence in each direction proportional to population size, he amended this formula to yield 2:

$$2. \quad I_{AB} = \frac{P_A \cdot P_B}{(d_{A-B})^2} \cdot \frac{P_A}{P_A + P_B}$$

where I_{AB} is the influence of town A on town or village B, P is the population in thousands, and d_{A-B} is the distance between A and B.

Furthermore, he added to the formula a factor s, expressing prior existing linguistic similarity. This final version of the formula as suggested in Trudgill's article is as given in 3:

$$3. \quad I_{AB} = s \cdot \frac{P_A \cdot P_B}{(d_{A-B})^2} \cdot \frac{P_A}{P_A + P_B}$$

where I_{AB} is the influence of town A on town or village B, P is the population in thousands, d_{A-B} is the distance between A and B, and s is a factor expressing prior existing linguistic similarity between the dialects of A and B.

However, since the dialects of the Norwegian peninsula were very similar to each other, Trudgill did not need to take into account the possible values of s in the Norwegian survey, and he used the formula without any factor s .

He gives some suggestions, based on his intuition, for the possible values of s . For example, s is 4 for the towns and villages near town A, 3 for the region around town A, etc.

He suggests further that the factor s is still a rather vague one which needs to be defined more precisely.

To explain the map of the influence that Larvik had on the towns and villages of the peninsula on the basis of the data obtained from persons older than 70, Trudgill used the formula taking into consideration the distances by sea between Larvik and the other towns and villages.

At the time that these people learned to speak, around 1900, roads had not yet been constructed on this peninsula and therefore travel by sea between Larvik and the cities on the coast was far more important than overland travel was. On the other hand, in order to explain the map of the influence that Larvik had on the peninsula on the basis of the data obtained from people younger than 24, he used the distances by land, because by the time that this generation learned their language, road traffic was far more important than sea traffic.

The linguistic map of the Larvik [a·] spoken by people older than 69 now indicates exactly those towns with a Larvik [a·] that have been predicted by the formula calculated for sea distances.

The linguistic map of Larvik [a·] spoken by people younger than 24 indicates precisely those towns and villages with a Larvik [a·] which have been forecasted by the formula calculated for distances by road.

In this Norwegian instance the formula exactly corresponded with the facts. This is the case not only for this example, but also for word initial h -deletion, a change in progress in East England, which is explained in Trudgill's article by the same formula. Thus it ap-

peared from his investigation that with the aid of a rather simple formula employing easily obtainable main factors such as distance and population size, dialect influence can be explained. On the other hand, such a formula can also be used to determine whether or not it is plausible to consider a language change to be the result of dialect influence.

Trudgill himself explicitly points out that this formula has to be considered as a starting point and that some other things should eventually be incorporated:

- the extent to which a factor has prestige or covered prestige;
- in which particular social group the innovation has arisen;
- refinement of the factors. (Some linguistic systems will offer more resistance to an innovation than others.)

In the present article we will restrict ourselves to redefining Trudgill's formula only with respect to factors.

4. TESTING TRUDGILL'S FORMULA: THE INFLUENCE OF THE DIALECT OF AMSTERDAM ON THE DIALECTS OF THE NEIGHBORHOOD

4.0. A formula can be tested by confronting the data which are found in the real world with the data expected on the grounds of that formula. In this section the data found in our investigation will be compared with the expectations yielded through Trudgill's formula.

However, before discussing our investigation, it is necessary to pay attention to the most important difference between our investigation and Trudgill's.

4.1. We try to become aware of language change by collecting data from different points of time (real time), while Trudgill tried to do so by collecting data from people of different age groups (apparent time). Studying language change in real time is rather traditional;

one studies the differences between the speech of, e.g., forty-year-old people in a certain society and the speech of people of the same age 60 years ago. On the other hand, study of language change by employing apparent time has been initiated and stimulated by sociolinguists (Labov 1966, Trudgill 1974). The principle of apparent time is based on the idea that the speech of a person of 80 can be considered as a reflection of the speech of the younger generation 60 years ago, and that the speech of a person of 60 can be considered as a reflection of the speech of the younger generation 40 years ago, etc. In studying language change in apparent time, one studies at a certain moment the differences between the speech of people of different ages. The use of apparent time is based on the hypothesis that changes in the speech of adults are of minor importance. Both types of diachronic investigation have their pro's and con's: *Apparent time* investigations share the following *advantages*:

- A. It is possible to get a corpus of data which is in principle unlimited; every classification according to the age of the informants can be made (within the limits of the human race: ± 55 years). It is therefore possible to enlarge the data whenever one notices that one lacks the information to solving a particular problem.
- B. Collecting, transcribing and processing the data can be done in a uniform way.
- C. It is possible to elicit different styles of speaking.

Apparent time investigations have the following *disadvantages*:

- A. It has to be emphasized that up until now the equation of apparent and real time was a working hypothesis and that results of very recent research have cast some doubt upon its correctness (Fred Peng, paper presented at the III ICHL).
- B. Investigations of changes over a period which surpasses 55 years is impossible, just as is the study of changes taking place more than 55 years ago, during a relative short period of time.

Real time investigations share the following *advantages*:

- A. Depending on quality and quantity of the material, in principle any period whatsoever can be studied.
- B. There is no need for the doubtful equation mentioned above as a disadvantage of apparent time investigations.

Real time investigations have the following *disadvantages*:

- A. The data are limited: the selection of the periods under investigation is dependent on the presence or absence of material from the dialects.
- B. The recordings can be unequal in quality, the gravest problem being that one can never be sure about their quality. Observed differences between two recordings can be attributed to differences in collecting, transcribing and processing the data.

Despite the disadvantages of the real time method, we had to use it because of the rather long period we wished to explore (about 90 years).

4.2. Method: Collecting the data.

For our investigation of the influence of the Amsterdam dialect on neighboring dialects, we collected data from the province of North Holland, the area surrounding the city of Amsterdam. This province is a peninsula, for the most part surrounded by the North Sea, the Wadden Sea and the (former) Zuider Sea. In past centuries North Holland was scattered with lakes and seas, most of which have now been reclaimed, the famous polders.

In our investigation the area was covered with a hexagon grid (see map 1), with the cross section of a hexagon being approximately 5 kilometers (3 miles). Subsequently we tried to find a town or village in each grid for which data for three different points of time was available, namely from the following sources:¹

1. The last quarter of the 19th century: the questionnaires of the Aardrijkskundig Genootschap (the Dutch Geographic Society) which sent out two questionnaires, a rather short one in 1879 and a very large one in 1895.
2. About 1950: the recorded sentences of the Reeks Nederlandse Dialektatlassen (RNDA, Dutch Dialect Atlas Series) of North Holland (Daan 1969) and partly of South Holland (Van Ooyen 1968).
3. About 1970: recordings of casual speech (along the lines of Labov 1966) of dialect speakers, made by us and other members of the staff of the Institute for Dialectology in Amsterdam.

Although we studied several phonological variables, in this article we shall only report on the reflexes of W_{Gm.} \hat{z} and W_{Gm.} ai , which are both realized as [ɛ_ɪ] in current Standard Dutch.

The method used to determine the Amsterdam variants per grid was the same for each of the three points in time. First, all words containing the phonemes under consideration were counted per point in time; the totals are presented in Table I:

Table I

		W _{Gm.} \hat{z}	W _{Gm.} ai
Aardrijkskundig genootschap	1879	19	14
	1895	14	11
RNDA	1950	20	15
Recordings	1970	±100	±25

The data from the 1879 survey can be considered as a supplement to those from the 1895 questionnaire, for there were not many differences between them. Besides, the first one was filled up for less towns and villages than the second one.

Next, the Amsterdam variants (see Table II) were counted and their frequency in each grid was computed per point of time with the aid of the "formula" expressed in (4).

Table II

Standard Dutch	A		B	
	Amsterdam Variants		Dialect Variants	
ε̂ _l WGM. <i>î</i>	ε _T · æ· a·		æ̂ _l ε _T ̂ _l â _l ô _l ɪ	
ε̂ _l WGM. <i>ai</i>	ε _T · æ· a·		æ̂ _l ε _T ̂ _l â _l ô _l	

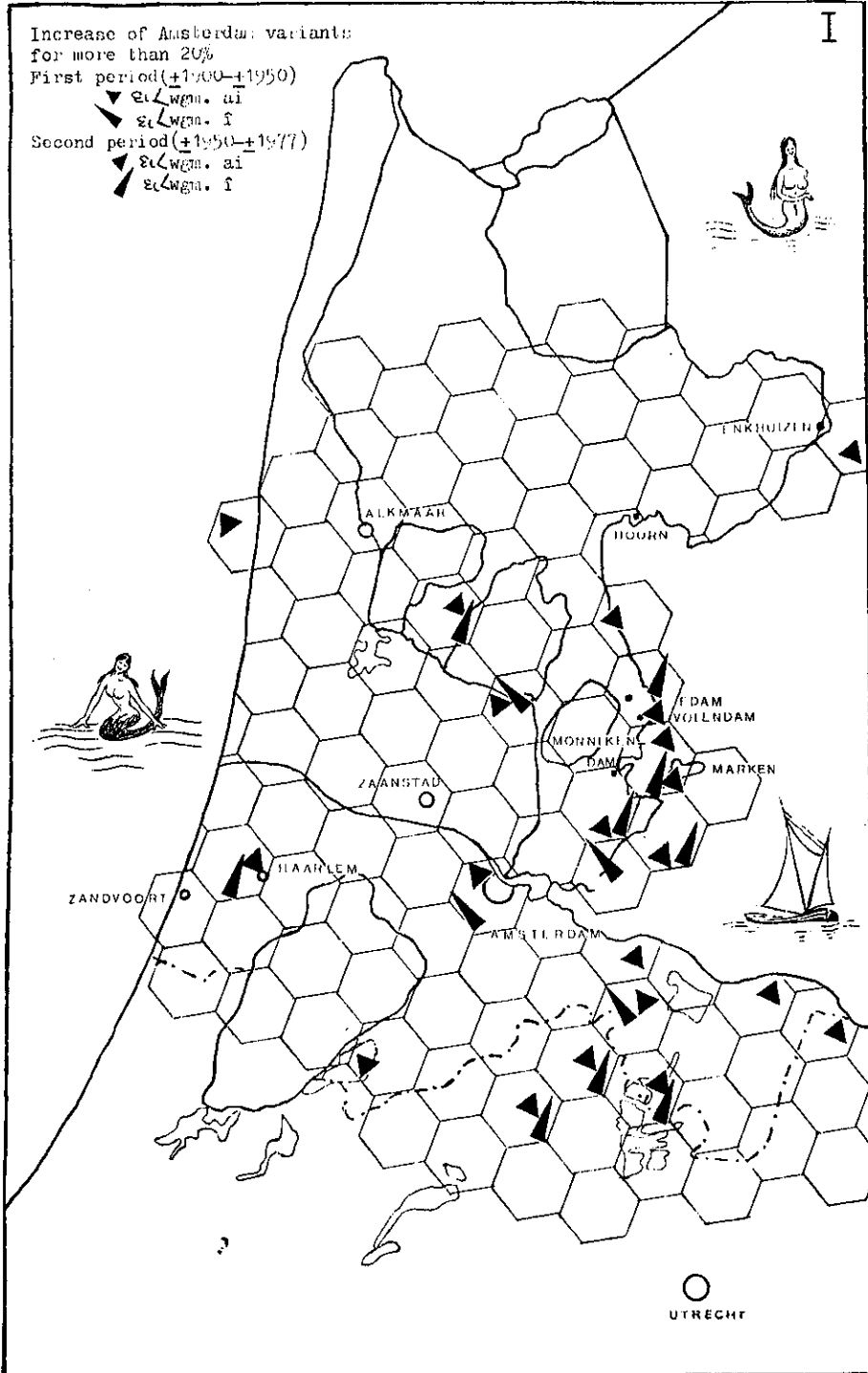
4.
$$\frac{\text{Number of Amsterdam variants in dialect D in point of time P}}{\text{Number of Amsterdam variants} + \text{number of all other variants in dialect D in point of time P}} = \text{Percentage of Amsterdam variants in dialect D in point of time P}$$

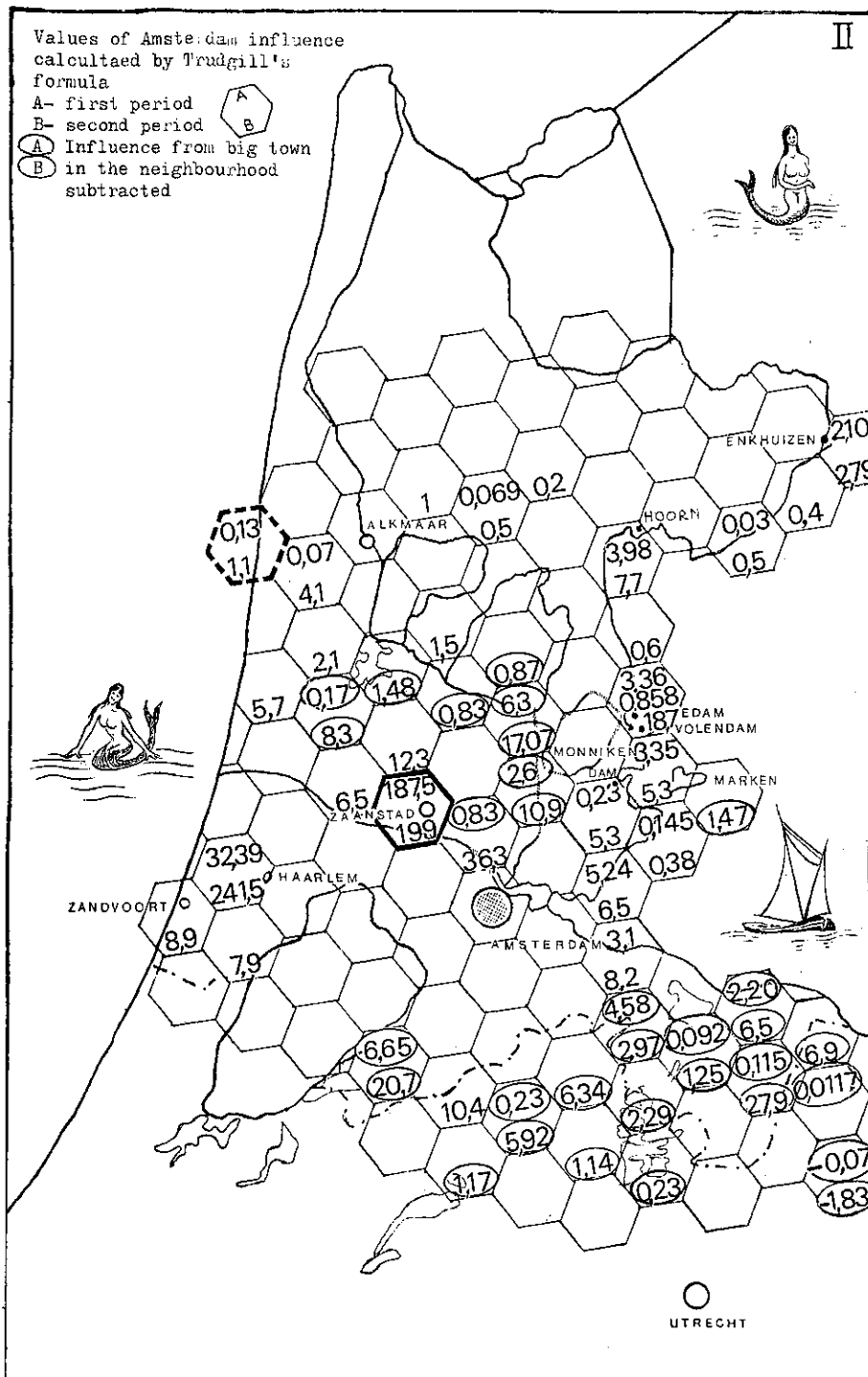
One must realize that in using such a method mistakes and errors can easily creep in, and that the precise percentages suggest more exactness than is justified. That is why we took increases in the number of the Amsterdam variants into account only if the growth of the percentage of Amsterdam variants between two points of time exceeded 20%. We are inclined to believe that an increase of 20% cannot be due to coincidence.

In Map 1 each increase of the Amsterdam variants greater than 20% has been depicted. Map 2 contains the indexes for Amsterdam influence, computed per period with the help of Trudgill's formula as given in (2), without any factor *s*.² For towns and villages situated between Amsterdam and another big town, two values have been calculated: one for the influence from Amsterdam and another for the influence from the other town, for example, Utrecht. After that, the value of the other town's influence was subtracted from the value of Amsterdam's influence. The resulting values have been circled.

4.3. The refinement of *s*.

A comparison of Map 1 and Map 2 reveals that there are a number of grids in which there are both a high index for influence in a certain period and a rise of Amsterdam variants, in the same period. These cases indicate that the formula works. However, there are also grids in which Trudgill's formula apparently does not work:





- A. There are instances of a high index of influence according to Trudgill's formula and yet no increase of the Amsterdam variants.
- B. There are also instances of a low index of influence according to Trudgill's formula co-occurring with an increase of the Amsterdam variants.

In our opinion, most incongruencies between attested influence and the indexes according to the formula can be resolved by refining the factors in two respects. These refinements of the factors will be discussed in detail in subsections 4.3.1. and 4.3.2., which deal with the restraining effect of "unnatural changes" and the restraining effect of "unfavorable system", respectively.

4.3.1. Unnatural Changes.

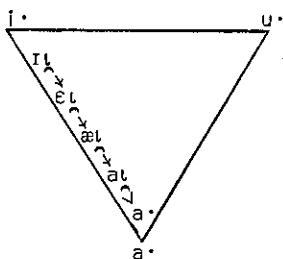
For a long time past linguists have noted that some sound changes occur frequently in the history of the languages of the world, while other sound changes occur seldom or never. This idea is being elaborated upon nowadays as the "search for substantive universals of sound change" or "natural changes".

Labov, Yaeger, and Steiner (1972) report some tendencies which they call principles of sound changes. These principles are based upon ongoing sound changes recently observed in sociolinguistic surveys by comparing the spectrograms made of vowels in the casual speech of different generations in the same speech community, and by comparison of the vowel spectrograms of the casual speech of dialect informants speaking closely related dialects.

The tendencies found again and again were confirmed by the philological evidence of sound changes in former stages in diverse languages. The observations of Labov which are relevant for our investigation are the following: in chain shifts, lax vowels usually fall, particularly the lax nuclei of upgliding diphthongs (p. 106). If this lax nucleus arrives at the lowest position of

the vowel triangle, in the neighborhood of the [a·], the glide of the diphthong is deleted and the former dissimilated diphthong is converted into a new long and low monophthong (p. 225). In Fig. 1 this typical development is depicted in the vowel triangle: a tensed long high vowel [i·] diphthongizes to [ɪɪ̯], then the nucleus lowers to [ɛɪ̯] and further to [æɪ̯] and [aɪ̯]. Finally the glide [ɪ̯] is deleted and there is a new long and low monophthong [a·].

Figure 1



→ = lowering of the lax vocal nucleus of the diphthong.

> = monophthongization of the most dissimilated diphthong.

(Based on Labov, Yaeger, and Steiner 1972.)

A slight digression about the status of "principles" of sound changes such as these, seems called for here. Every claim about something universal is somewhat presumptuous, for strictly speaking it can never be based on sufficient data. Therefore, one must in general be very cautious with universals.

However, we think that the ample documentation by Labov et al. can be backed up by material about changes in still other languages and dialects. See, for example, Andersen (1972:42), Schmitt (1931:100), Stampe (1972), and Miller (1973).

Therefore we believe the principles we shall use here are established enough to build upon.

We call a change which is just in line with the Labovian principles of sound changes a "natural change" and those which are not in line with those principles "unnatural changes".

With the aid of the distinction between natural and unnatural changes it is possible to differentiate between a rise of Amsterdam variants due to natural change (a "natural rise" of Amsterdam variants) and a rise of Amsterdam variants due to unnatural change (an "unnatural rise" of Amsterdam variants).³ This distinction is important for two reasons:

- A. The rise of Amsterdam variants due to a natural change is a less certain case of Amsterdam influence than is the rise of Amsterdam variants due to an unnatural change.⁴ If, for example, there is a rise of Amsterdam variants brought about by a natural change, and a very low index of influence according to Trudgill's formula, this can be explained in either of two ways:

1. there is no influence at all in that dialect: the rise of the Amsterdam variant is a spontaneous development;
2. the formula doesn't work.

The consequences of the formula are much more severe in the case of a low index and an unnatural change, when one is forced to assume that the formula does not work. Conversely, when there is a high index and a rise of Amsterdam variants brought about by a natural change, one *can* assume Amsterdam influence, although a spontaneous development is also possible. In the same circumstances with an unnatural change, the Amsterdam influence is certain. With the aid of the distinction between natural and unnatural changes, it is possible to discard some counterexamples, and, on the other hand, to establish firm and falsifiable cases of influence.

- B. Since there are two types of rising of Amsterdam variants -- natural changes, which can be considered as the stimulation or backing up of a natural development by Amsterdam influence, and unnatural changes, in which the Amsterdam variants had to substitute for one or more dialect variants -- it is not unreasonable to postulate that there will be a difference in

speed and force between these two, the first being faster and more powerful. We can assume that if there is an observable difference the lowest index for natural rise of the Amsterdam variants will be lower than the lowest index for the unnatural rise of the Amsterdam variants. If this assumption is in accordance with the facts, it can be considered an important argument in favor of the reality of the distinction between natural and unnatural changes.

In Map 3 the natural changes have been depicted in a different way from the unnatural changes.

Since it will obviously be impossible to discuss all of the changes in detail, we shall only consider those cases which can shed light on the more theoretical considerations mentioned above.

First, let us direct our attention to the thickly hatched grid of Map 2, the village of Egmond. From comparison of Map 2 with Map 3, it is apparent that there is a natural rise of Amsterdam variants in the first period combined with a very low index for influence (0.13). However, since this is a question of a natural change, the monophthongization of a maximally dissimilated diphthong, we are inclined to assume a development not caused by influence from Amsterdam. That's why this is not a true counter-example to the formula.

From comparing Map 2 with Map 3 it can be concluded that, according to our data, a natural rise of the Amsterdam variants has taken place, starting from an index of influence of 4.58 for the first period and from an index of 1.4 in the second period. Furthermore, it is apparent that an unnatural increase of the Amsterdam variants has taken place, starting from an index of 6.3 on in the first period and from an index of 5.3 in the second period.⁵

Thus, there is a difference between the minimal values for natural and unnatural changes in both of our periods and these differences are such that they support our hypothesis (cf. B).

This seems to be evidence enough to warrant trying to incorporate in the factor s of the formula the ability that influence

due to natural change is taking place in an easier way than does influence due to unnatural change.

In order to do so, one first has to take one type of change, either natural or unnatural, as the basic one. Our choice was the less marked change, the natural one.

As has already been mentioned, the lowest index for a natural change was 4.5, and for an unnatural change 6.3, in the first period. In other words, the restraining power of the factor for accounting for unnatural change in this period is so strong that the index for Amsterdam influence has to be $\frac{6.3}{4.6} = 1.36$ times as great as the Amsterdam influence index in the case of a natural change. There is yet another way to say the same thing: the index for influence is restrained by the factor $\frac{4.6}{6.3} = 0.73$ when the influence is due to an unnatural change.

For the second period the procedure is the same: the restraining power of the factor accounting for unnatural change has to be $\frac{5.3}{1.5} = 3.5$ times as great as the Amsterdam influence in the case of an unnatural change. In other words: the index for influence is restrained by the factor $\frac{1.5}{5.3} = 0.28$ when the influence is due to an unnatural change.

On the basis of the data from two different periods we have been able to define two values for the restraining power of an unnatural change: 0.73 and 0.28. Both values are less than 1; thus in this investigation the restraining effect of an unnatural change has been demonstrated.

It is not plausible on *a priori* grounds that the value for the restraining effect of an unnatural change can ever be fixed at one and the same "universal height". Up until now we have found that in our survey the restraining factor of an unnatural change lies between 0.28 and 0.73.

Further determination of the value for the restraining effect of an unnatural change will have to be done in other investigations.

4.3.2. Unfavorable system.

In the tradition of structuralist phonology there has been a lively debate about the probability of the assumption that certain properties of a vowel system stimulate or restrain a sound change. Goossens (1969:62ff.) refutes the premise that the properties of a vowel system can have a stimulating effect on a sound change, as has been assumed in Moulton (1962). Goossens demonstrates that, using the same data as those presented by Moulton, his isoglosses can be explained by assuming the contrary, namely the restraining effect of an unfavorable system on a sound change. It is this theory of a "negative teleology", in the words of Goossens, which is adopted here.

In short, the argument is as follows: a sound change, for example [a_ɪ] becomes [a·], caused by phonetic or extralinguistic factors, can spread throughout a speech community until it reaches the boundaries of a dialect in which there is already another [a·]. The spread will stop there because the collapsing of the other [a·] and the [a·] from [a_ɪ] would cause too much ambiguity.

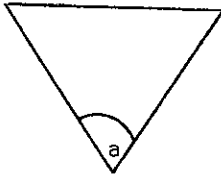
Proponents of this theory (Weijnen 1969:96) have stipulated -- on theoretical grounds -- one important proviso: the two phonemes must have a high frequency in the dialect under investigation.

The theory that an unfavorable vowel system can have a restraining effect on a sound change corresponds with the data found in our investigation.

The Amsterdam variants for Standard Dutch [e_ɪ] (see Table II) occupy a position in the vowel triangle as indicated in Fig. 2.

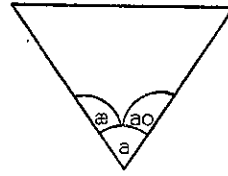
From comparison of Fig. 2 with Fig. 3 it is apparent that the position occupied by the Amsterdam variants for Standard Dutch [e_ɪ] in the phonological space is the same as the position occupied by the palatal and neutral [a·] for Standard Dutch [a·].

Figure 2



Position of Amsterdam
[a·], [æ·] for standard
[ε̥] in a phonological
space.

Figure 3



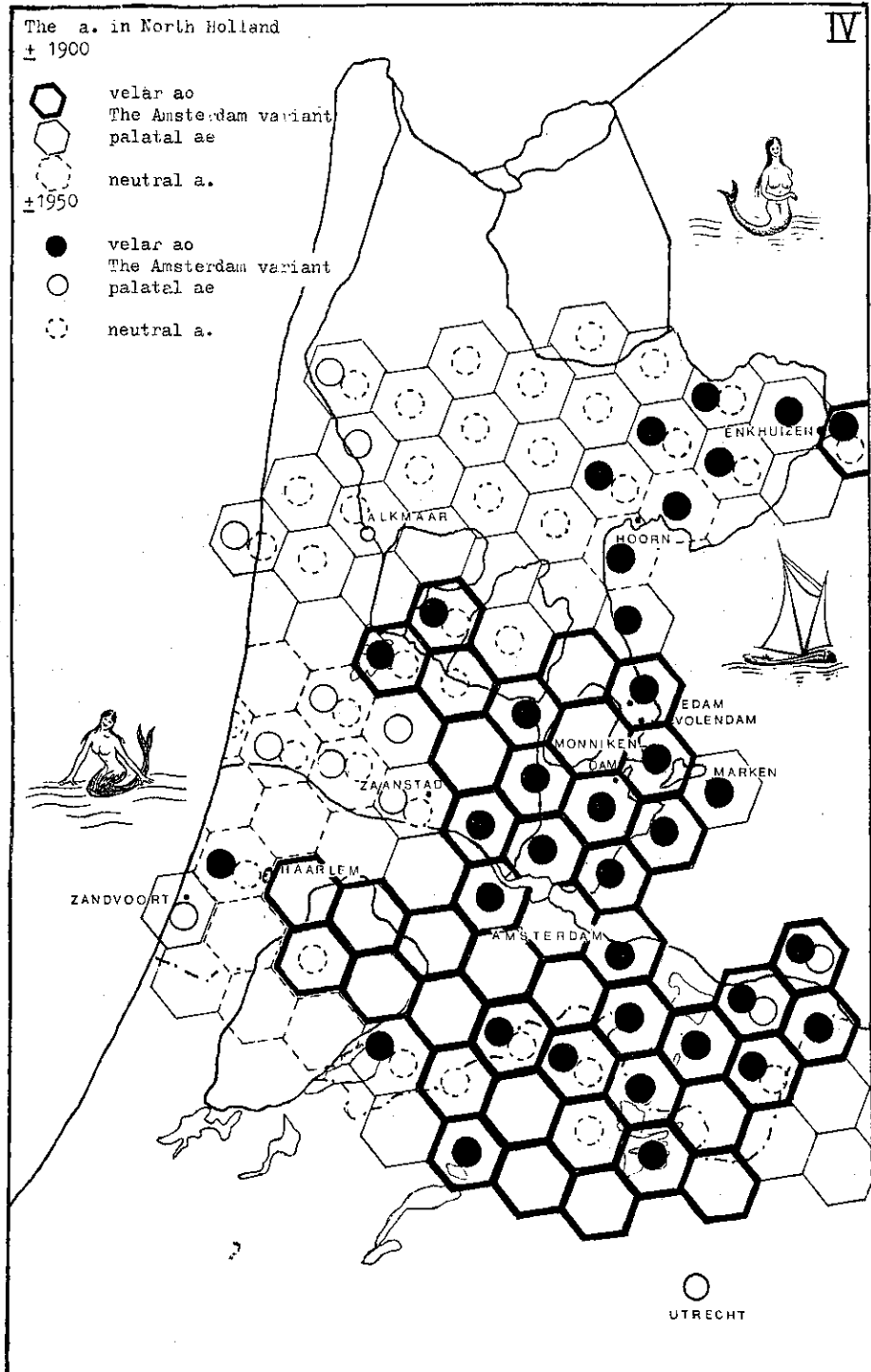
Positions of velar, neutral
and palatal [a·] in a phono-
logical space.

According to the theory that an unfavorable system indeed has a restraining effect on a sound change we can expect that the Amsterdam variants for Standard Dutch [ε̥] could not spread into dialects with a palatal or neutral [a·], since both [ε̥]'s and the [a·] occur very frequently in current spoken Dutch and collapsing the two would lead to much ambiguity.⁶

The dialects of the province of North Holland can be divided into two groups, one with a neutral or palatal [a·] for Standard Dutch [a·] from WGM. *a* and *æ*, the other with a velar [a·] for Standard Dutch [a·].

In Map 4 the different realizations for Standard Dutch [a·] depicted for the first two points in time of our investigation. The data are obtained from the same sources as those used for Maps 1 and 3. Comparing Map 4 with Map 3, one can conclude that in our area the presence of a palatal and/or neutral [a·] indeed had a restraining effect on the Amsterdam variants for standard [ε̥].

The restraining effect of an unfavorable system is powerful enough to warrant trying to determine its force more precisely in factors of the formula. This can be done in the following way: one should look first for the highest index of influence in a place where nevertheless no Amsterdam influence has been found, due to the unfavorable system. This would be *Zaanstad*, a large



town in the neighborhood of Amsterdam with an index of 199, a palatal [a·] and no Amsterdam influence. Secondly, one should find out what index this 199 should be lowered to, in order to prevent or obstruct Amsterdam influence. In our survey this would be 1.5, the minimal value of influence due to natural changes.

Thus it appears from the data of our investigation that the value of s for the restraining effect of an unfavorable system is $\frac{1.5}{199} = 0.00736$ or less.

It seems doubtful to us whether it will be possible to determine a fixed value for the restraining effect of an unfavorable system. Only the results of other investigations will be able to shed some light on "universality" of the value we have determined in our survey for the restraining effect of an unfavorable system.

Up until now, the only evidence adduced for the theory of the restraining effect of an unfavorable system, has been based upon the interpretation of dialect isoglosses, drawn on the basis of data for only one point in time (Moulton 1962). As a result of our investigation we see that the influence a large town has on its surroundings during a certain period could only be accounted for by adducing the restraining effect of an unfavorable system. The fact that the theory of an unfavorable system is also needed in order to explain the growth of Amsterdam influence for a certain period, can be regarded as stronger evidence in support of this theory. Besides, the incorporation in our formula of a factor for the restraining effect of an unfavorable system has the advantage that Trudgill's proposal to incorporate a factor of "prior existing dialect similarity" can be avoided when using the formula for explanations of sound changes. This is very attractive, because Trudgill's integers for the factor "prior existing dialect similarity" were rated intuitively and were not based on any theoretical insight. Besides, they were in principle based

on all the features that two dialects have in common, which makes it rather difficult to weigh this factor. The factor for the restraining effect of an unfavorable system, as proposed in this paper, is more precise because it is based upon only those differences between dialects which are relevant for the sound changes under consideration.

5. FINAL REMARKS

In this last section a few short remarks are in order.

In the first place, one should not take this paper as a report accounting for every decision we made and all the peculiarities we met while working on the project. In particular, we have omitted discussion of a few exceptions to the refined formula. These exceptions are of course very interesting, but we think that their explanation has little, if any, bearing on the problems focussed upon here.

Secondly, our refined formula should be tested in its turn. This could be done by investigating other Amsterdam dialect variants in the same area, or, even more interesting, by investigating dialect influence in other areas. The purpose of these urgent follow-up investigations would not be to find a universal constant proportion among the geographic factors in the formula. Because of the area dependency of these factors in the formula, it will never be possible, in our opinion, to find a fixed index above which dialect influence takes place and under which it doesn't. We think that testing the reality of the linguistic factors in the formula would be more successful.

From Labov's uniformitarian principle it follows that the linguistic factors in the formula probably will not be contingent or entirely language-particular.

We posit that the forces operating to produce linguistic change today are of the same kind and order of magnitude as those which operated in the past five or ten thousand years. (Labov 1972:275.)

We hope that other investigations will yield the result that the linguistic factors in the formula are language-independent qua direction and (perhaps) force.

This brings us to our final remarks: the benefits of the use of a formula. These are twofold:

1. Regarding dialectology: a formula can give explanations for isoglosses (see Trudgill 1974) and with the aid of a formula the use of dialect borrowing as an explanatory tool can be kept within bounds, for it is now possible to demonstrate when consideration of a language change as being a result of dialect borrowing is highly improbable.
2. Regarding diachronic linguistics: whenever the reality of a restraining or stimulating linguistic factor is demonstrated and incorporated in the formula, we can take it as independent evidence for the reality of the analogue idea in diachronic linguistics. Of course, the procedure can also work the other way round: whenever the incorporation of an alleged stimulating or restraining factor in the formula gives highly inconsistent results, the reality of the analogue in diachronic linguistics has to be questioned.

NOTES:

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1) It will be clear that for some hexagons we were not able to collect sufficient data, since part of the area under investigation consists of polders with some farms but almost no villages.

2) Since travel by water in the first period was as important as traffic by road, the formula had to be modified according to our data for towns and villages which had a good connection with Amsterdam by water as follows:

$$I_{\text{amst.-B}} = \frac{P_{\text{amst}}}{P_{\text{amst}} + P_{\text{B}}} \cdot \frac{1}{2} \cdot \left(\frac{P_{\text{amst}} + P_{\text{B}}}{(d_{\text{amst-B}})^2} \right)_{\text{by road}} + \frac{P_{\text{amst}} + P_{\text{B}}}{d_{\text{Amst-B}} \sqrt{d_{\text{amst-B}}}}_{\text{by water}}$$

By using $d_{Amst-B} \sqrt{d_{Amst-B}}$ instead of $(d_{Amst-B})^2$ we have incorporated the fact that in the first period villages and towns with both road and water connections had more contact with Amsterdam than places with only road connections had.

3) The standards which are applied for establishing the existence of an unnatural change are: (A) the occurrence of 20% or more Amsterdam variants ($[\varepsilon\cdot]$ or $[a\cdot]$) at a point in time, while there are no Amsterdam variants at a previous point in time, nor diphthongs ($[\varepsilon\underset{\wedge}{a}]$ or $[a\underset{\wedge}{a}]$) which could develop into them by a natural change. (B) the rise of 20% or more Amsterdam variants, while there is at the previous point in time a minimal percentage of diphthongs apt to change naturally into them, compared with the percentage of Amsterdam variants in the latter point of time.

This way of defining an unnatural rise of Amsterdam variants is rather doubtful for the first period because of the long space of time covered (50 years). In theory, it would have been possible to mistakenly conclude that a change was unnatural while it actually was natural. We tried to exclude misinterpretation by looking for indications in several dialect surveys (especially Heeroma 1935) of intermediate stages in the development of the sounds.

4) In the first case, using Andersen's (1973) terminology it can also be an example of evolutive change; in the latter case, it can only be an example of adaptive change.

5) It is evident from the maps that natural changes of all the phenomena under consideration do not take place in every grid with an index of influence higher than 4.5 for the first period and 1.5 for the second period. Also, unnatural changes of all the relevant phonemes do not take place in every grid with a value higher than 6.3 for the first period and 5.3 for the second period.

This is partly due to the fact that in some grids the same variants as the Amsterdam variants were present from the first point of time on (Hoorn, Marken), partly due to a factor which will be explained in 4.3.2.

6) According to the frequency list of words in spoken Dutch (Uit den Boogaart 1975), which is based on 121,569 tokens, the frequency of $[\varepsilon\underset{\wedge}{a}]$ from WGM. \hat{z} is 2854, of $[\varepsilon\underset{\wedge}{a}]$ from WGM. \hat{a} 738, and that of $[a\cdot]$ from WGM. \hat{a} and WGM. \hat{a} 5866.

REFERENCES:

- Andersen, H. 1972. "Diphthongization", *Language* 48.11-50.
 ----- 1973. "Abductive and Deductive Change", *Language* 49.765-93.
 Bloomfield, L. 1933. *Language*.
 Boogaart, P. C. Uit den. 1975. *Woordfrequenties*.
 Chen, M. 1972. "The Time Dimension: Contribution Toward a Theory of Sound Change", *Foundations of Language* 8.457-98.
 Daan, J. 1969. *Dialektatlas van Noord-Holland*.

- Debus, F. 1962. "Mundart und Hochsprache", *Zeitschrift für Mundartforschung* 29.1-43.
- Frings, Th. 1926. "Sprache und Geschichte am Rhein", *Sprache und Geschichte II*. Reprinted 1956. Halle.
- Goossens, J. 1969. *Strukturelle Sprachgeographie*.
- Heeroma, K. H. 1935. *Hollandse Dialectstudies*. Groningen.
- Kloeke, G. G. 1927. *De Hollandsche expansie in de 16e en 17e eeuw en haar weerspiegeling in de hedendaagse dialecten*. 's-Gravenhage.
- Labov, W. 1966. *The Social Stratification of English in New York City*. Washington: Center for Applied Linguistics.
- 1972. *Sociolinguistic Patterns*. Philadelphia.
- Labov, W., M. Yaeger and R. Steiner. 1972. *A Quantitative Study of Sound Change in Progress*. Report on National Science Foundation, Contract NSF-GS-3287, University of Pennsylvania. Printed and distributed by the U.S. Regional Survey, 204 N. 35th Street, Philadelphia, PA 19104.
- Miller, P. D. 1973. "Bleaching and Coloring", *Papers 9th Regional Meeting Chicago Linguistic Society*. Pp. 386-97.
- Moulton, W. G. 1962. "Vokalspaltung durch innere Kasualität: die Ostschweizerische Vokalspaltung", *Zeitschrift für Mundartforschung* 29.227-51.
- Ooyen, L. van. 1968. *Dialectatlas van Zuid-Holland en Utrecht*. RND A nr. 11.
- Paul, H. 1880. *Prinzipien der Sprachgeschichte*. Halle.
- Peng, F. C. C. 1977. *Sound Change and Language Change*. Paper presented at the IIIrd ICHL.
- Schmitt, A. 1931. *Akzent und Diftongierung*. Heidelberg.
- Schuchardt, H. 1885. *Ueber die Lautgesetze: gegen die Junggrammatiker*. Vennemann & Wilbur (eds.), 1972.
- Stampe, D. 1972. "On the Natural History of Diphthongs", in *Papers 8th Regional Meeting of the Chicago Linguistic Society*. Pp. 443-54.
- Trudgill, P. 1974. *The Social Differentiation of English in Norwich*. Cambridge.
- 1974. "Linguistic Change and Diffusion; Description and Explanation in Sociolinguistic Dialect Geography", *Language in Society* 3.215-47.
- Vennemann, Th. & T. H. Wilbur. 1972. *Schuchardt, the Neogrammarians and the Transformational Theory of Phonological Change*. Linguistische Forschungen 26. Frankfurt.
- Weijnen, A. 1969. "Lautgeschichte und Wortfrequenz", in *Actes du Xe Congrès International des Linguistes*. Bucharest. Pp. 453-62. Also in A. Weijnen, 1975, *General and Comparative Dialectology*. Pp. 95-105.

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