THE SOCIAL ORIGINS OF SOUND CHANGE

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The past century of phonetic research has illuminated our understanding of the production of sounds, the properties of the acoustic signal, and to a certain extent, the perception of speech sounds.[1] Studies of the linguistic organization of these sounds have clarified our understanding of their distribution and diversification, the end results of the process of sound change. But the search for the originating causes of sound change itself remains one of the most recalcitrant problems of phonetic science. Bloomfield's position on this question is still the most judicious:

> Although many sound changes shorten linguistic forms, simplify the phonetic system, or in some other way lessen the labor of utterance, yet no student has succeeded in establishing a correlation between sound change and any antecedent phenomenon: the causes of sound change are unknown. (1933:386)

In spite of Bloomfield's warning, linguists have continued to put forward simplistic theories that would attempt to explain sound change by a single formal principle, such as the simplification of rules, maximization of transparency, etc. But at the 2nd Congress of Nordic and General Linguistics, King rejected his own earlier reliance on simplification (1975), and recognized the point made 50 years earlier by Meillet (1921), Saussure (1922) and Bloomfield (1933): that the sporadic nature of sound change rules out the possibility of explanation through any permanent factor in the phonetic processing system. Explanations of the fluctuating course of sound change are not likely to carry much weight unless they take into consideration the parallel fluctuations in the structure of the society in which language is used.

The approach to the explanation of linguistic change outlined by Weinreich, Labov and Herzog (1968) divides the problem into five distinct areas: locating universal constraints, determining the mechanism of change, measuring the effects of structural embedding, estimating social evaluation, and finally, searching for causes of the actuation of sound changes. The quantitative study

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of sound change in progress by Labov, Yaeger and Steiner (1972) located three universal constraints on vowel shifting, a line of investigation originally foreseen by Sweet (1888), and expanded the view of functional embedding in phonological space outlined by Martinet (1955). Our current studies of sound change in progress in Philadelphia have developed further techniques for the measurement and analysis of vowel shifts, with the end in view of attacking the actuation problem itself. We have approached the question of why sound changes take place at a particular time by searching for the social location of the innovators: asking which speakers are in fact responsible for the continued innovation of sound changes, and how their influence spreads to affect the entire speech community.

It is often assumed that sound change is no longer active in modern urban societies, and that local dialects are converging under the effect of mass media that disseminate the standard language. The results of sociolinguistic studies carried out since 1961 show that this is not the case: on the contrary, new sound changes are emerging and old ones proceeding to completion at a rapid rate in all of the speech communities that have been studied intensively. Evidence for sound changes in progress has been found in New York, Detroit, Buffalo, Chicago (Labov, Yaeger and Steiner 1972), Norwich (Trudgill 1972), Panama City (Cedergren 1973), Buenos Aires (Wolf and Jiménez 1978) and Paris (Lennig 1978). This evidence is provided by distributions across age levels (change in apparent time), and by comparison with earlier phonetic reports (change in real time), following the model of Gauchat 1904 and Hermann 1930.

Whenever these changes in progress have been correlated with distribution across social classes, a pattern has appeared that is completely at variance with earlier theories about the causes of sound change. If one looks to the principle of least effort as an explanation, or to discontinuities of communication within urban societies with accompanying isolation from the prestige models, then it would follow that sound change arises in the lowest social classes. Arguments for the naturalness of vernaculars and the marked character of prestige dialects would also look to the lowest social class as the originating site of sound change (Kroch 1978). If the theorist focuses on the laws of imitation (Tarde

1873) and the borrowing of prestige forms from centers of higher prestige, then it would follow that new sound changes will be the most advanced in the highest social classes. Neither of these cases has appeared in the internal changes studied in urban societies. It is true that older sound changes, like stable sociolinguistic variables, are often aligned with the socioeconomic hierarchy, so that the lowest social class uses the stigmatized variant most often, and the highest social class least often. But new sound changes in progress are associated with a curvilinear pattern of social distribution, where the innovating groups are located centrally in that hierarchy: the upper working class, for example, or the lower middle class.

Thus in New York City, lower middle class groups were the most advanced in the raising of long open o in lost, law, etc (Labov 1966, 1972). The same pattern was found in the backing of (ay) and the fronting of (aw) in that city. In Norwich, Trudgill found that the backing of short e before /l/ in belt, help, etc., showed a rapid development among younger speakers, and was most advanced in the upper working class (1972). In Panama City, Cedergren found that one of five sociolinguistic variables studied showed an age distribution characteristic of sound change in progress: the lenition of (ch) in cerca, muchacha, etc. This sound change showed a strong peak in the centrally located Classes II and III that Cedergren had established in Panama City (1973).

Our project on linguistic change and variation selected Philadelphia as a site for the further study of this problem, since it appeared that almost all of the Philadelphia vowels were in motion, and all of the basic patterns of chain shifting found in English and French dialects could also be located in Philadelphia. The main data base for the Philadelphia investigation is a series of long-term neighborhood studies in working class, middle class and upper class areas, involving repeated interviews and participant observation of the speech community. To this is added a geographically random survey of telephone users employing short, relatively formal interviews. The convergence of the findings from these two data bases, which show opposing strengths and sources of error, provides strong support for the general findings, though only data from the neighborhood studies will be presented here.

The measurement of vowel nuclei was carried out by a frequency analysis using a real-time spectrum analyzer (SD 301C), followed by linear predictive coding of the frequency domain (Markel and Gray 1976, Makhoul 1975) to derive more exact estimates of the central tendencies of F1, F2, F3 and FØ. Complete vowel analyses of spontaneous speech were carried out for 97 subjects in the neighborhood studies and 60 subjects in the telephone survey, with 150-200 vowels measured for each subject. The mean values for each subject were then submitted to three normalization programs: a log mean model developed by Nearey (1977), the vocal tract scaling of Nordström and Lindblom (1975), and a three parameter method developed by Sankoff, Shorrock and McKay (1974).

Stepwise regression was carried out on the unnormalized and normalized series, deriving equations that predicted mean F1 and F2 positions from age, sex, social class, social mobility, ethnicity, neighborhood, communication patterns and the influence of other languages. The regression program enters into the equation the independent variable that has the highest partial correlation with the mean formant values, and with each successive term reexamines all previous terms as if they were the last to be added to the equation: if their effect falls below a given level of significance, they are removed (Draper and Smith 1966, Efroymson 1960). Thus the relative order in which variables are presented to the program is immaterial.

We then searched for the method of normalization that showed the maximum clustering to eliminate the effects of differences in vocal tract length, and the minimum tendency to eliminate variation known to be present in the data by independent means. Uniform scaling based on the geometric or log mean (Nearey 1977) was selected by these criteria and will be used as the basis for the discussions to follow.

Figure 1 shows the mean positions of the Philadelphia vowels of 93 speakers in the neighborhood series. It also shows vectors representing the significant age coefficients of the regression equations. The age coefficients are multiplied by the chronological age of the subject, e.g.

$$F2(aw) = 2086 - 5.39 \cdot Age^{[t=6.0]} \ldots$$

where the numbers may be read as F2 values in Hz. Thus the first and most significant coefficient shown above predicts that the difference in mean F2 positions for two speakers 50 and 25 years old

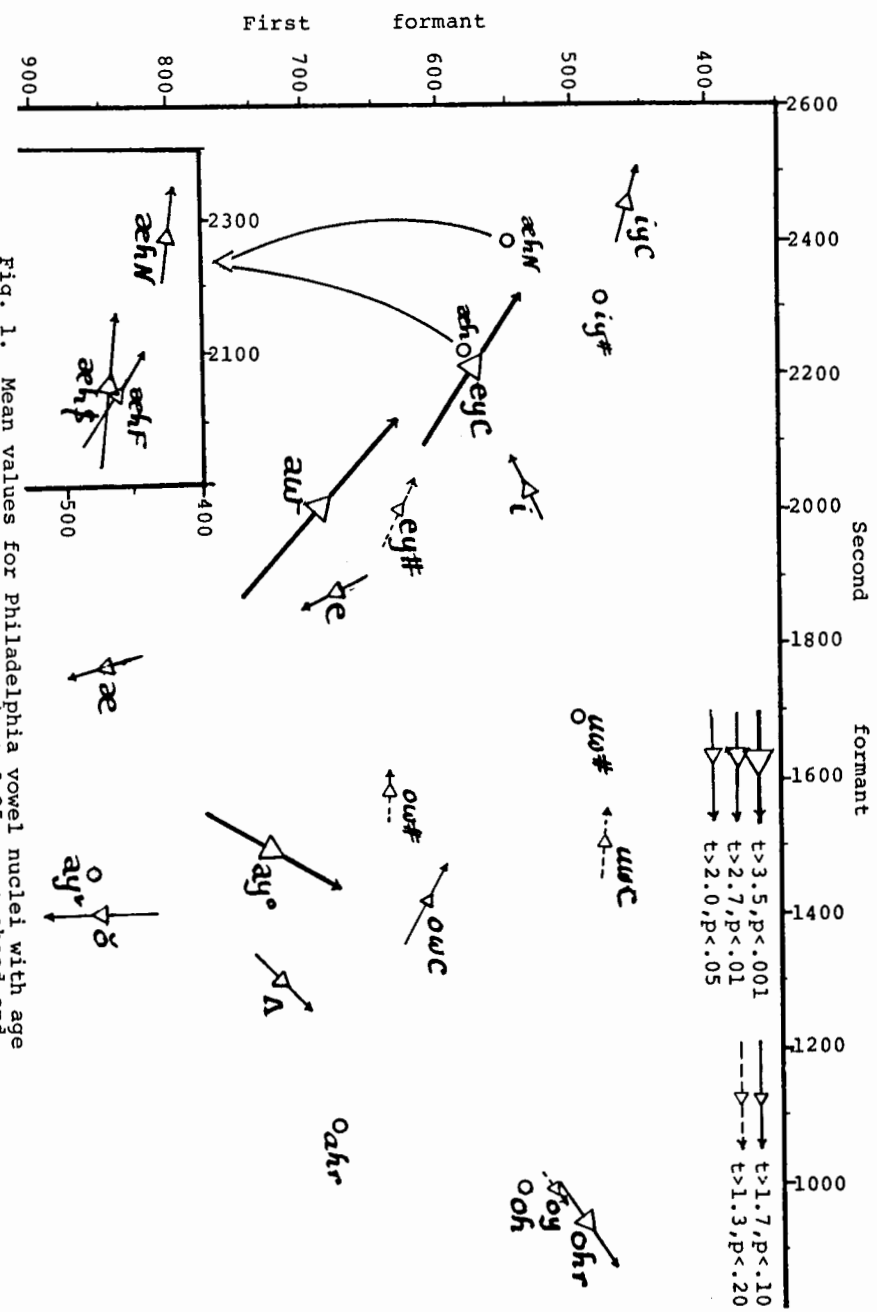

Fig. 1. Mean values for Philadelphia vowel nuclei with age coefficients shown as vectors projected 25 years ahead and 25 years behind the mean: data for 93 neighborhood speakers.

will be (25)(5.39) Hz: that is, the younger speakers will have a mean F2 135 Hz greater than the older. The vectors on Figure 1 represent the result of projecting the sound change 25 years ahead of the mean value and 25 years behind it. The significance of the effect is shown by the size of the triangles and the heaviness of the vector lines.

These age vectors fit in with evidence derived from earlier records and synchronic characteristics of the current data that allow us to set up five strata of sound change in Philadelphia:

a) recently completed changes: e.g., the raising of /ahr/ in car, part, etc.

b) changes nearing completion: e.g., the raising and fronting of (aeh) in man, hand, etc.

c) middle range changes: the fronting of (uw) and (ow) in too, moved, go and code (but not before liquids).

d) new and vigorous changes, not reported in earlier records: the raising and fronting of (aw) in house, down, etc., from [æᵘ] to [eᵒ]; the raising and backing of (ayᵒ) before voiceless consonants in fight, like, etc., from [aᵗ] to [ʌᵗ]; the raising of (eyC) in the checked syllables of made, lake, etc., from [ɛᵗ] to [eᴧᵗ].

e) incipient changes, e.g., the lowering of the short vowels /i/, /e/ and /æ/.

Conclusions from the earlier studies would lead us to associate a curvilinear social pattern with (d) the new and vigorous changes represented by the long, heavy vectors in Figure 1. Further terms in the regression equation show that this is the case. Extending the equation for F2 of (aw) to the three next most significant coefficients, we have [SEC = 'socio-economic class']:

$$F2(aw) = 2086 - 5.39 \cdot \text{Age} + 126 \cdot \text{Female}^{[t=3.5]} + 261 \cdot \text{SEC } 9^{[t=3.1]} - 253 \cdot \text{SEC } 13\text{-}15^{[t=2.5]}$$

In this socio-economic class scale, a 16-point index based on education, occupation and residence value, SEC 9 is generally considered the highest section of the working class, and 13-15 the upper middle class. Fig. 2 shows the coefficients for F1 and F2 projected as a single index on the front diagonal for all SEC, forming a smooth curvilinear pattern around SEC 9. Non-significant points are consistent with the main effects shown above.

Figure 3 shows the class distribution for the projection of checked (eyC). This is a broader curvilinear pattern with a significant peak in the middle working class group SEC 7, and two

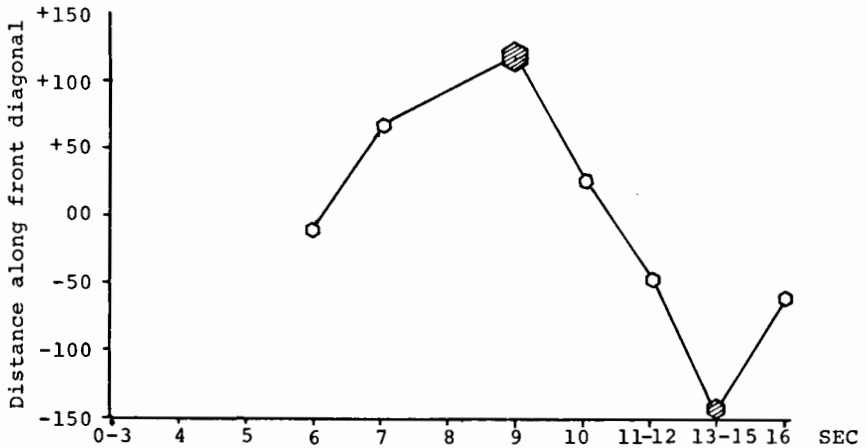

Fig 2. Projection along front diagonal of regression coefficients for F1 and F2 of (aw) for all socio-economic classes compared to SEC 0-3: data from 93 speakers in Philadelphia neighborhood study.

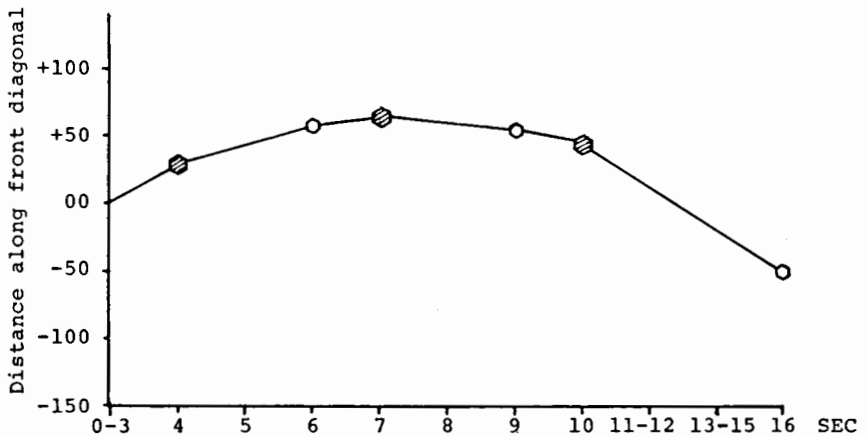

Fig 3. Projection along front diagonal of regression coefficients for F1 and F2 of (eyC) for all socio-economic classes compared to SEC 0-3: data from 93 speakers in Philadelphia neighborhood study.

$p < .01$
$p < .05$
$p < .10$

other points significantly higher than the reference level of SEC 0-3, located symmetrically above and below SEC 7. Again, the less significant points form a smooth curvilinear pattern.

The third new and vigorous change, the raising of (ay^0), shows no significant class distribution. It is worth noting that this is also the only change where men are in the lead: as in most previous studies of vowel change Philadelphia women are about one generation ahead of men in the early stages of change, except in the case of (ay^0). Whatever the explanation for this connection between sex and SEC patterns, the Philadelphia results agree with impressionistic studies in showing no cases where the lowest or highest social classes appear as innovators in systematic change.

Given the powerful tendency for systematic sound changes to arise in interior social groups, we must ask how this observation bears on the causes and motivations of sound change. Instead of pursuing speculations on the psychological traits of these upper working class innovators, it will be more fruitful to probe more deeply into their social roles and relations to others in the community. The further investigation of the problem carried out by our research group is based on the evidence of communication networks which cannot be presented in this brief report. In general, it can be said that the speakers who are most advanced in these sound changes are those with the highest status in their local community: more specifically, they are persons with the largest number of local contacts within the neighborhood, yet at the same time with the highest proportion of their acquaintances outside the neighborhood. A portrait is beginning to emerge of the individuals with the highest local prestige who are responsive to the broader, almost metropolitan prestige that has become associated with the sound changes in question. It is plain that we are dealing with the emblematic function of phonetic differentiation: the identification of a particular way of speaking with the norms of a particular local community.

Through the further study of the role of new ethnic groups entering the community, and the communication patterns that connect local neighbhorhoods, we hope to delineate more closely the social pressures that are responsible for the dissemination and further advance of sound change, and thus isolate the driving force behind the continued diversification of linguistic forms.

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