1994 Universelle Nuklearphonologie mit epiphänomenaler Silbenstruktur. In: Karl Heinz Ramers, Heinz Vater und Henning Wode (eds), *Universale phonologische Strukturen und Prozesse*, 7–54. Tübingen: Niemeyer.

1995 Der Zusammenbruch der Quantität im Spätmittelalter und sein Einfluß auf die Metrik. In: Hans Fix (ed.), *Symposion Quantitätsproblematik in den Germanischen Sprachen des Mittelalters und die Metrik 1993, Greifswald*, 185–223. (Amsterdamer Beiträge zur älteren Germanistik 42.) Amsterdam: Rodopi.

Vietor, Wilhelm

1893 *Wie ist die Aussprache des Deutschen zu lehren?* Marburg: Elwert.

Weithase, Irmgard

1930 *Anschauungen über das Wesen der Sprechkunst von 1755–1825.* Berlin: Ebering.

Wortmann, Felix

1970 Zur Geschichte der kurzen Vokale in offener Silbe. In: Dietrich Hoffmann (ed.), *Gedenkschrift für William Foerste*, 327–353. Köln: Böhlau.

Lexical diffusion in regular sound change

Joan Bybee

1. Introduction

Lexical diffusion refers to the way a sound change affects the lexicon: if sound change is lexically abrupt, all the words of a language are affected by the sound change at the same rate. If a sound change is lexically gradual, individual words undergo the change at different rates or different times. Whether sound changes exhibit gradual or abrupt lexical diffusion is a topic that surfaces persistently in historical linguistics, but as yet has not reached resolution. One early contribution to this debate by Schuchardt has been brought to modern attention in the Vennemann and Wilbur (1972) translation in which Schuchardt observes that high-frequency words are affected by sound change earlier and to a greater extent than low-frequency words. In this chapter I document the tendency noted by Schuchardt in several ongoing sound changes that are gradual phonetically and I argue that such changes are best accounted for in an exemplar model of phonological representation, a model that is an elaboration of the model argued for in Vennemann (1974).

2. Regular sound change or lexical diffusion?

The hypothesis that sound change is lexically regular seems well supported by the facts of change: when we observe that two languages or dialects exhibit a phonological difference it is very likely that this difference is regular across all the words that have the appropriate phonetic environment. This observation is fundamental to the comparative method; the establishment of genetic relations and the reconstruction of proto-languages are based on the premise that sound change affects all words equally. Schuchardt was one of the detractors from this position. When he observed sound change in progress, he noted that all words did

not change at the same rate, and the differences were not due to "dialect mixture" as often claimed by the Neogrammarians who supported the regularity position.

A major challenge to the regularity position in the twentieth century is expressed in the writings of William Wang (1969, 1977; Wang and Cheng 1977) who documents changes that seem to occur word-by-word over a long period of time. While some of these changes result in lexical regularity, Wang and his colleagues also identify changes that seem to be arrested after affecting only part of the lexicon.

William Labov (1981, 1994) also deals with the issue availing himself of the data from his numerous studies of sound change in progress. His proposal is that there are two types of sound change: "regular sound change" which is gradual, phonetically motivated and without lexical or grammatical conditioning and is also not influenced by social awareness; and "lexical diffusion change" as in cases studied by Wang, which are "the result of the abrupt substitution of one phoneme for another in words that contain that phoneme" (1994: 542). He observes this type of change most often "in the late stages of internal change that has been differentiated by lexical and grammatical conditioning" (1994: 542). Labov even goes so far as to propose that certain changes, such as the deletion of glides and schwa, will be regular changes, while the deletion of obstruents will show lexical diffusion.

A number of researchers have challenged this position. Phillips (1984) has argued that even low-level sound changes exhibit gradual lexical diffusion. Oliveira (1991) argues also that it is likely that gradual lexical diffusion occurs even in changes that turn out to be regular. Krishnamurti (1998) demonstrates that the change of $s > h > \emptyset$ in Gondi exhibits gradual lexical diffusion but still goes through to completion in some dialects. In this paper I will review evidence that even gradual, phonetically-conditioned change exhibits gradual lexical diffusion, though it is perhaps of a more subtle nature than the lexical diffusion studied by Wang and Labov. The lexical diffusion presented here for reductive phonetic change is highly conditioned by word-frequency.

In Hooper (1976) I identified a lexical diffusion paradox: reductive sound change tends to affect high-frequency words before low-frequency words, but analogical leveling or regularization tends to affect low-frequency words before high-frequency words. Working from this observation, Phillips (1984, 2001) has studied a number of changes

that move in each direction and has attempted to refine a hypothesis that predicts the direction of lexical diffusion. In this paper I will only discuss the first direction of change, the characteristic of reductive sound change, with the intent of demonstrating that word-frequency affects even changes that may have seemed regular to the Neogrammarians.

3. Frequency effects on regular sound change

Sound changes that are complete can be identified as regular or not, depending upon whether or not they affected all lexical items existing at the time of the change. Ongoing changes cannot be designated as regular or not, since they are not complete. However, one can reference the typical characteristics of a change to project whether it will be regular or not. That is, a phonetically gradual change that has a clear phonetic conditioning falls into Labov's first type and we can project its regularity. In the following I document lexical diffusion from high-frequency to low-frequency words in ongoing changes that can be expected to be regular, as well as in certain reductive changes that may never be complete because of the nature of the lexicon.

3.1. American English t/d-deletion

Consider the deletion of final /t/ and /d/ in American English, which occurs most commonly in words ending in a consonant plus /t/ or /d/, such as *just, perfect, child* or *grand.* This much-studied variable process has been shown to be affected by the preceding and following consonant, deleting more if a consonant follows, by grammatical status, deleting less if the /t/ or /d/ is the regular past tense of English, and by social and age factors (with more deletion among younger, lower socioeconomic class speakers) (Labov 1972; Neu 1980).

My own study of the deletion of /t/ and /d/, using a corpus of phonological variation in Chicano English speakers in Los Angeles (Santa Ana 1991) focussed on lexical frequency as a factor (Bybee 2000). Using 2000 tokens of final /t/ and /d/ following a consonant and referencing word-frequency from Francis and Kucera (1982), I found that deletion occurred more in high-frequency words. Table 1 demonstrates this

effect with a cut-off point of 35 per million. This number was chosen because I was also interested in whether or not a frequency effect could be found among regular past tense verbs (see Table 3) and this figure is the median for such forms in Francis and Kučera (1982).

Table 1. Rate of t/d-deletion for entire corpus by word-frequency

	deletion	non-deletion	% deletion
high-frequency	898	752	54.4%
low-frequency	137	262	34.3%

Chi-squared: 41.67, $p < .001$, df = 1

Similar results were obtained by Jurafsky et al. (2001) using 2042 monosyllabic content words ending in /t/ or /d/ from the Switchboard corpus, which is a corpus of telephone conversations by monolingual American English speakers. They found a strong effect of word-frequency ($p < .0001$). Another study, using both function and content words and polysyllabic words in addition to monosyllabic ones in the Switchboard corpus, found a higher level of significance for the association of word-frequency with final /t/ and /d/ deletion ($p < .00005$) (Gregory et al. 1999).

Will final /t/ and /d/ deletion after a consonant turn out to be a regular sound change? There is certainly precedent for such a change being regular in the end, especially in certain phonetic contexts. Final consonant deletion in French was completely regular when a consonant followed, but less so when a vowel followed (Harris 1988). In English erosion has been working on final consonants for some time. The deletion of a /b/ and /g/ after a homorganic nasal, as in *bomb* and *gang*, was completely regular and leaves English speakers virtually unable to produce final [mb] or [ng] clusters. Final /nd/ could certainly follow and delete regularly as well.

Can the deletion of an obstruent be phonetically gradual? Labov (1994) lists obstruent deletion under "lexical diffusion" changes, presumably because he considers obstruent deletion to involve the phonetically abrupt loss of a phoneme. However, there is evidence that the reduction of final /t/ and /d/ can be gradual. A final /t/ or /d/ may vary in length. This length variation occurs under the same conditions and in the same direction as the deletion variation. Losiewicz (1992) has shown that monomorphemic /t/ or /d/ are shorter in duration than regular past tense /t/ or /d/. As mentioned above, monomorphemic /t/ or /d/ are also more likely to delete. Figures from Bybee (2000) confirm this, as shown in Table 2.

Table 2. Rate of deletion for regular past tense compared to all other words of comparable frequency (403 or less)

	percentage deletion
all words:	44.1%
-ed verbs	22.6%

In addition, Losiewicz found that a final past tense /t/ or /d/ was longer in low-frequency verbs than in high-frequency verbs. This finding parallels the deletion data presented in Bybee (2000), as shown in Table 3. Regular past tense /t/ and /d/ are more likely to delete in high-frequency verbs than in low-frequency verbs.

Table 3. The effects of word-frequency on t/d-deletion in regular past tense verbs (non-prevocalic only)

	deletion	non-deletion	% deletion
high-frequency	44	67	39.6%
low-frequency	11	47	18.9%

Chi-squared: 5.00313, $p < .05$, df = 1

The data on this obstruent deletion process, then, demonstrates both lexical and phonetic gradualness. It thus cannot be said that obstruent deletion is the abrupt deletion of a phoneme. In fact, these data are problematic for any version of phonemic theory. A model that can accommodate these data will be presented in section 4.

3.2. Spanish [ð] deletion

Another good candidate for a phonetically gradual change in progress that exhibits lexical diffusion and that could turn out to be regular is the deletion of intervocalic /d/ or [ð] in many dialects of Spanish. D'Introno and Sosa (1986) regard the variants ranging from [d] to [ð] to ∅ as a continuum, affirming that the reduction is gradual in this case. My own

study of 571 tokens of intervocalic /d/ in Spanish spoken by native New Mexican speakers reveals that the rate of deletion is higher among high-frequency words. The frequency count used for Table 4 is taken from the 1.1 million word *Corpus oral de referencia del español contemporáneo (COREC)*. Past participle tokens were removed because the data also showed that past participles have a higher rate of deletion that other items.

Table 4. Rate of deletion according to token frequency for all non-past participle tokens in the small corpus using the *COREC* as a measure of frequency

	Low (0–99)	High (100+)	Total
Retention	243	287	530
Deletion	23 (8.6%)	78 (21.4%)	101 (16.0%)
Total	266	365	631

Chi square (N=631, df=1)= 17.3 p<.001

Again we have evidence that obstruent deletion can diffuse gradually through the lexicon, affecting high-frequency words earlier than low-frequency words. We do not know if this sound change will turn out to be completely regular. The earlier deletion of Latin /d/ between vowels left some residue (Menéndez-Pidal 1968). Thus Latin *credit* gives Spanish *cree* '3s believes'; *foedu* > *feo* 'ugly'; *pedes* > *pies* 'feet'; *fide* > *fe* 'faith'; *audire* > *oir* 'to hear'; *limpidu* > *limpio* 'clean'; etc. but a few words maintain the /d/, e.g. *sudare* > *sudar* 'to sweat'; *vadu* > *vado* 'ford'; *crudu* > *crudo* 'raw'; *nidu* > *nido* 'nest'; *nudu* > *(des) nudo* 'naked'. However, all of these words are attested without the *d* in Old Spanish, leading Penny (1991) to suggest that the form with the *d* is influenced by the Latin spelling. Others have argued that the deletion was constrained by whether or not the resulting vowel combination obeyed the phonotactics of Spanish at the time (see Pensado 1984). Thus while the earlier change was not completely regular, it was comparable to the present deletion in being phonetically gradual and it affected a large majority of words with intervocalic Latin *d*. I suspect the Neogrammarians would have counted it as "regular."

3.3. Vowel shifts

Labov (1994) searches his data on vowel shifts in American English for evidence of lexical diffusion. What he is looking for are cases in which words with the same phonetic environment for the vowel have distinctly different vowel realizations, as opposed to small differences that could be part of a phonetically gradual continuum. The vowel changes reviewed in his Chapter 16 show detailed phonetic conditioning, gradualness and lexical regularity. Labov even tests to see if homonyms can split given differences in their token frequency (pp. 460–465). This test, on words with very similar phonetic environments, such as *two, too, to, do, through,* turns up no lexical diffusion by word-frequency. The difficulty with this test is that all of the words used occurred three or more times in the interview, and thus must be considered to be of high-frequency. In addition, taking the very small set of words necessary to get comparable phonetic environments yielded so few words that it would be very difficult to discover any general word-frequency effect in these gradual changes. Indeed, it might be that for vowel shifts the phonetic environment is generally more powerful than any other effects because there are fewer words in each phonetic category.

However, some lexical diffusion is found in Labov's data on vowel shifts. The most famous and still unexplained case concerns the raising of short [æ] which affects the adjectives ending in [d] *mad, glad* and *bad,* but not *sad.* In this same shift some evidence for lexical diffusion by frequency is cited: Labov notes (1994: 506–507) that when word-initial short [æ] "occurs before a voiceless fricative, only the more common, monosyllabic words are tensed: tense *ass* and *ask;* lax *ascot, aspirin, astronauts, aspect, athletic, after, African, Afghan.*"

Similarly, in Moonwomon's (1992) study of the centralization of /æ/ in San Francisco English, she finds that in the environment before a fricative this vowel is more centralized than before a non-fricative; it is also more centralized after [l]. The most commonly used word with this pair of phonetic environments is *class. Class* shows more centralization than the other words with these two environments: e.g. *glass, laugh* and so on.

Moonwomon also studies the fronting of /a/ in the same speakers. Here a following /t/ or /d/ conditions more fronting than other consonants. Of the words in the corpus ending in final /t/, *got* is the most fre-

quently occurring. Moonwomon also shows that the fronting in *got* is significantly more advanced than in other words ending in alveolars, such as *not, god, body, forgot, pot,* and so on.

It appears, then, that some evidence that high-frequency words undergo vowel shifts before low-frequency words can be found. As mentioned above, it may be more difficult to discern frequency effects in vowel shifts because of the effects of the preceding and following environments, which narrow each phonetic class to a small number of words.

3.4. Vowel reduction and deletion

In addition to consonant reduction, as discussed in sections 3.1 and 3.2, another type of change that shows robust word-frequency effects is vowel reduction and deletion. Fidelholz (1975) demonstrates that the essential difference between words that do reduce a pre-stress vowel, such as *astronomy, mistake* and *abstain,* and phonetically similar words that do not, such as *gastronomy, mistook* and *abstemious,* is word-frequency. Van Bergem (1995) finds that reduction of a prestress vowel in Dutch also is highly conditioned by frequency. The high-frequency words *minuut* 'minute', *vakantie* 'vacation', and *patat* 'chips' are more likely to have a schwa in the first syllable than the phonetically similar low-frequency words, *miniem* 'marginal', *vakante* 'vacant', and *patent* 'patent'.

Deletion of reduced vowels is also conditioned by word-frequency. Hooper (1976) asked native speakers of American English for their judgments concerning whether or not a post-stress schwa was usually, sometimes, or rarely deleted in words such as *every, memory* and *family.* The results showed that subjects exercised some phonological constraints on schwa deletion, but aside from these, the contexts in which deletion occurred were highly influenced by word-frequency. That is, deletion was more likely in *nursery* than in *cursory*, in *memory* than in *mammary*, in *scenery* than in *chicanery*, and so on.

These deletions appear to be phonetically gradual in that the variants range from those in which a schwa is followed by a resonant, in these cases, [r], to variants in which the resonant is syllabic, to cases in which the resonant is not syllabic, i.e. all syllabicity has been lost. Such changes, then, are both phonetically gradual and lexically gradual. However, they may never fall into the category of regular sound change. The reason is that as new words enter the language, or low-frequency words become more frequent, there will always be new schwas developing in the context for this deletion process. Similarly, the vowel reductions discussed by Fidelholz and Van Bergem may never be complete. As new full vowels come into unstressed position there will be new material for the reduction to work on.

3.5. Reasons for word-frequency effects

The cases documented so far indicate that high-frequency words tend to change before low-frequency words when the change is the deletion of stops (English t/d-deletion), the deletion of fricatives (Spanish ð-deletion), some vowel shifts (Labov 1994; Moonwomon 1992), the reduction of vowels to schwa (in both Dutch and English), and the deletion of schwa (in American English). One might therefore predict that in general reductive changes tend to occur earlier and to a greater extent in words and phrases of high-frequency.

If we take linguistic behavior to be highly practiced neuromotor activity (Anderson 1993; Boyland 1996; Haiman 1994), then we can view reductive sound change as the result of the automation of linguistic production. It is well-known that repeated neuromotor patterns become more efficient as they are practiced – transitions are smoothed by the anticipatory overlap of gestures and unnecessary or extreme gestures decrease in magnitude or are omitted. Recent theories of articulatory change point to precisely these two types of changes – increase in overlap of gestures and decrease in magnitude – as describing all changes that occur in casual speech (Browman and Goldstein 1992) or in sound change (Mowrey and Pagliuca 1995).

If casual speech processes and reductive sound change are the natural result of the automation of linguistic productions, then it follows that such change will be more advanced in productions that are more highly practiced, i.e. high-frequency words and phrases. In fact, reductive sound change may be just the more salient aspect of an overall reduction in high-frequency words. Jurafsky et al. (2001) have shown, using the Switchboard corpus, that for 1412 tokens of monosyllabic content

words ending in /t/ or /d/, high-frequency words (at the 95th percentile) were 18% shorter than low-frequency words (at the 5th percentile). That is, the entire articulatory span of high-frequency words may be reduced compared to low-frequency words, a phenomenon that could give rise to some noticeable and not-so-noticeable articulatory changes.

Other findings by Jurafsky and colleagues indicate that articulatory reduction cannot run rampant. Using the same set of tokens discussed above, Jurafsky et al. (2001) find that the predictability of the word given the following word affects duration. That is, the first words in frequently occurring word pairs, such as *Grand Canyon, grand piano,* or *Burt Reynolds* were shorter than words used in less predictable contexts. Gregory et al. (1999) found that among 4695 monosyllables ending in /t/ or /d/, again from the Switchboard corpus, semantic relatedness to the discourse topic affected word duration: words related to the discourse topic were shorter than words that were not. In addition, in Gregory et al.'s study, words tended to be shorter if they were repeated in the same discourse (see also Fowler and Housum 1987). My interpretation of these results is that the tendency for articulatory reduction due to increased automation is always present and shows itself more prominently in highly practiced, frequent words. Reduction can be inhibited by the speaker's sensitivity to the predictability of words in the context. If the speaker knows that the word will be easily accessed in the context, because it or related words have already been activated, the reductive automating processes will be allowed to advance. If the word is less predictable in discourse, the speaker is likely to suppress the reductive processes and give the word a more explicit articulation.

4. Modeling phonetic and lexical gradualness

Both Wang's and Labov's views of lexical diffusion assume that a change that diffuses gradually through the lexicon must be phonetically abrupt. This is a necessary assumption if one accepts a synchronic phonological theory that has phonemic underlying representations. Words can change one by one only if the change is a substitution of phonemes in such a theory. The discovery that sound change can be both phonetically gradual and lexically gradual forces a different view of the mental representation of the phonology of words. If subphonemic detail or ranges of variation can be associated with particular words, an accurate model of phonological representation must allow phonetic detail in the cognitive representation of words.

Thus a proposal by Theo Vennemann comes to mind. In the late 1960's and 1970's there was much discussion of how abstract underlying phonological forms should be. Very few researchers were willing to take a definite stand on this admittedly complex issue, and the notion of underlying form careened wildly back and forth between concrete and abstract. In a 1974 Chicago Linguistic Society paper, Vennemann states clearly that the only realistic model and the only one that solves certain problems of interdependencies between patterns (or rules) would be one in which all words are listed in their systematic phonetic form. This proposal is a start towards a solution to the lexical-diffusion problem.

One objection that was brought up at the time concerned the problem of the variant phonetic shapes of different tokens of the same word. Vennemann's solution was to appeal to the notion of "systematic phonetic" representation as defined by Chomsky and Halle (1968). However, this level of representation is also an abstraction. A modification of the 1974 model, which maintains its beneficial features, can be made now given advances in the study of categorization by psychologists. A recent proposal is that the cognitive representation of a word can be made up of the set of exemplars of that word that has been experienced by the speaker/hearer. Thus all phonetic variants of a word are stored in memory and organized into a cluster in which exemplars that are more similar are closer to one another than ones that are dissimilar, and moreover, exemplars that are frequently-occurring are stronger than less frequent ones (Johnson 1997; Bybee 2000, 2001; Pierrehumbert 2001).

In this model, the exemplar "cloud" or cluster continues to change as language is used and new tokens of words are experienced. Thus the range of phonetic variation of a word can gradually change over time, allowing a phonetically gradual sound change to affect different words at different rates. Given a tendency for online reduction, the phonetic representation of a word will gradually accrue more exemplars that are reduced, and these exemplars will become more likely to be chosen for production where they may undergo further reduction, gradually moving the words of the language in a consistent direction. The more frequent words will have more chances to undergo online reduction and thus will change more rapidly. The more predictable words (which are usually

also the more frequent ones) will have a greater chance of having their reduced version chosen, given the context, and thus will also advance the reductive change more rapidly.

The exemplar clusters are embedded in a network of associations among words that map relations of similarity at all levels. Distinct words with similar phonetic properties are associated, as are words with shared semantic features. In Bybee (1985, 1988) I have shown that in such a network morphemes and morphological relations are emergent from parallel phonetic and semantic associations, and that schemas or abstractions over relations of similarity can be formulated that account for the regularities and patterns evident in language use. Other questions about this model with respect to phonology are answered in Bybee (2001).

An important property that the exemplar model shares with the 1974 model of Vennemann is the emphasis on words as storage units. Vennemann (1974) argued that even multimorphemic words have lexical listing, citing the fact that appropriate constraints on syllable structure can only be applied to whole words, not to morphemes. The common objection to this proposal made in the 1970's was that the human brain does not have sufficient storage capacity for all the words of a language, especially a language with large morphological paradigms. This argument has now been finessed with the discovery of the huge amount of detail the brain is capable of recording. Moreover, newer conceptions of the lexicon, not as a list, but as a network with tight interconnections provides the insight that listing two related words such as *Bund, Bundes,* does not take up as much cognitive space as listing two unrelated words, such as *Bund, Auto*. In addition, the lexical diffusion data provides empirical evidence that multimorphemic words can have lexical storage: as we saw in Table 3 above, high-frequency regular past tense English verbs are more likely to have their final /t/ or /d/ deleted than low-frequency verbs. In order for a frequency effect to accrue to a word that word must exist in memory storage; if multimorphemic words evince frequency effects, they must be stored in the lexicon.

5. Conclusions

A careful analysis of phonetically gradual reductive changes reveals lexical diffusion at a level not encompassed by the theories of Wang and Labov. It supports the observation made by Schuchardt that "Rarely used words lag behind; very frequently used ones hurry ahead" (Schuchardt [1885]1972: 58). Such patterns of diffusion have now been documented for changes involving consonant reduction, vowel reduction and deletion and, to a lesser extent, vowel shifts. Changes that are gradual phonetically and lexically present a challenge to the notion that words are represented phonemically in cognitive storage and suggest rather that a language user's memory representation of words is heavily based on his or her experience with the phonetic tokens of the language input.

In this model, as in Vennemann's 1974 model, memory representations always consist of complete syllables and words, and phonological generalizations describe only patterns that are present and accessible in the phonetic form of words.

References

Anderson, John R.
1993 *Rules of the mind.* Hillsdale, NJ: Erlbaum.

Boyland, Joyce Tang
1996 Morphosyntactic change in progress: A psycholinguistic approach. Ph.D. dissertation, Department of Psychology, University of California, Berkeley.

Browman, Catherine P. and Louis M. Goldstein
1992 Articulatory phonology: An overview. *Phonetica* 49: 155–180.

Bybee, Joan L.
1985 Morphology: A study of the relation between meaning and form. Philadelphia: John Benjamins.
1988 Morphology as lexical organization. In: Michael Hammond and Michael Noonan (eds.), *Theoretical morphology,* 119–141. San Diego: Academic Press.
2000 The phonology of the lexicon: Evidence from lexical diffusion. To appear in: Michael Barlow and Suzanne Kemmer (eds.), *Usage-based models of language*, 65–85. Stanford: CSLI.
2001 *Phonology and language Use.* Cambridge: Cambridge University Press.

Chomsky, Noam and Morris Halle
1968 *The sound pattern of English*. New York: Harper and Row.
D'Introno, Francisco and Juan Manuel Sosa
1986 Elisión de la /d/ en el español de Caracas: Aspectos sociolingüísticos e implicaciones teóricas. In: Rafael A. Núñez Cedeño, Iraset Páez Urdaneta, and Jorge Guitart (eds.), *Estudios sobre la fonología del Español del Caribe*. Caracas: Fundación Casa de Bello.
Fidelholz, James
1975 Word-frequency and vowel reduction in English. *Chicago Linguistic Society* 11: 200–213.
Fowler, Carol A. and Jonathan Housum
1987 Talkers' signaling of "new" and "old" words in speech and listeners' perception and use of the distinction. *Journal of Memory and Language* 26: 489–504.
Francis, W. Nelson and Henry Kučera
1982 Frequency analysis of English usage. Boston: Houghton Mifflin.
Gregory, Michelle, William D. Raymond, Alan Bell, Eric Fosler-Lussier, and Daniel Jurafsky
1999 The effects of collocational strength and contextual predictability in lexical production, *Chicago Linguistic Society* 35: 151–166.
Haiman, John
1994 Ritualization and the development of language. In: William Pagliuca (ed.), *Perspectives on grammaticalization*, 3–28. Amsterdam/Philadelphia: John Benjamins.
Harris, Martin
1988 French. In: Martin Harris and Nigel Vincent (eds.), *The Romance Languages*, 209–245. Oxford: Oxford University Press.
Hooper, Joan B.
1976 Word-frequency in lexical diffusion and the source of morphophonological change. In: William Christie (ed.), *Current progress in historical linguistics*, 96–105. Amsterdam: North Holland.
Johnson, Keith
1997 Speech perception without speaker normalization. In: Keith Johnson and John W. Mullennix (eds.), *Talker variability in speech processing*, 145–165. San Diego: Academic Press.
Jurafsky, Daniel, Alan Bell, Michelle Gregory, and William D. Raymond
2001 Probabilistic relations between words: Evidence from reduction in lexical production. In: Joan Bybee and Paul Hopper (eds.), *Frequency and the emergence of linguistic structure*, 229–254. Amsterdam/Philadelphia: John Benjamins.
Krishnamurti, Bh.
1998 Regularity of sound change through lexical diffusion: A study of s > h > ∅ in Gondi dialects. *Language variation and change* 10: 193–220.

Labov, William
1972 *Sociolinguistic patterns*. Philadelphia: University of Pennsylvania Press.
1994 *Principles of linguistic change: Internal factors*. Oxford: Basil Blackwell.
1981 Resolving the Neogrammarian controversy. *Language* 57: 267–308.
Losiewicz, Beth L.
1992 The effect of frequency on linguistic morphology. Ph.D. dissertation, Department of Linguistics, University of Texas, Austin.
Menéndez-Pidal, Ramón
[1904]1968 *Manual de gramática histórica Española*. Madrid: Espasa-Calpe.
Moonwomon, Birch
1992 The mechanism of lexical diffusion. Paper presented at the Annual Meeting of the Linguistic Society of America, January 1992, Philadelphia.
Mowrey, Richard and William Pagliuca
1995 The reductive character of articulatory evolution. *Rivista di Linguistica* 7(1): 37–124.
Neu, Helene
1980 Ranking of constraints on /t,d/ deletion in American English: A statistical analysis. In: William Labov (ed.), *Locating language in time and space*, 37–54. New York: Academic Press.
Oliveira, Marco Antonio de
1991 The Neogrammarian controversy revisited. *International Journal of the Sociology of Language* 89: 93–105.
Penny, Ralph
1991 *A history of the Spanish language*. Cambridge: Cambridge University Press.
Pensado, Carmen
1984 *Cronología relativa del Castellano*. Salamanca: Ediciones Universidad de Salamanca.
Phillips, Betty S.
1984 Word-frequency and the actuation of sound change. *Language* 60: 320–342.
2001 Lexical diffusion, lexical frequency and lexical analysis. In: Joan Bybee and Paul Hopper (eds.), *Frequency and the emergence of linguistic structure*, 123–136. Amsterdam/Philadelphia: John Benjamins.
Pierrehumbert, Janet
2001 Exemplar dynamics: Word-frequency, lenition and contrast. In: Joan Bybee and Paul Hopper (eds.), *Frequency and the Emergence of Linguistic Structure*, 137–157. Amsterdam/Philadelphia: John Benjamins.

Santa Ana, Otto
1991 Phonetic simplification processes in English of the barrio: A cross-generational sociolinguistic study of the Chicanos of Los Angeles. Ph. D. dissertation, Department of Linguistics, University of Pennsylvania.

Schuchardt, Hugo
1885 *Über die Lautgesetze: gegen die Junggrammatiker.* Oppenheim, Berlin (Reprinted and translated in Theo Vennemann and Terence Wilbur 1972).

Van Bergem, Dick
1995 *Acoustic and lexical vowel reduction.* (Studies in Language and Language Use 16) Amsterdam: IFOTT.

Vennemann, Theo
1974 Words and syllables in natural generative phonology. *Parasession on Natural Phonology*, 346–374. Chicago: Chicago Linguistic Society.

Vennemann, Theo and Terence Wilbur
1972 *Schuchardt, the Neogrammarians and the transformational theory of phonological change.* Frankfurt: Athenäum.

Wang, William S.-Y.
1969 Competing changes as a cause of residue. *Language* 45: 9–25.

Wang, William S.-Y. (ed.)
1977 *The lexicon in phonological change.* The Hague: Mouton.

Wang, William S.-Y. and C.-C. Cheng
1977 Implementation of phonological change: the Shaungfeng Chinese case. In: William S.-Y. Wang (ed.), *The lexicon in phonological change,* 86–100. The Hague: Mouton.

Unveiling a masked change: behind vowel harmony in the dialect of Claro*

Michele Loporcaro

1. Introduction

A great part of the pleasure of intellectual work resides in discovering things. All things still to be discovered share an elementary property: at first sight, they do not seem to be there at all. In the realm of language change, new objects can be discovered, in a rather trivial sense, whenever new data are described. In this paper, however, I will discuss an entirely different case. The empirical data we shall deal with have been known, in the scientific community of Romance scholars, for more than one century: they concern a vowel harmony process which is at work in the Italo-Romance dialect of Claro, spoken in Canton Tessin (Switzerland). This vowel harmony (henceforth VH) is in itself the product of a remarkable change, which deservedly attracted considerable attention, since it characterizes this dialect with respect to its parent language (viz. Latin) as well as to its cognates (Romance varieties).

The aim of this paper is to demonstrate that another phonological change hides behind VH. The organization of the paper is as follows. §2 briefly sketches the working of VH in the dialect of Claro. §3 deals with the interplay of VH and cliticization. In particular, it turns out that VH is blocked in one environment, and that precisely this blocking – which has been previously overlooked in the descriptive literature – is crucial to unveil another phonological change (viz. the fronting of all final low vowels), which also took place in this variety, but has gone unnoticed so far. The identification of this change is an unexpected by-product of the analysis of the interplay of VH and cliticization provided in §3. In fact, as argued in §4, the reason why the change was overlooked is that VH, by far the most distinctive property in the phonology of this dialect, exerts a masking effect, concealing most surface evidence for final -/a/ fronting. Elaborating on this observation, §5 provides an explanation for