1. Sound change and synchronic phonology

This being a chapter on sound change in a volume primarily concerned with synchronic phonology, it seems appropriate to begin by stating the relationship between synchronic and diachronic phonology that will be assumed here. As is well known, for the Neogrammarians a scientific investigation of language could only be undertaken from a historical perspective (Paul 1880). More recently some scholars of phonology have expressed somewhat similar views (see Good 2008: 11-15 for discussion). Thus, Blevins (2004) has argued that historical explanations must be given priority in accounts of synchronic phonological patterns. One of Blevins’ main points, also expressed by other authors (e.g. Bybee 2008), is that the phonetic naturalness of phonological patterns is a consequence of their origin in common mechanisms of sound change.

The view that typological tendencies observable in synchronic sound patterns and (morpho)phonological alternations follow primarily from the relative frequency of different sound changes and paths of development (so that ‘naturalness’ resides in diachrony) is not universally held. The alternative is that (in addition) there are principles of UG that dictate the shape of synchronic ‘phonological grammars’. Kiparsky (2008:52) proposes “a principled separation between true universals, which constrain both synchronic grammars and language change, and typological generalizations, which are the results of typical paths of change.” In this view ‘true universals’ are due to UG.

I believe that, regardless of one’s opinion on this matter, the study of synchronic sound patterns should not be reduced to an account of their historical evolution. There is more to synchronic phonology than accounting for the relative frequency or rarity of patterns and alternations. Synchronic and diachronic phonology have different goals. The goal of the diachronic analysis of a phonological pattern is to discover how it developed through time. A synchronic analysis of the same phenomenon, on the other hand, may be concerned with providing a succinct and precise statement of the facts and/or with modeling speakers’ knowledge of the phenomenon in question.

Consider, for example, /e/-epenthesis before word-initial consonant clusters starting with /s/- in Spanish. Spanish, unlike English, French or Italian, lacks sC- clusters. In the adaptation of borrowings an initial /e/ is automatically inserted, as in eslogan ‘slogan’, estrés ‘stress’, etc. This insertion phenomenon is obligatory and also pervasive in the second-language pronunciation of native speakers of Spanish. Spanish speakers are typically unaware that there can be a difference between [sC-] and [esC-]. A synchronic phonological account would presumably explain these facts by making reference to the syllable structure of the language.

When we consider the historical origin of the phenomenon, it turns out that this is a very old process in Romance, which originally had a much wider dialectal distribution (see Sampson 2010). Under one hypothesis, initially, a short /i/ was inserted when a word starting with sC was preceded by a consonant-final word, that is, in C#_sC, a context where epenthesis is still found in formal or conservative styles in Italian, as in scritto ‘written’ but per iscritto ‘in writing’, strada ‘road’, in istrada ‘on the road’. In Old
French, the context for vowel insertion was expanded and an epenthetical vowel is found both after a consonant and after pause, but not after a vowel: *espose/*ta spose* ‘wife/your wife’, *espée/la spée* ‘sword/the sword’ (Price 1984). In both Gallo-Romance and Ibero-Romance, epenthesis with these words was then generalized to all contexts as we can see comparing the following examples in Latin, Italian, French and Spanish, among many others that could be given (in French syllable-final /s/ was later lost: sC > esC > ehC > eC).

<table>
<thead>
<tr>
<th>(1)</th>
<th>Latin</th>
<th>Italian</th>
<th>French</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCRIPTUM</td>
<td>scritto</td>
<td>écrit</td>
<td>escrito</td>
<td>‘written’</td>
</tr>
<tr>
<td>SCHOLA</td>
<td>scola</td>
<td>école</td>
<td>escuela</td>
<td>‘school’</td>
</tr>
<tr>
<td>STATUM</td>
<td>stato</td>
<td>été</td>
<td>estado</td>
<td>‘been’</td>
</tr>
<tr>
<td>STUDIARE</td>
<td>studiare</td>
<td>étudier</td>
<td>estudiar</td>
<td>‘study’</td>
</tr>
<tr>
<td>SPONSA</td>
<td>sposa</td>
<td>épouse</td>
<td>esposa</td>
<td>‘wife’</td>
</tr>
<tr>
<td>SPATHA</td>
<td>spada</td>
<td>épée</td>
<td>espada</td>
<td>‘sword’</td>
</tr>
</tbody>
</table>

In Spanish, as mentioned, the rule has remained fully productive as a phonotactic constraint on pronunciation up to the present day. In French, on the other hand, this rule lost its vitality at a certain historical point, after which the language started accepting unmodified sC- words, as shown by the fact that we find words like *style, spatule*, etc. (cf. Sp *estilo, espátula*). A diachronic analysis would need to account for all these facts: what is the source of the inserted vowel? How did the process become generalized from the phrasal C##sC- context to the lexical sC- context in Gallo- and Ibero-Romance? How was the insertion rule lost in Gallo-Romance after centuries of productivity? Why didn’t the same thing happen in Ibero-Romance? These questions are different from those that arise in a synchronic analysis of present-day Spanish or French phonology.

Frequently, an adequate account of a synchronic alternation or sound pattern may need to differ substantially from its diachronic explanation. It is perhaps useful to briefly make the point that synchronic and diachronic phonology do not need to provide converging accounts. Knowing how an alternation came about does not necessarily tell us how it should be analyzed synchronically. Sometimes there is, in fact, evidence that speakers interpret the facts in a way that is not consistent with their diachronic origin. Let us consider an example.

Regular plural formation in English involves a phonologically-conditioned alternation among three allomorphs, */-əz/, */-z/ and */-s/. Diachronically, this allomorphy was brought about by a process of vowel deletion, followed by voice assimilation in resulting clusters of obstruents. Comparison of modern English *stone/stones* with Old English Nom/Acc sg. *stān*, Nom/Acc pl *stānas* shows us that, historically, a vowel has been lost in the plural form *stones*: Old English /staːnas/ > Middle English /stəːnæs/ > Modern English /stonz/. The vowel was not deleted when the stem ended in a strident fricative or affricate, thus avoiding a cluster of strident consonants, as in *churches, kisses*. Historically, then, the ending */-əz/ is primary. It does not follow from this, however, that, from a synchronic point of view as well, */-əz/, as in *churches and kisses*, is the most basic plural allomorph and that a synchronic process of vowel deletion, mirroring the historical sound change, should be postulated to account for *stones or cats*. Depending on the
analyst’s theoretical persuasion, the choice of synchronic analysis may be based on psycholinguistic evidence such as ‘wug’ tests (Berko 1958), simplicity of the statements or other criteria. In this case, perhaps the most adequate account of the morphophonological alternation that we find in regular English plurals would posit /-z/, as in *stones, as the most basic allomorph and would derive /-oz/ as in churches, kisses by an epenthesis rule and /-s/ as in cats by a voice assimilation rule or constraint (tautosyllabic clusters of obstruents always agree in voice in English).

A well known phenomenon, which English plural allomorphy exemplifies in part, is rule inversion (Vennemann 1972). This is the case where a synchronic rule takes the opposite direction from the sound change that caused the alternation. That is, a sound change of the type x > y in context z is phonologized as a synchronic alternation best captured as y \rightarrow x in other contexts.

In Basque, for instance, in the compositional form of a set of nouns a final vowel is deleted and, if the preceding consonant is -r, it is changed to -l, as schematized in (2a) and exemplified in (2b).¹

(2) -r/-l alternation in Basque

a. -rV \rightarrow -l in compositional forms

b. basic forms | compounds
   — gari ‘wheat’ | gal-buru ‘head of wheat’
   — atari ‘doorway’ | atal-zain ‘doorman’
   — euskara ‘Basque language’ | euskal-dun ‘Basque speaker’
   — abere ‘cattle’ | abel-gorri ‘free-roaming cattle’
   — merkatari ‘merchant’ | merkatal- ‘commercial’

Since this rule is somewhat productive and can be applied to new formations, we may speculate that from knowledge of pairs like those in (2b), Basque speakers can extract something like the rule in (2a).

If we now ask about the diachronic origin of the alternation, it turns out that it is to be found in a sound change in the opposite direction. We can see this from the treatment of early borrowings from Latin. Borrowings such as zeru ‘sky’ < Lat. CAELU(M), gura ‘desire’ < Lat. GULA, goru ‘distaff’ < Lat. COLU(M), etc. show a change from intervocalic -l- to -r-. It seems reasonable to assume that the same process affected the native lexicon at the time. The original form of, for instance, ‘wheat’ may have been *gali, which became gari by rhotacism. In compositional forms intervocalic rhotacism was bled by the deletion of the final vowel. The original lateral of *gali was thus preserved stem-finally in the compositional form gal-. This resulted in pairs with a basic form in -rV and a compositional form in -l (e.g. gari/gal- ‘wheat’), which created a pattern for analogical formations. The compositional form abel- in (2b), for instance, is the result of such an analogy, since the source of Bq. abere ‘cattle’ is Lat. HABÈRE. In other words, to repeat, the sound change -l- > -r (*gali > gari) has given rise to a synchronic rule -rV \rightarrow -l (2a) (gari \rightarrow gal- in compounds).

To give another example, Stockwell & Minkova (2001: 125) analyze the

¹ This Basque alternation is also discussed in Hualde (1991:84) and is used to exemplify rule inversion in Trask (1996).
alternation in cases like *table/tabulate, single/singular*, etc., as instances of synchronic ‘U-Epenthesis’, although form a historical point of view what we have is vowel deletion (in the evolution from Latin to French): Lat. *TABULA* > Fr. *table*.

The accumulation of sound changes can also give rise to synchronic alternations that lack all phonetic motivation, as in the alternation in English *critic/criticize* where /k/ is replaced by /s/ before a low vowel (on this general topic, see Anderson 1981). Such cases of “telescoping” may be capturable by means of more-or-less natural synchronic rules by positing derivations with a series of intermediate stages, as in classical generative models. Consider for instance the examples in (3) for Ondarroa Basque:

(3) Ondarroa Basque

<table>
<thead>
<tr>
<th>Uninflected</th>
<th>Absolutive singular</th>
</tr>
</thead>
<tbody>
<tr>
<td>giʃon</td>
<td>giʃona</td>
</tr>
<tr>
<td>sagar</td>
<td>sagarra</td>
</tr>
<tr>
<td>neska</td>
<td>neski</td>
</tr>
<tr>
<td>alaba</td>
<td>alabi</td>
</tr>
</tbody>
</table>

‘man/the man’

‘apple/the apple’

‘girl/the girl’

‘daughter/the daughter’

As the first two examples in (3) show, the absolutive singular form is normally created by adding the suffix /-a/. In words whose stem ends in /-a/, however, this vowel is replaced by /-i/. This is the result of the accumulation of four distinct sound changes affecting the sequence /a-a/ in this inflectional context: *neskaa > neskea > neskia > neskie > neski* ‘the girl’. All the intermediate forms are attested in other Basque dialects. In a generative analysis it would be possible to formulate a series of ordered natural synchronic rules that mirror the (necessarily ordered) sound changes that we have illustrated (see Hualde 1991). In a less abstract analysis, different processes could be postulated to account for the pairings of uninflected and singular forms, depending on the last segment of the stem, without synchronically deriving *neski* from /neska+a/ (see Hualde 1999). Knowledge of the historical evolution does not determine the choice of synchronic analysis.

To summarize this section, synchronic and diachronic phonological analysis have different goals. Furthermore, since synchronic phonological patterns may reflect their history only in an indirect way, knowledge of how a given pattern originated does not necessarily inform us regarding the best synchronic analysis of the facts. The choice of synchronic analysis will depend in part on the analyst’s criteria for selecting among competing accounts. A phonologist’s goal may be, for instance, to provide an accurate, elegant, description of the sound patterns of a given language; or it may be to discover what generalizations regarding the sound structure of the language its speakers’ actually make, as revealed by psycholinguistic experimentation, and perhaps modeling them.\(^2\) The diachronic origin of the phonological facts is not directly relevant for either of these purposes.

Sound changes have an effect on the synchronic ‘phonological grammar’ of a language when they give rise to (morpho-)phonological alternations or to new phonotactic constraints. But the same type of change that creates robust patterns of

\(^2\) See Hayes et al. (2009) for a recent application of the ‘wug’ test methodology with computational modelling.
alternations in one language may not create any alternations in another language, depending on the structure of the lexicon of the language in question. In the rest of this chapter we will be concerned exclusively with changes in pronunciation, either accomplished or in progress, but leaving the synchronic phonological analysis of the facts aside for the most part. The issues to be addressed have been topics of debate for many decades, some since the origins of our discipline. Some of these issues will be presented here in a somewhat different light than in other contemporary discussion.

2. Regular sound change and analogy: Phonemes or words as objects of phonological change

A classical but still current debate in diachronic phonology is concerned with the question of whether sound change affects phonemes in specific phonetic environments, without regard to lexical identity or, instead, sound change affects words, so that different words will undergo sound changes at different speeds. In recent years, Pierrehumbert (2002) and Bybee (2003), among others, have claimed that phonetic change always operates on words and that more frequent words will change more rapidly than less frequent ones. The possibility (or necessity) of “word-specific phonetics” would appear to follow from the architecture of exemplar models of lexical encoding. Different words will be used in different contexts and with different frequencies and their reduction patterns will be part of their mental representation.

On the other hand, Labov (1981, 1994, 2006, 2007) has argued that, even though some changes do show lexical effects, the various vowel shifts currently taking place in North American English dialects are affecting all instances of the respective phoneme in the relevant phonological contexts in the same manner and simultaneously, regardless of whether the words containing them are frequent or infrequent. Whatever pronunciation a given speaker has for the vowel of high-frequency *pin* will also be his/her pronunciation of the vowel in the first syllable of low-frequency *pinafore*.

This debate goes back to the original formulation of the notion of sound change by the Neogrammarians.3 The Neogrammarians distinguished two types of process. “(Regular) sound change” *stricto sensu* and “analogy” (see Kiparsky 2003 for discussion). Regular sound change is claimed to be phonetically gradual and lexically abrupt. It is lexically abrupt because all words containing the same sound in the relevant phonetic environment are affected in the same manner and simultaneously (see, for instance, Paul 1889: 58-59). Analogical change, on the other hand, is lexically gradual and phonetically abrupt. For instance pre-Latin *honōsis* ‘honor, gen. sg.’, *flōsis* ‘flower, gen. sg.’ became Latin honōris, flōris by a regular sound change that, by hypothesis, simultaneously affected all instances of intervocalic /s/ gradually modifying their articulation, s > z > r / V__V (with phonetically intermediate realizations). Later on, -s also became -r in the nominative singular of some words, where it was word-final and, therefore, not in the context of the sound change, as in *honos* > honor. The latter was an analogical change that abruptly replaced a phoneme with another phoneme under the influence of other words in the inflectional paradigm. This analogical phenomenon is lexically gradual because only some words were affected. For instance, *flōs* ‘flower, nom. sg’ did not undergo the change (or not until much later).

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3 For an overview of the development of Neogrammician thinking see Pedersen (1962[1931]). An early dissenting voice was Schuchardt (1885).
The distinct operation of regular (Neogrammarian) sound change and analogy can also be observed in phonological change in progress. As mentioned above, Labov has claimed that changes like those involved in the Northern Cities Vowel Shift operate with Neogrammarian regularity. On the other hand, the shortening (or laxing) of long /u:/ to /ʊ/ is spreading throughout the lexicon, so that a given speaker may pronounce roof with a short vowel and proof with a long one. Gradual lexical diffusion involves the abrupt replacement of one phoneme with another. The spread to a new word may be due to analogy with similarly sounding words: e.g. if a speaker knows that roof can be either /ru:f/ or /ru:f/, s/he may also start accepting and producing both pronunciations for proof, by analogy.

In one type of process, “regular sound change”, the change affects sounds or phonemes. In the other type, “analogy”, the objects are words (see Labov 1981 for discussion). Another way to interpret this dichotomy is that “regular sound change” and “analogy” differ in the structural level at which they apply. “Regular sound change” operates at the level of meaningless sound units, phonemes and allophones, and it is thus purely conditioned by mechanical, physical aspects of speech. “Analogy”, on the other hand, takes into account meaningful sound units, morphemes and words, and thus may be conditioned by both physical and mental aspects.

A third logical possibility is that sound change may be both lexically and phonetically gradual. In this view, the objects of sound change are always words, which undergo gradual, essentially reductive, change (see, e.g., Bybee 2008).

It could obviously be the case that different types of sound changes show different paths of development and that only some types of sound changes show Neogrammarian regularity, but what the “words as objects of phonological change” hypothesis denies is that sound change ever operates as the Neogrammarians envisioned. Under this hypothesis it should be the case that those sound changes that have been claimed to operate with Neogrammarian regularity, affecting all lexical items with the relevant phonological environment simultaneously and at the same rate actually, show lexical effects when more carefully examined. This remains to be proven (see Dinkin 2008).

It is useful to make a distinction between reductive and non-reductive sound changes, since they appear to differ in fundamental ways regarding both their origin and their spread (Phillips 1984). Reductive sound changes are those that have their origin in the reduction of magnitude and temporal overlap of articulatory gestures, as typically found in relaxed styles and especially in less informative parts of utterances (see Browman & Goldstein 1991).

All sound changes do not appear to be reductive (although most of them certainly

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4 The Northern Cities Vowel Shift involves a number of changes affecting different stressed vowels at different stages. First /æ/ rises and diphthongizes; then /a/ and /ʌ/ front; finally, /u/ lowers, /e/ lowers and retracts and /ʌ/ retracts (Labov 1994: 195).
It should be noted that vowel shifts, on whose evidence Labov has relied to maintain the validity of the Neogrammarian hypothesis, are rather special types of sound changes. Whereas the most frequent sound changes involve reduction of segments in prosodically weak positions, the vowel shifts that Labov has studied target (prosodically strong) stressed vowels. There is no a priori reason to expect that lexical frequency or lexical identity may play the same role in reductive and nonreductive sound changes.

In the next sections we will consider the phonetic and phonological nature of reductive sound change, before turning to the less common nonreductive sound changes. Regarding regularity, the specific view that will be presented here is that many sound changes, including regular reductive phenomena with a well-understood mechanical origin, start as across-the-board phonetically gradual processes, as the Neogrammarians claimed, but involve the operation of something very close to analogy at some point in their phonologization. In other words, initially, regular change happens to sounds in specific phonetic contexts, but, at a later stage, the sound change is lexicalized. This happens when sounds are phonologically recategorized. The observation that word and morpheme boundaries may condition phonological processes by either preventing their application or allowing a less restricted application than within single morphological domains is relevant for establishing this point. The distinction between regular sound change and analogy may not be as straightforward as the Neogrammarians envisioned.

In principle, the same stages that I am proposing for lenitions would apply to fortitions, although the types of words that would lead in the change at the stage of phonological recategorization would be expected to be different. In this view, the lack of lexical effects in the Northern Cities Vowel Shifts (if Labov is correct), would follow from the fact that there has not been actual phonological recategorization, in spite of changes in vowel quality. At the phonological level there has been no change yet.

3. The phonetic seeds of reductive sound change
It is fairly well established that common processes such as lenition and assimilation have their ultimate origin in the reduction and coarticulation that we find in casual speech, as opposed to more careful styles. Articulatory Phonology provides an explicit model of these phenomena as arising from synchronic variation; in particular, from undershooting and overlap of targets (Browman & Goldstein 1990, 1991 and other work by these authors). In this framework, segmental weakening, including deletion and assimilations are shown to be the consequence of the online reduction in magnitude and overlap of articulatory gestures. For instance, the reduction in the magnitude of the gesture of the active articulator needed to produce complete occlusion, under time pressure or in relaxed speech, would result in an approximant realization. Assimilation between adjacent targets may likewise result from overlap and reduction of gestures under temporal compression.

In addition to weakenings and assimilations, quite a few other phenomena, which traditionally are given very different labels can also result from gesture retiming and reduction. An example would be consonant epenthesis in sonorant-obstruent groups, as in

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5 The hypothesis that sound change (when properly defined) is always reductive has been put forward in Mowrey & Pagliuca (1995). It do not believe this hypothesis can be maintained, but sound changes that have their origin in articulatory reductions are clearly much more frequent than all other sound changes.
something, elf[t]se, Lat. TENERA > *tenra > Fr. tendre, etc. In the last example given, for instance, the epenthesis is the result of a retiming of the closure of the velic-nasal port with respect to the oral gestures: the cessation of airflow through the nasal cavity while the apico-alveolar contact of /n/ is still maintained will result in the production of a segment identifiable as /d/.

Beddor (2009) shows that American English speakers perceive pronunciations such as [bɛt] and [bɛ̃t] as being equivalent, the crucial thing being the duration of the nasal gesture, rather than its specific alignment with respect to the dorsal gesture of the vowel and the apical closing gesture at the end of the word. This equivalence could lead to the development of nasal vowels by the progressive favoring of the latter gestural alignment in this context.

Another common diachronic change, word-final devoicing, which at first glance appears very different from lenitions and assimilations, can also be understood in reductive terms. Hock (1991: 239-241) argues that word-final devoicing has its origin in prepausal devoicing and is a sort of assimilation (to silence), in spite of the apparent differences.

At least some types of metathesis may also be understood as originating in gestural coarticulation. Metathesis would arise from the reinterpretation or resegmentation on the part of listeners of an ambiguous or indeterminate signal created by gestural coarticulation (Blevins & Garrett 1998, Hume 2004). To give an example from sound change in progress, whereas many Spanish dialects have aspiration of /s/ in syllable-final position, a recent development in Andalusian Spanish is the postaspiration of stops following an etymological /s/: pasta [pasta] > [pahta] > [paθa] ‘paste’. Torreira (2007) shows that this development, which mirrors historical metathesis in other languages, can be modeled as a readjustment in the timing of laryngeal and oral gestures.

Even (some) dissimilations may be attributed to gestural mistiming/retiming, to the extent that they involve the coordination of “stretched-out” gestures with other gestures (see Ohala 1993).

It is thus clear that unintended online retiming and reduction of gestures, which are pervasive in unmonitored speech styles, may produce new articulations, as casual speech variants. These online reductions may mirror many of the most common changes that we can observe when we study the history of languages. An understanding of these phenomena, however, is not sufficient to explain sound change. Casual speech phenomena need to be conventionalized and phonological recategorization must take place for sound change to occur.

4. Phonology of reductive sound change: Conventionalization and recategorization

Sound change involves both phonetics and phonology. It seems fair to say that the phonetic mechanisms that give rise to different reductive sound changes, which we have just briefly considered in the previous section, are better understood than the psychological and social processes that lead to their conventionalization in specific environments and to the recategorization of sounds.

Ohala (1993, 2003) has argued that the operation of sound change requires a mistake on the part of listeners, who misinterpret the sound signal as something different from what the speaker had intended. For instance, the unintended voicing of /p/ between vowels, due to temporal reduction of the labial gesture and incomplete abduction of the
vocal folds, is reinterpreted by listeners as intended /b/. As Ohala (2003) points out, however, the ambiguity of speech signals and the consequent potential for errors of interpretation is a pervasive phenomenon. To continue with our example, examination of acoustic records shows that sporadic voicing of intervocalic stops is found in many languages without leading to recategorization or even to the conventionalization of allophonic rules. One would expect sound change to operate at a much higher rate than it actually does if ambiguity systematically led to errors in perception and sound categorization. There must be factors that slow down the progress of sound change.

What may explain the relatively slow pace of sound change is that, at the phonological level, two things need to happen for /p/ to become /b/, as in, for instance, Lat. SAPÈRE > Port. saber ‘to know’, Lat. LUPU(M) > Port. lobo ‘wolf’, etc. First, at some point in time, [b] must become a conventionalized realization of the phoneme /p/ in intervocalic position. At a later point, [b] must be reinterpreted as /b/, a different phoneme, so that perhaps [p] is no longer an option in words that used to have that sound:

(5) Sound change p > b
   a) Phonetic change: [p] > [b] V__V /apa/ [apa] > /apa/ [aba]
   b) Phonological change: /p/ [b] > /b/ [b] /apa/ [aba] > /aba/ [aba]
   (Recategorization)

In fact, since [b] is only one of several ways in which [p] may be reduced in this context, the other common one being its reduction to a voiceless bilabial fricative or approximant, a prior phenomenon must be the conventionalization of the reduction process. That is, before recategorization takes place, a specific way of reducing targets must have already been conventionalized in the language. This may involve a choice among competing reductive mechanisms. For instance, in our example, among the various ways to reduce /p/ between vowels, its voicing to [b] may be chosen. Conventionization of the phonetics involves the recognition of a distinct and acceptable articulatory target, first as an optional allophone and later perhaps as the normal realization of the phoneme in a given context; for example, the recognition of [b] as an acceptable allophone of /p/ in intervocalic position.

Phonological recategorization consists of the recognition of a different phonological category. To continue with our example, recategorization takes place when [b] is no longer an allophone of /p/ but rather something different, /b/.

In Portuguese and the other Western Romance languages, Latin word-internal intervocalic /ptk/ were recategorized as /bdg/, becoming identified with the original voiced plosives in other contexts. Thus, for instance, the intervocalic consonant of LUPU(M) ‘wolf’ > lobo at some point was no longer identified with the initial consonant of PORTA ‘door’, but was now a member of the same phoneme as the initial consonant of BUCCA ‘cheek’ > ‘mouth’.

(6) Recategorization in Western Romance

<table>
<thead>
<tr>
<th>Latin</th>
<th>Portuguese</th>
</tr>
</thead>
<tbody>
<tr>
<td>/p/</td>
<td>PORTA</td>
</tr>
<tr>
<td>/p/</td>
<td>LUPU</td>
</tr>
<tr>
<td>/b/</td>
<td>BUCCA</td>
</tr>
</tbody>
</table>
In our example there has been recategorization because *[lopo] is no longer a possible pronunciation for Portuguese /lobo/ (whereas in Italian dialects with optional voicing of intervocalic stops, completely voiceless realizations are still found, Cravens 2002). I would thus like to suggest that, in the case of reductive sound changes, phonological recategorization is typically preceded by a conventionalization of a specific reductive process. In our example, p > b, we would have the three stages in (7):

(7) Stages in sound change /p/ > /b/ /V__V

1) Online gestural reduction: variable voicing and/or incomplete labial closure in casual speech: /lopo/ [lopo] ~ [lopo] ~[lobo] ~ [lo̞o]

2) Conventionalization of phonetics: voicing becomes the conventionalized casual speech variant: /lopo/ [lobo]

3) Phonological recategorization: realizations are no longer attributed to underlying /p/: /lobo/ [lobo]

Conventionalization affects the phonetic realization of phonemes in specific contexts and it is thus lexically abrupt. Recategorization, on the other hand, may occur in a word-by-word fashion. Whereas in Western Romance recategorization of intervocalic /ptk/ operated quite regularly in word-internal position (but see section 6 below for the word-initial position), in Italian recategorization is a lexically very irregular process; compare, for instance, Lat. STRĀTA > Ital. strada ‘road’ vs. Lat. CANTĀTA > Ital. cantata ‘sung, fem. sg.’ (see Cravens 2006).

To give another example, in present-day Spanish, the voiced obstruents /bdg/ are systematically realized as the approximants [β ð ɣ], with a variable degree of constriction, intervocally and in some postconsonantal contexts, without regard to lexical identity. It is a fully conventionalized allophonic process. The recategorization of the weakest degree of lenition, which involves the deletion of the segment, on the other hand, is operating in a lexically-conditioned manner. Some words have acquired two distinct pronunciations, with and without an intervocalic consonant, but most have not; e.g.: lado ‘side’, with two categorically distinct pronunciations, /lado/ [laðo] and /lao/, recado ‘errand’ /r:ekado/ ~ /r:ekao/ vs. enfado ‘anger’ only /enfado/ [en̞fado] not */enfao/, invado ‘I invade’ only /inbado/ [imbaðo] not */inbao/.

Browman & Goldstein (1991) point out that the change from Lat. HABĒRE to It. avere, Fr. avoir, involves a reduction in degree of constriction, from stop to fricative. This is the phonetic aspect. But we also need to explain the conventionalization of this reduction whereby intervocalic [b] came to be regularly pronounced as [v] and the subsequent recategorization as /v/, but only in word-internal position.

This sound change is slightly more complex than the voicing of intervocalic /ptk/ in Western Romance. We may note that from the reduction of [b] we would not directly expect a labiodental fricative [v], but rather an approximant [β] (see Lavoie 2000: 163-164): HABĒRE [aβe:re] > [aβe:re]. There is some evidence that this was in fact the initial result. The eventual outcome [v] may have been due, in part, to merger between intervocalic realizations of /b/ and the original phoneme /w/, as in LAVĀRE [lawa:re] ‘to
In all Romance languages there was a merger between -b- [β] and -v- [w]. The result of this merger is eventually [v] in most of the Romance area (Herman 2000:39). We may assume that first [w] became a labiodental [v], a relatively common sound change, and that this was followed by the merger between -b- [β] and - v- [v]. We will come back to the restriction of the merger to the word-internal position.

To give another example, long-distance dissimilation, as in Grassman's Law in Sanskrit and Ancient Greek, may have its roots in listeners’ “hypercorrection”, as claimed by Ohala (1993): in domains containing more than one segment bearing a certain “stretched-out” feature, the listener attributes all the effect to one of the segments. In order for something like Grassman’s Law to arise, however, the phenomenon must be conventionalized. “Hypercorrection” does not determine directionality in the dissimilation. It could in principle result in an systematic assignment of the marked feature to only the first potential feature-bearing segment in one word and to only the last one in another. What we find in Grassman’s Law is that the last aspiration is systematically retained: Cʰ...Cʰ > C...Cʰ (also in Basque, e.g. hil ‘dead’ + herri ‘town’ > ilherri ‘cemetery’, Michelena 1985: 211-212). In Quechua, under the hypothesis that present-day Aymara represents the older situation (which is not undisputed, see Landerman 1994), we find the opposite: only the first instance of glottalization or aspiration is retained, cf. Aymara t’ant’a ‘bread’, Quechua t’anta ‘bread’.

5. How does recategorization happen in sound change?

As mentioned, in Ohala’s model (1993, 2003) sound change takes place when unintended articulatory reductions are reinterpreted by listeners as new intended targets. Intended or underlying forms are subject to online reductions, and, eventually, these online reductions become lexicalized, that is, intended or underlying. This recategorization, in Ohala’s model of sound change, involves a “mistake” on the part of the listener.

For instance, Nolan (1992) demonstrates that coronal assimilation in English, as in red car, is a gradual process that allows for a continuum of reduction of the alveolar gesture. In his response to this paper, Ohala (1992) points out that, even if this is the case, there could be instances where the assimilation is categorical, phonologized, intended as such. In his words “there may be a huge gap between the faintest version of an alveolar stop in red car and the fully assimilated form [rɛɡkɑː]” (Ohala 1992:286). The point is that for sound change to take place, the products of online phonetic reductions must become lexicalized as categorically different. The question is how and when this lexicalization takes place. How can we know whether a given token of complete assimilation was intended as such and it is not just an extreme instance within a continuum of reduced articulations? In the case of alveolar place of articulation in English, besides the gradual reduction and coarticulation that Nolan documents, could it be that already some speakers optionally have a different target gestural score to produce these sequences, which does not involve an apical gesture? In any event, coronal assimilation appears to be a conventionalized process in English, to the extent that this is something that affects specific sequences in a specific way in this particular language. The phonetic gradual process is a conventionalized phenomenon of English which may apply in a Neogrammarian fashion, without regard to the identity of the lexical items involved. On the other hand, phonological recategorization as something different from
the historical sequence may operate on an item-by-item basis, showing frequency effects.

The traditional demonstration that reanalysis has taken place is provided by the occurrence of the new target in contexts beyond the one where it arose. For instance, we can be sure that listeners have interpreted the acoustically overlapped /t/ in *perfect* memory (to use one of Browman & Goldstein’s 1990 examples), as being intentionally absent when, as speakers, they start producing sequences such as *perf* [k] *art*, where the absence of the word-final [t] cannot be attributed to acoustic masking. In the case of word-internal segments, however, this evidence may not be available, as the phonetic context is constant.

Recategorization clearly takes place earlier than sometimes has been assumed. Janda (2003) discusses Twaddell’s explanation of the phonologization of umlaut. As Janda points out, at the time it was proposed, Twaddell’s account was seen as real progress. Essentially the idea is the following. Umlaut was a predictable allophonic process as long as the triggering high front vowel was present (Stage I in (8a), I illustrate with a familiar pre-English example). At this stage [y] would be a predictable allophone of the phoneme /u/ in the environment of a following /i/. We may postulate the synchronic rule in (8b) to capture the distribution of allophones. Later, the reduction of final unstressed /i/ to schwa made the presence of [y] unpredictable from the context, thus triggering its categorization as an independent phoneme (Stage II):

(8) Umlaut

a. Stage I

/mu:si/ [my:si] > [my:so] /my:sə/ ‘mice’

b. /u:/ \rightarrow [y:] / ___ (C) i

Janda (2003), following several other critics of Twaddell’s analysis, calls our attention to a conceptual problem with this account. If umlaut was a predictable effect at stage I, triggered by the phonological environment, it should have gone away once the conditioning factor disappeared. That is, if the synchronic allophonic rule was as in (8b), the centralization of the conditioning final vowel should have resulted in [my:si] changing to *[mu:so]*. That is, once the final vowel could no longer condition its fronting, the phoneme /u/ should surface as [u]. The conclusion that Janda draws is that the umlauted [y] vowel became a distinct phoneme while the originally conditioning environment was still present. Whether or not we want to use the term “phoneme” in this sense, the lesson clearly is that [y] was an intended, conventionalized target, part of the gestural score of the word (in Articulatory Phonology terms) at some historical point when final /i/ was also part of the gestural score.

If phonologization must precede loss of the conditioning environment, the question is then what causes it. Janda makes the reasonable assumption that when two allophones are phonetically distinct enough they will be learned as distinct categories, even if they are in complementary distribution (for discussion see also Kiparsky 1995: 656-657). It is unclear, however, how one can determine the relevant degree of dissimilarity that would warrant independent phonemic categorization (although this could, in theory, be empirically investigated through psycholinguistic experimentation).
We must also ask the question of how the fronting of /u/, caused by articulation, was exaggerated to the point that speakers of the language reinterpreted it as a different target. One possibility, following Ohala, is that this was an abrupt change: at some point, Old English listeners reinterpreted very coarticulated, fronted productions of /u/ as a distinct target /y/, maybe on a word-by-word basis. But another possibility is that the change took place in the phonetically slow, gradual manner postulated by the Neogrammarians, more and more fronted productions becoming more and more frequent until the awareness of a different target from that of /u/ arose. In principle, Ohala’s listener-induced abrupt recategorization seems more compatible with changes that show lexical diffusion or are sensitive to the presence of morpheme or word boundaries than with sound changes that apply across the board. Umlaut and vowel harmony rules are typically limited to (prosodic) word domains and tend to have exceptions and/or be limited to certain morphological contexts. Coarticulation of the type that may give rise to umlaut has been observed across words sequences (Cole et al. 2010). If this coarticulation is not phonologized (as vowel assimilation) across word boundaries (e.g. hypothetical /bl/u/ /boat vs. /bl/y/ /sea/), it must be because analogical pressure among tokens of the same word prevents this from happening.

To give another example, consider the difference in the duration of vowels preceding voiced and voiceless coda consonants in present-day American English. This difference goes considerably beyond what may be expected from merely phonetic coarticulatory effects and is sufficiently salient to serve as a cue for the voicing of the following consonant (Peterson & Lehiste 1960, Rafael 1972, Rafael, Dorman, Freeman & Tobin 1975). Now, final obstruents in English show a tendency to devoice (Flege & Brown 1982, Smith 1997). We may thus envision a future scenario where word-final devoicing of obstruents becomes an obligatory rule of English, as has happened in German. It would not be surprising in this hypothetical scenario if pairs such as /bet/ and /bed/ were still distinguished by the duration of the vowel: /bet/ vs. /bed/. In this scenario final devoicing would have caused the phonologization of a formerly predictable difference in vowel duration, as has happened, for instance, in Friulian (Vanelli 1979). Arguably, however, this vowel duration contrast has already been phonologized in present-day English. That is why we wouldn’t expect it to disappear by the systematic devoicing of word-final obstruents. On the other hand, to the extent that vowels preceding both voiced and voiceless obstruents are still treated in a similar manner in phenomena such as the various vowel shifts that are taking place in English, it must be concluded that speakers still categorize over both contexts. What appears to be needed to understand sound change is a richer theory of categorization than is traditionally assumed (see, e.g., Ladd 2006, Hualde 2004 for proposals). Unlike the example that we considered above, umlaut in German and in Old English, which is restricted to certain morphological contexts (Janda 1998), durational differences in English vowels conditioned by the phonological voicing of a following consonant apply without exception. Vowel duration has been conventionalized, but no phonemic recategorization has occurred.

6. Restriction of sound changes to the word internal context and extension outside of its original phonetic context at word boundaries

Unless word-boundaries can be demonstrated to have Phonetic correlates in the language, they should be irrelevant for “regular sound change”. For instance in Spanish
/bdg/ are spirantized both within words and across word boundaries, e.g. Maria bebe agua [mariaɾeβiaɾəɣa] ‘Maria drinks water’. The spirantization of /b/ in Amharic is similarly an across-the-board phenomenon: [bet] ‘house’, [kaɾet] ‘from the house’. In some historical lenitions, however, we observe that rephonologization is restricted to the word domain.

In the Western Romance voicing of intervocalic stops, which we mentioned in the preceding section, only word-internal intervocalic instances of /ptk/ were recategorized as /bdg/; e.g. Lat. LATU(M) > Sp./Port. lado ‘side’ vs. Lat. ILLA TERRA > Sp. la tierra, Port. a terra ‘the land’. On the other hand, outside of the Western Romance area, in central and southern Italian dialects, in Corsican and Sardinian, the voicing of these segments has an allophonic or optional character and applies both inside words and across words boundaries; e.g. Lat. LATU(M) > Sard. [laðu], Lat. TERRA > Sard. [tɛr:a] ‘land’, Lat. IPSA TERRA > Sard. [saðɛr:a] ‘the land’ (Jones 1997:377). As Weinrich (1958) pointed out, the area where Lat. /ptk/ underwent systematic recategorization coincides with those languages where the voicing is restricted to the word-internal domain. The question that arises is how to account for this difference in the domain of application of the sound change.

Examination of synchronic variation and possible sound change in progress appears to show that at the initial stages intervocalic lenition applies across the board. In some Spanish dialects, for instance, we are witnessing an incipient “second round” of lenition of intervocalic /ptk/. In a recent study, Hualde, Simonet and Nadeu (2010) found about 30% of partially or completely voiced tokens of intervocalic /ptk/ in a sample of spontaneous speech. Other studies have found roughly comparable percentages, sometimes higher, depending on the specific dialect, the speaking style and the speaker (Machuca Ayuso 1997, Lewis 2001). Lenitive voicing is found both word-internally and across word boundaries.

Both the state of affairs in other areas, such as Sardinia and southern and central Italian areas with “phonetic” voicing and the examination of the incipient second round of voicing that we are witnessing in some Spanish dialects lead us to the conclusion that initially voicing must also have operated across word boundaries in western Romance (as Weinrich 1958, Hall 1974 and Cravens 2002 also conclude). As voicing became obligatory and categorical it became restricted to the word-internal context. The elimination of voicing across word boundaries must be attributed to the operation of analogy among tokens of the same word in different syntactic contexts. In a phrase like ILLA TERRA > hypothetical WRom [lätɛr:a] ~ [ladɛr:a] ‘the land’, voiceless realization would eventually prevail under the influence of phrase-initial and postconsonantal tokens of the word /tɛr:a/, including contexts of word-initial gemination (from consonant assimilation): AD TERRĀ > [at: ɛr:a] ‘to land’. Sporadically, however, we find generalization of the voiced variant instead, as in Lat. COLAPHUS > Sp. golpe ‘strike’.

We find the same restriction to the word-internal context in Browman & Goldstein’s (1991) example of lenition as reduction in constriction degree: Lat. HABÊRE > It. avere. Whereas Latin word-internal intervocalic B and V have merged in all the Romance languages, the intervocalic [b] of, for instance, ILLA BUCCA did not become [v] in It. la bocca [labokka] ‘the mouth’, Fr. la bouche.
As we mentioned, in all Romance languages, Latin -B- /-b-/ and -V- /-w-/ have merged. In French, Italian and standard Portuguese, the modern result is /v/:

\[(9)\]

<table>
<thead>
<tr>
<th></th>
<th>Italian</th>
<th>French</th>
<th>Portuguese</th>
</tr>
</thead>
<tbody>
<tr>
<td>HABÈRE</td>
<td>‘have’</td>
<td>avere</td>
<td>avoir</td>
</tr>
<tr>
<td>DEBÈRE</td>
<td>‘must’</td>
<td>devere</td>
<td>devoir</td>
</tr>
<tr>
<td>LAVĀRE</td>
<td>‘wash’</td>
<td>lavare</td>
<td>laver</td>
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</tbody>
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In word-initial position on the other hand, these languages preserve an etymological contrast between /v/ and /b/:\(^6\)

\[(10)\]

<table>
<thead>
<tr>
<th></th>
<th>Italian</th>
<th>French</th>
<th>Portuguese</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCCA</td>
<td>‘mouth’</td>
<td>bocca</td>
<td>bouche</td>
</tr>
<tr>
<td>BONA</td>
<td>‘good, f.s.’</td>
<td>buona</td>
<td>bonne</td>
</tr>
<tr>
<td>VACCA</td>
<td>‘cow’</td>
<td>vacca</td>
<td>vache</td>
</tr>
<tr>
<td>VÔCE</td>
<td>‘voice’</td>
<td>voce</td>
<td>voix</td>
</tr>
<tr>
<td>VÔS</td>
<td>‘you, pl.’</td>
<td>voi</td>
<td>vous</td>
</tr>
</tbody>
</table>

As mentioned in the previous section, in these Romance evolutions, the first relevant change is the lenition of Latin intervocalic /b/, which subsequently results in its merger with /w/.\(^7\) Again, the merger would also be expected to affect word-initial B- and V- when intervocalic; that is, ILLA BUCCA, for instance, should have undergone lenition to [illaβukka], and its B should acquired the same articulation as the V in ILLA VACCA [illavakka] when the contrast between the medial labials of HABÈRE [aβe:re] > [ave:re] and LAVĀRE [lawa:re] > [lava:re] was lost:

\[(11)\] Hypothesized evolution of intervocalic -B- and –V-

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<table>
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<tr>
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<tbody>
<tr>
<td>HABÈRE</td>
<td>aβere</td>
<td>avere</td>
</tr>
<tr>
<td>LAVĀRE</td>
<td>lavare</td>
<td>lavare</td>
</tr>
<tr>
<td>BUCCA</td>
<td>bukka</td>
<td>bukka</td>
</tr>
<tr>
<td>ILLA BUCCA</td>
<td>illa βukka</td>
<td>illa vulka</td>
</tr>
<tr>
<td>VACCA</td>
<td>vaka</td>
<td>vaka</td>
</tr>
<tr>
<td>ILLA VACCA</td>
<td>illa vaka</td>
<td>illa vaka</td>
</tr>
</tbody>
</table>

\(^6\) In Old Castilian Spanish the contrast may have been between /β/ and /b/. This contrast was subsequently lost, in postmedieval times, by the lenition of /b/.

\(^7\) Whereas we cannot be sure when /b/ started to admit approximant realizations or even when these approximant realizations of intervocalic /b/ became the usual articulatory target, we know that -B- /b/ merged with -V- /w/ by the first century of our era. This is because around this time the graphemes B and V start getting confused (Allen 1978:41, Weinrich 1958:87).
At the last stage represented in (11) the phonemes /b/ and /v/ are in contrast in word-initial position only if not intervocalic (e.g. after pause or consonant). There is no phonemic contrast in intervocalic position, either word-externally or phrase-externally. The result is that words that have different initial consonants in some contexts do not in other contexts.

No Romance language has preserved the situation depicted in (11). We may conclude that languages like Italian, French and Portuguese have analogically reestablished the contrast between /v-/ and /b-/ also after a vowel, so that a given word either begins with [v-] or with [b-] in all phrasal contexts (Weinrich 1958).

The frequent cases of confusion between initial b- and v- in old texts from central Italy and even in graffiti from Pompei (see Tekavčić 1972, I:142-144) provide quite strong evidence for the hypothesis that the phonemic contrast was indeed analogically reestablished in word-initial postvocalic position, after a period where the two phonemes were contextually neutralized, as proposed by Weinrich (1958).

In the Romance lenition processes that we have just considered, a sound change was prevented from operating across word boundaries as it became phonologized. In other cases, instead, the opposite seems to have happened, with extension of the process to further contexts across word boundaries.

Although in American English the flap /ɾ/ originally arose from the weakening of /t/ and /d/ in certain contexts, it is now, arguably, a distinct articulatory target. Speakers show awareness of its existence as a different sound. A word like better, for instance, has a flap in its normal pronunciation in the relevant dialects, but speakers may replace it with /t/ for stylistic purposes. Flaps are found both word-externally and word-finally. All words ending in /t/ in their citation form can be pronounced with /ɾ/ before a vowel in the next word, as in but again, at all, forget about, eat oats. Interestingly, the phonetic conditions for the occurrence of the flap are different word-externally and across word boundaries, as shown by the impossibility of flapping in atoll and its possibility in at all. Inside words, the segment must be preceded by the stress and followed by an unstressed vowel. Across word-boundaries, instead, flapping is not conditioned by stress and may occur immediately before a stressed vowel, as in ate apples; this is also the case in a compound such as whatever (cf. potato).

Given the importance on word stress in English as a conditioning factor in reductive processes, I assume that the more restrictive phonetic conditioning that is still found word-externally was the original one and that, across word-boundaries, the change was generalized to all prevocalic contexts, not only unstressed ones.

Flapping is a conventionalized reduction of /t/, since it is only one of the possible phonetic reductions that it may undergo. Other possibilities, all of them found in the same contexts in other English dialects, are the replacement of [t] with a glottal stop, its affrication to [ts]and its spirantization to [θ]. It seems reasonable to assume that after [ɾ] was conventionalized as a replacement for [t] before unstressed vowels it was analogically extended to the context before stressed vowels when word final.

Bybee (2000, 2003) has discussed a similar example, the extension of the aspiration of /s/ in Spanish dialects from the preconsonantal context, where it is found word-externally, as in este [elte] ‘this, masc. sg.’ to the prevocalic context where one may
have aspiration across word boundaries in the relevant dialects, as in *los animales* [lohanimale] ‘the animals’. In Bybee’s account, the extension of aspiration to the intervocalic context across word boundaries involves a sort of analogy. In a first stage of development, the plural masculine article *los*, to give an example, would have aspirated realizations in phrases such as *los toros* ‘the bulls’, where the final /s/ is preconsonantal, but not in *los animales* ‘the animals’, where it is prevocalic and, thus, not in the context of aspiration. The fact that *s#C* is more common than *s#V* (i.e. there are more consonant-initial than vowel-initial words) implies that at this hypothetical stage [loh] ~ [los] would be more frequent than invariant [los], and the alternation would subsequently be extended from the more frequent to the less frequent context. Bybee shows that the distribution of aspiration in several Spanish dialects is consistent with this hypothesis. In the view that I am defending in this paper, it is at this second stage where we are more likely to find lexical effects. An example would be intervocalic word-internal aspiration in *nosotros* /nos+otros/ [nohotro] ‘we’, where a morphological boundary is discernible (cf. *los otros* [lohotro] ‘the others’) vs., e.g., word-internal *ositos* [osito], **[ohito] ‘little bears’, in the relevant dialects. This is similar to flapping in *whatever*, as we saw above.

The phonologization of phrase-final devoicing at the word level provides another example of analogical extension. As mentioned above, a reasonably hypothesis is that word-final obstruent devoicing, as we find in German, starts out as phrase-final devoicing and then is extended to the word domain (Hock 1991:80). The phonetic causes of phrase-final devoicing are reasonably clear, as this is in fact a phenomenon that is easily observable in many languages, affecting all kinds of word-final segments, not only obstruents. This phonetic effect may at some point become conventionalized for phrase-final obstruents. After that, it may be analogically generalized to the word-domain, so that alternations of the type -p## ~ -b#V are eliminated by extension of the word variant ending in a voiceless consonant.

7. Non-reductive sound change

As mentioned in section 2, the main evidence that Labov has adduced in favor of the Neogrammarian orthodoxy comes from the study of vowel shift in progress. These vowel shifts in English crucially differ from reductive processes in that they affect segments in prominent positions, stressed syllables. In fact, Labov points out that one finds more advanced vowel tokens in the direction of the shift in syllables with primary stress than in syllables with secondary stress, vowels in words with emphatic stress being especially advanced along the path of the vowel shift (Labov 1994: 122-123, 173, 195). This is quite different from reduction processes, where we expect to find the least reduced tokens under emphatic stress.

The changes involved in vowel shifts are essentially the same types of processes as other changes targeting stressed vowels, both conditioned (umlaut/metaphony) and unconditioned, including diphthongization, mora dissimilation within diphthongs and rising of (tense/long) vowels. In at least some of these changes it is clear that the added duration of vowels in certain positions led to their recategorization. Thus, in Spanish the phonologically short mid vowels of Latin, which had acquired a more open quality /ɛ/, /ɔ/ gave rise to rising diphthongs when lengthened under stress. In French they diphthongized in the same manner, but only in syllables that were stressed and open, cf. Lat. PEDE(M) > Sp *pie*, Fr *pied* ‘foot’ vs. Lat PERDIT > Sp *pierde*, Fr *perd* ‘s/he loses’.
The long mid vowels of Latin also diphthongized in French, in this case producing falling diphthongs, but again only in stressed, open syllables, where the extra length would presumably favor the perception of a difference in quality between the beginning and the end of the nucleus. In this case, further developments show the sort of mora differentiation that we find in some of the vowels involved in the English vowel shifts; cf. Lat TĒLA > [teɪlə] > [taɪlə] > [toɪlə] > [twel] > [twal]. Notice that to the extent that, under the hypothesis that greater stress causes greater vowel duration and longer vowels are more likely to be recategorized as diphthongs (and diphthongs as containing a more extreme change), if anything we would expect the least frequent words to lead these changes, since they would be more likely to receive phrasal stress.

Besides changes targeting stressed vowels, the most obvious examples of nonreductive changes are consonant fortitions. Whereas experimental work has pointed out the existence of domain-initial strengthening (Fougeron & Keating 1997, Cho & Keating 2009), its phonologization as word-initial fortition is a rare phenomenon. When they happen, these changes seem to have nonphonetic, analogical origins for the most part. For instance, the strengthening of word-initial /r/, /l/ and /n/ in different Ibero-Romance languages where they give the same result as word-internal geminates (Lat ROSA > Sp [r:osa], Lat LŪNA > Cat *[l:una] > lluna [ˈluna] ‘moon’, Lat NŪBES > Leonese [ɲuβes] ‘clouds’ is most likely an extension from contexts where a word-initial geminate arose from consonant assimilation (AD LŪNA > [al:una], see Cravens 2002). To the extent that these changes are correctly analyzed as purely analogical they operate on words, and we may expect lexical effects.

The fortition of word- and syllable-initial glides, as repeatedly found in the history of the Romance languages (e.g. Lat IIOCĀRE > It giocare, Fr jouer, Sp jugar ‘to play’; Sp. huevo [weβo] ~[gweβo]; also in Basque *e-an > jan [jan] ~ [djan] ~ [zan] ~ [jan] ~ [xan] ‘to eat’) remains ill understood. In the several successives processes of syllable-initial palatal glide fortition in the history of Spanish (and also of Basque) the recategorization of the palatal glide shows lexical effects, e.g. IAM > Sp. ya ‘already’ vs. IAM MAGIS > OSp. /ʒamas/ > Sp. jamás /xamás/ ‘never’; Argentinian Sp. yerba /ʒerba/ (mate) ‘maté leaves’ vs hierba /ierba/ ‘grass’, etc. The hypothesis would be that fortition of glides starts in prosodically strong phrase-initial contexts and is later phonologized as a word-initial phenomenon, which may then spread to word-internal syllable-initial contexts. On the other hand, the fortition that we observe en examples such as Lat. VACCA [wak:a] > OSp. [baka] > Sp. vaca [baka] ‘cow’, is the indirect (analitical) result of the weakening of intervocalic /b/ at two distinct stages in the history of the language.

8. Summary
This chapter has focused, to a large extent, on the classical issue of the regularity of sound change (i.e. the Neogrammarian hypothesis), which, concerning recent debate, may be phrased as the question of whether there are sound changes that operate purely on
phonemes in specific phonological contexts, without regard to the lexical identity of the words containing them. I have proposed that in many common sound changes we should distinguish two stages. The first stage is the conventionalization of a phonetic process. Conventionalized phonetic processes operate without regard to lexical identity. At a second stage, there may be phonological recategorization, which will tend to operate on a word-by-word basis. The spreading throughout the lexicon of this recategorization (by analogy) will produce the effect of regularity. Phenomena such as word-boundary effects may be an effect of analogical spreading.

We have studied reductive and nonreductive sound changes separately, since their paths of development can be reasonably expected to be different. Whereas significant progress has been made in our understanding of the phonetic origin of reductive sound changes, nonreductive changes including those affecting stressed vowels and consonant and glide fortition are less well understood.

References


