Abstract: Sound change, phonetics

Sound change has traditionally been viewed as the result of microscopic changes in the production of speech, thus it is considered gradual and unperceivable. Ohala’s program of Experimental Historical Phonology contends that sound change is mainly perceptually driven and can be demonstrated in the laboratory using tools of experimental phonetics. Two phonetically motivated mechanisms underlie most sound changes: hypo-correction and hyper-correction. Hypo-corrective sound change occurs when a listener fails to correct the perturbations in the speech signal and takes the signal at face value. Hyper-corrective sound change happens when a listener overanalyzes and incorrectly attributes an intended phonetic cue as contextual. The union of scientific phonetics and historical linguistics has proven to be a fertile ground for cross-disciplinary pollination. The study of sound change has consistently provided the raw materials for phonological typologies and phonetic explanations while historical linguists, in turn, use these constructs in their hypotheses about sound change trajectories and in their reconstructions.

Keywords:

Sound change, phonetics, hypo-correction, hyper-correction, misperception, variation, history of linguistics, the Neo-grammarian, tonogenesis, perceptual confusion

Suggestions for cross-references

Sound change, phonetics, the Neo-grammarians, tonogenesis, speech perception, speech production, history of linguistics

Biography

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Sound change, phonetics

The fact that sound changes is undisputable, but the fact that only a limited set of sound change occurs in the world’s languages and that many of such changes recur across typologically diverse languages have puzzled historical linguists since advent of the comparative method. Thus, for example, assimilation (1) is commonly found in the world’s languages.

(1) Latin       Italian
    octo >    otto ‘eight’
    noxtem >   notte ‘night’
    septem >   sette ‘seven’
    somnus >   sonno ‘sleep, dream’

Equally puzzling is the fact that sound change often displays directionality effects. For example, the majority of assimilation tends to be anticipatory (also referred to as regressive). That is, for a sequence of C₁C₂, it is more likely for C₁ to take on the features of C₂ than vice versa. Even more common are cases nasal assimilation (2) where a nasal invariably agree in place of articulation of the following stops, never the preceding one.

(2) English
    in-possible > i[m]possible
    in-tolerable > i[n]tolerable
    in-compatible > i[ŋ]compatible

While one of the crowning achievements of historical linguistics is arguably the discovery of ways to reconstruct the history of languages via the comparative method, the comparative method per se has nothing to say about why certain sound change should be more prevalent than others, nor can it explain why asymmetric directionality effects of sound change exist. The comparative method simply does not require the linguist to understand why languages are structured as they are or behave as they do. Words and their constituent sounds are treated more or less as abstract algebraic entities devoid of physical substance. Thus, the comparative method is analogous to ‘a quasi-mathematical operation, involving implicit (and qualitative, not quantitative) estimations of probability of events and what is, in effect, the application of optimization theory’ (Ohala 1993:237). While some leading historical linguists continue to advocate the view that reconstructed forms are simply parts of a formulae for relating sets of cognates and should not be regarded as representing phonetic structure (Bloomfield 1914: 274ff; Meillet 1964:39ff), most historical linguists are not completely blind to the need for an explanation for the cause of sound change. For example, it is often implicitly assumed that the posited reconstructed forms and the accompanying sound changes must also be within the bounds of the plausible, where plausibility is generally determined inductively, that is, by what the linguist have previously encountered in other human languages. Historical linguists also often rely on the notion of phonetic plausibility. To this end, historical linguists generally turn to phoneticians for answers.

Phonetics, broadly defined, is the study of the production and perception of speech. There are two main aspects of phonetic research: taxonomic vs. scientific phonetics. Taxonomic phonetics concerns mainly the articulatory aspect of speech. It provides linguistics with the terminology
and conceptual framework for describing speech sounds and their natural classes. As an area of research, taxonomic phonetics reached its zenith in the late nineteenth century through the efforts of phoneticians such as Alexander Melville Bell, Otto Jespersen, Paul Passy, Henry Sweet, and Wilhelm Viëtor. The basic descriptive system has not changed very much since. Unlike taxonomic phonetics, scientific phonetics is a vibrant and growing discipline that focuses on developing methodologies and theories of phonetics to better understanding the working of speech. The marriage between scientific phonetics and historical linguistic research on sound change is what Ohala calls ‘experimental historical phonology’ (1974).

The union of scientific phonetics and historical linguistics is mainly inspired by two truisms derived from speech research: the infinite variability of speech and the parallelism between such phonetic variation and sound change. That speech shows tremendous variability has been evident to phoneticians as early as Pāṇini. Equally important, however, is the realization that the variation is often lawfully determined. This restrictiveness of phonetic variation leads many researchers to posit phonetic theories to explain the observed regularities. The application of phonetic theories to explaining sound change is made possible by the second observation, namely, the often observed similarity between phonetic variation and sound changes. For example, previous phonetic research has revealed that the fundamental frequency (F0) on vowels is often non-distinctively higher following voiceless consonants than voiced ones (e.g., Hombert et al. 1979). Similarly, historical linguists have pointed out that, in East and South-east Asian languages, a higher tone develops after what had been the voiceless consonants and lower tone after the voiced ones (e.g., Edkins 1853:6-54, esp. 47, Maspéro 1912). These types of similarities are repeatedly observed as instrumental studies and perceptual studies of speech accumulate, which eventually prompted the phonetically-minded historical linguists to posit a potential causal relationship between the two (e.g., Haudricourt 1954). This in turn led phoneticians to apply phonetic theories to the explanation of sound change.

Not all variations constitute sound change, however. On the one hand, the Neo-grammarians viewed sound change as the result of microscopic changes in the production of speech, which gives rise to the notion of articulatory drift and the view that sound change is gradual and unperceivable (Bloomfield 1933). Ohala (1974 et seq.), on the other hand, contends that sound change is mainly perceptually driven and can be demonstrated in the laboratory. In particular, Ohala (1993) argues that variation in perception caused by the confusion of acoustically similar (but sometimes articulatorily different) speech sounds may constitute a (mini-) sound change, but not so for variation in production. Variation in production, however, may still play an important role in the development of sound change. In particular, when a listener fails to correct the perturbations (e.g., from coarticulation) in the speech signal and takes the signal at face value, his conception of the pronunciation might differ from the intended one. Ohala refers to this ‘hypo-correction’. A canonical example of hypo-correction is the emergence of umlaut in the history of Old English. Umlaut takes place when a back vowel is fronted by a front vowel or a palatal glide in the following syllable. In the case of Old English, the plural suffix –i in pre-Old English created a front allophone of the back vowels in the root. The listener hypo-corrected, perhaps due to the failure in detecting the final front vowel (the conditioning factor), and the fronted back vowel subsequently became phonemic when the conditioning environment is lost (e.g., mus-i → mys ‘mice’).
Examples of hypo-corrective sound change are many, including regressive assimilation (Ohala 1990), tonogenesis (e.g., a tonal contrast emerges from a historically prior voicing contrast), the development of distinctive nasal vowels (i.e. contextually nasalized vowels become distinctive nasal vowels; $\tilde{V}N > \tilde{V}$; Beddor et al. 1986), the rise of emergent stops (e.g. Samson > Sampson; Ohala 1997), nasal effacement (e.g., Late Latin *ansa > Milanese asa ‘handle, loop, occasion’; Ohala & Buzà 1995), nasalization-induced lowering (e.g., fine [fɛ̃] but fin [fɛ] in French; Beddor et al. 1986) and velar softening (e.g., Lung chow kjaa : Po-ai tjaa ‘rice seedlings’; Guion 1998).

Listeners not only fail to normalize variation in production sometimes, they may also overanalyze and incorrectly attribute an intended phonetic cue as contextual. This mechanism of sound change is referred to as ‘hyper-correction’. Hyper-corrective sound changes invariably involve only phonetic features which manifest themselves over fairly long temporal intervals, such as labialization, aspiration, retroflexion, pharyngealization, the voice quality called ‘glottalization’ and place of articulation. Only such stretched out features may encroach on adjacent segments thus creating an ambiguity as to where the feature is distinctive and where fortuitous. A classic type of hyper-correction is dissimilation. Thus, in the history of Sanskrit and Greek, when a root contains two aspirated stops the first dissimilates to an unaspirated stop (i.e. Grassmann’s Law). What appears to have happened is that the listener identified only a unique source for the laryngealization, which spanned across multiple syllables in PIE. As a result, aspiration is hyper-correctively eliminated from all aspirated stops except the last.

(4) a. PIE          Sanskrit
    *bhudhyetoy  >  budhyatē  ‘is awake’
    *bhebhowdhe  >  bubōdha  ‘was awake’

   b. PIE         Greek
    *pʰakʰus       >  pakʰus  ‘thick’
    *kʰepʰalē:     >  kepʰalē: ‘head’

Ohala’s listener-oriented misperception based explanation of sound change (or what Steriade (1999) refers to as the ‘innocent’ view of sound change) not only offer great insights into the mechanism of the actuation of sound change in general, but it resolves an important embarrassment for the traditional Neo-grammarian view of sound change. The main tenet of the Neo-grammian account of sound change is that sound change is gradual, regular and exceptionless. Yet, it has been repeatedly recognized that there is a class of changes that is sporadic and abrupt (Bloomfield 1933). These so-called ‘minor’ sound changes include dissimilation and metathesis. As already illustrated above, Ohala’s hyper-correction model provides an explanation as to why dissimilatory sound change may take place. Blevins & Garrett
1998 & 2004 applies the same mechanism to account for metathesis (Classical Greek *gambrós* > South Italian Greek *grambó* ‘son-in-law’). Both types of minor sound changes are the results of the listener failing to correctly identifying the source of some long stretched-out phonetic cue. In the case of dissimilation, the listener resolves the ambiguity by reducing the number of conditioning factors, while in the case of metathesis, the listener incorrectly localizes the source of the ambiguity, resulting in an apparent sound transfer.

An important difference between hypo- and hyper-corrective sound changes is in the role of the conditioning environment. In hypo-corrective sound change, the conditioning environment is often lost at the same time as the conditioned change occurs since failure to detect the conditioning environment is a direct cause of the listener failing to implement normalization of a contextual-induced perturbation in the first place. The conditioning environment in a hyper-corrective sound change, on the other hand, crucially may not be lost at the same time as the conditioned change since the listener must be able to detect the conditioning factor before he may, albeit erroneously, attribute an imagined perturbation to the conditioning environment.

In recent years, a renewed interest in the phonetic explanation of sound change has resulted in several attempts to reevaluate the merits of the listener-oriented misperception view of sound change. For example, Steriade (1999) asserts that the innocent view of sound change fails on two counts. First, patterns of perceptual confusion found in the laboratory do not always match up with attested sound changes. Second, sound change seems to favor outcome that is perceptually optimizing. Note, however, that perceptual confusion is not always bidirectional (e.g., Guion 1998, Ohala 1983 & 1997), thus it is not at all surprising that sound change may show asymmetric directionality effect as well. In addition, while the benefit of applying laboratory findings to the explanation of sound change is great, one must exercise great caution in interpreting laboratory results. A variety of factors may influence the outcome of an experiment (e.g., the nature of the stimulus presentation, the method of subject response etc.). Thus, the discovery of discrepancies between laboratory results and sound change cannot be taken at face value as a definitive failure of the Experiment Historical Phonology program. Another aspect of the listener-oriented model of sound change that has come under increased scrutiny is the listener’s role in deciding the direction of a change. Steriade (1999) proposes that linguistic innovations must be channeled in the direction that is least likely to yield blatant departures from the norm through some mechanism of the phonological grammar (e.g., the P-map). Blevins (2004) recognizes a similar gap in Ohala’s original model and adds a third mechanism called CHOICE, which refers to the situation where the listener chooses among multiple phonetic representations with distinct phonological representation.

In sum, the cross-pollination of ideas between phonetics and historical linguistics has proven to be beneficial to both disciplines. The study of sound change thus has consistently provided the raw materials for phonological typologies and phonetic explanations while historical linguists, in turn, use these constructs in their hypotheses about sound change trajectories and in their reconstructions.
Bibliography


