RECIPROCAL SOUND CHANGE

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1. Simplification and complication in phonological change

A fundamental tenet of markedness theory has been the claim that language sounds are not equal-valued. The theory attributes varying degrees of complexity to different segments, and it further maintains that these differences elucidate properties pertaining to phonological systems.

For example, in the realm of phonological change, Postal (1968:170) notes: "One would expect...that given two series of related segments, one of which is of the Unmarked type, that sound change will frequently merge the Marked with the Unmarked, or change the Marked in some other way....But opposite situations in which there is loss or merger of 'normal' to 'nonnormal' types should be extemely rare or nonexistent." According to this view, languages ought to change in directions leading to simpler phonological inventories.

Lass (1975) has severely criticized this aspect of markedness. He cites data from Germanic to show the nontenability of 'markedness' claims. He notes that the Germanic languages have had a long, and complex, series of developments involving front rounded vowels. Now, markedness theory contends that the set of front rounded vowels, with its mixed tonality, is more complex than either set of peripheral vowels--front unrounded or back rounded. Changes from mixed tonality to peripheral would count as 'unmarked', while from peripheral to mixed would count as 'marked'. Lass examines the evolution and demise of front rounded vowels in Icelandic and in English. Three of his six Icelandic changes go from unmarked to marked. Lass concludes that a "50%...counterprediction is not a very good record for an algorithm." (479).

Lass's criticism is in need of interpretation. First, I do not think that anyone (Postal included) would claim seriously that the only type of change is simplification. If that were so, then by now, all languages should have fairly impoverished sound systems. Second, it is not surprising that Lass finds 50 percent simplification counterbalanced by 50 percent complication. (His findings for English are comparable.) Lass's statistics suggest that, over the long run, languages tend to be relatively stable in their degree of complexity, and even though, at particular points in their histories, the pendulum may swing in one direction or the other, the accounts must eventually get balanced. That is, although there may indeed be an inherent tendency for complex sounds to change into simpler ones, at the same time, there will be strong intrasystemic pressure for maintaining an overall level of complexity.

If markedness (or something like it) handles the 50 percent simplification, then what brings about complication? Assimilation will account for some complications--for example, the original umlaut process of Germanic, where back vowels were fronted by [i] in a following syllable. But assimilation accommodates only a relatively small number of complications. What can one say about the innumerable context-free changes?

2. Reciprocal change

Having examined the vowel changes from early Germanic on through English, I have found that where there are several changes attributed to roughly the same period, a simplification in one segment or group of segments is almost consistently offset by a 'reciprocal' complication elsewhere. I call this reciprocal change, because, as we shall see, the context-free complications are rarely random, but rather, the pairs of segments entering into the complication/simplification relationship generally exhibit a symmetrical phonological structure and the resulting changes also portray a certain symmetry.

The reciprocal nature of the complications and simplifications is particularly perspicuous in particle notation. In that framework, vowels are specified through different combinations and numbers of particles. Due to this mode of representation, particle notation automatically contains within itself a built-in 'markedness' metric: Number of particles determines degree of complexity.[1] (See Tables 1-4 of the Introduction of this issue for the particle structures of the different vowels and diphthongs. Note, in particular, in Table 2, the two modes of representation of long vowels.) Thus, [a], [i], and [u], with one particle each, are the least marked vowels. For vowels of the same height, front unrounded and back rounded, with one tonality particle each, are equally marked, but front rounded vowels, with both tonality particles, are more marked. For vowels of the same series, lower height corresponds to greater markedness. Long vowels are more complex than short ones, and short ones that are lax are more complex than plain short ones. This distribution of complexity agrees, for the most part, with the observations of Chomsky and Halle (1968) in this regard. Hence, in particle phonology, complication is interpreted as the acquisition of new particles, whereas simplification is seen as the loss of particles.

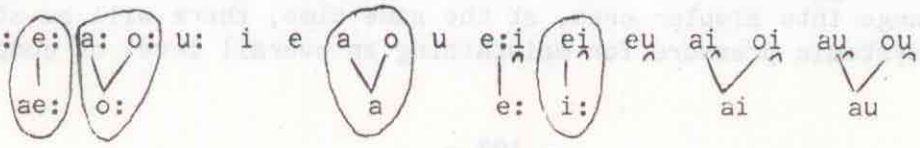
2.1. Examples of reciprocal change

Let us turn now to some examples of reciprocal change. I draw most of these from the history of English, beginning with its Germanic origins.

2.1.1. Early Germanic

Changes from Indo-European to early Germanic are presented in (1).

(1) i: e: a: o: u: i e a o u e:i ei eu ai oi au ou



Two changes affect the long vowel system: [e:] is lowered to [ae:], and [a:] is raised and rounded to [o:]. Among the short vowels, there is a single change: [o] has become [a]. This same change affects the vocalic nuclei (which act like short vowels) of the diphthongs [oi̯] and [ou̯]. The diphthongs [e:i̯] and [ei̯] monphthongize: [e:i̯] becomes [e:] (thereby reintroducing [e:] into the vowel system), and [ei̯] is raised to [i:]. The crucial changes have been circled in (1) and are reproduced as particle structures in (2).[2]

(2)

[e:]	ai i	[i:]	i i	[a:]	a a	[a]	a
↓		↑		↓		↑	
[ae:]	aai i	[ei̯]	ai i̯	[o:]	au au	[o]	au

There are two reciprocal changes. The first one involves [e:] and [ei̯]. The long vowel, when lowered to [ae:], gains an aperture particle, which represents a complication; the diphthong [ei̯], when raised to [i:], loses an aperture particle, which counts as a simplification. The second particle exchange affects [a:] and [o]. The long vowel, when converted to [o:], acquires labial particles; the short vowel, when changed to [a], loses its labial particle. In particle notation, this type of reciprocal change is manifested as particle exchange--one segment has lost a particle, and a segment elsewhere has gained that kind of particle.

As a result of the last reciprocal change, there cease to be occurrences of [a:] and of [o]. However, both of these vowels are reintroduced in the early Germanic period. New occurrences of [o] are derived from [u], whenever the latter is followed by a nonhigh vowel. Concurrent with this lowering, there is a raising elsewhere: [e] becomes [i] when followed by a high vowel. These changes are shown in (3).

(3)

[u]	u	[i]	i
↓		↑	
[o]	au	[e]	ai
/__ [e,a]		/__ [i,u]	

We have here another height exchange. The back vowel [u] acquires an aperture particle, while the front vowel [e] loses one. (This change affects as well the diphthong [eu̯]: It becomes [eo̯] if a nonhigh vowel follows, but [iu̯] if there is a high vowel.)

How does [a:] become re-established? One source comes from the deletion of a postvocalic nasal with compensatory lengthening of the preceding vowel (e.g. early Germanic *fahanan > Gothic fahān; OE fōn 'seize, take'). However, it is the other source of [a:] that is of special interest.

2.1.2. Old English

Early Germanic [ae:] has as reflexes both [ae:] and [a:] in old English: [ae:] is found in most environments, whereas [a:] occurs only before certain consonants and a following back vowel. A similar

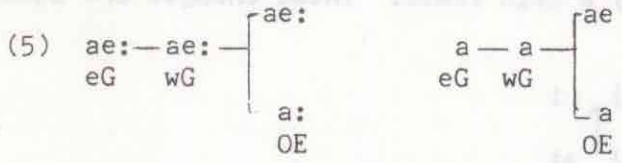
distribution obtains for the short vowels [ae] and [a]. Now there are two different accounts of these developments. Some scholars (e.g. Campbell 1959, Moore and Knott 1955) maintain (see (4)) that early Germanic [ae:] first became West Germanic [a:], because other Germanic languages have uniquely [a:] as the reflex of early Germanic [ae:]. Then certain occurrences of this [a:]--namely, those in the nonbacking environments--are shifted to [ae:]. Similar developments are attributed to the short vowel: [a] becomes [ae] in the nonbacking environments. In this account, the long and short vowels change in the same way. Note, though, that a shift from [a(:)] to [ae(:)] represents, in particle phonology, a complication.

(4)

/__ w,p,k,g [+ back V] /__ C [+ back V], w, N

Wright (1925) has a different account. He claims (see (5)) that early Germanic [ae:] remains unchanged in west Germanic, and, subsequently, in old English, backing takes place in the appropriate environments. The short vowel [a] then shifts to [ae] in the complementary environments. If we accept this version, it too becomes a instance of reciprocal change: The shift from [ae:] to [a:] in the long vowel system (a simplification due to loss of tonality particles) is counterbalanced by the shift from [a] to [ae] in the short vowel system (a complication because of the acquisition of tonality).[3]

(5)



There are additional developments for old English: changes in diphthongs, and effects from umlaut and 'breaking'. However, so far as I can tell, these have nothing to do with reciprocal change. This observation holds also in the subsequent period for some of the changes of middle English: the monophthongization of certain diphthongs, and open syllable lengthening. (See Schane 1984 for a particle analysis of the latter phenomenon.)

2.1.3. Middle English

An interesting set of changes, shown in (6), affects the low vowels of early middle English. Once again, [ae] becomes [a]. In the non-northern dialects, this simplification is offset by a complication: [a:] shifts to [ɔ:]. In particle notation, [ae] has lost its tonality

particle, whereas [a:] has aquired particles of opposite tonality.

(6) [ae] aai | [ɔ:] aau aau
↓ ↑
[a] aa | [a:] aa aa

2.1.5. Modern English

The most dramatic set of changes, beginning in late middle English and extending well into modern English, is, of course, the Great Vowel Shift. In its totality, the GVS represents an impressive collection of reciprocal changes. The principal stages are summarized in (7).

(7)

Stage 1	i:	e:	ae:	a:	u:	o:	ɔ:
Stage 2	e͡i	i:	e:		o͡u	u:	o:
Stage 3	^͡i			ae:	^͡u		
Stage 4	a͡i		i:	e:	a͡u		

Stage 1 depicts the original middle English long vowels. Stage 2 corresponds to the dialect of John Hart, as described by Chomsky and Halle (1968) and by Wolfe (1972). By the beginning of the sixteenth century, high vowels had diphthongized and shifted downward one step, whereas mid and low vowels had been raised one degree in height. Stage 3 represents vowel patterns described in the mid-seventeenth century by the orthoepists, John Wallis and John Wilkins (Wolfe 1972). The changes here are the centralization of the nulei of [e͡i] and [o͡u] to [^͡i] and [^͡u], respectively, and the fronting of [a:] (that arose from middle English open syllable lengthening) to [ae:]. Stage 4 covers the remaining changes: the further lowering of the nuclei of the diphthongs [^͡i] and [^͡u] to [a͡i] and [a͡u], and the raising of the nonhigh front vowels [e:] and [ae:] (the latter derived from [a:]) to [i:] and [e:], respectively. Observe the symmetries: Stage 2 involves shifts in height, stage 3 in the front/central dimension, and stage 4 in height, once again.

The particle representations of the GVS are presented in (8).[4]

(8)

Stage 1	i	i		ai	i		aai	i		aa	aa		u	u		au	u		aau	u
Stage 2	ai	i͡			i	i		ai	i				au	u͡		u	u		au	u
Stage 3	a	i͡								aai	aai		a	u͡						
Stage 4	aa	i͡					i	i		ai	ai		aa	u͡						

Notice how the symmetries exemplify reciprocal change. At stage 2, nonhigh tonality vowels each lose an aperture particle, while the two (diphthongized) high vowels acquire one. At stage 3, the nuclei of the diphthongs lose their tonality particles, and the vowel [a:] acquires particles for tonality (i.e. palatality). Stage 4 repeats aspects of stage 2: Both nonhigh front vowels each lose an aperture particle, while the diphthongs each acquire one.

2.2. Types of reciprocal change

We have now seen several examples of reciprocal change. The notation of particle phonology portrays quite vividly the mechanism of this operation. There are three types of changes.

In the first type, the two sounds that undergo change are, at the outset, more or less of equal complexity. They diverge, such that one of them becomes more complex, and the other becomes simpler. An example was the change leading to early Germanic, where [e:] becomes [ae:], and [e$\hat{i}$] goes to [i:]. The original sounds are of mid height in their respective systems: The long vowel acquires an aperture particle, and the diphthong loses one. A similar example is stage 4 of the GVS, where [e:], [ae:], [$\hat{}$i] and [$\hat{}$u] are all nonhigh. This time it is the long vowels that lose aperture particles, while the diphthongs acquire them.

In the second type of change, the sounds, at the outset, are different. They change in such a way that the first becomes more like the second, and the second, more like the first. We have seen several examples of this type. Some involve aperture. In early Germanic, high [u] becomes mid [o], while mid [e] becomes high [i]. In stage 2 of the GVS, high [i:] diphthongizes and goes down to mid [e$\hat{i}$], whereas nonhigh [e:] and [ae:] move up to [i:] and [e:], respectively. (A similar exchange takes place in the back rounded vowels.) Other examples illustrate exchange of tonality. In early Germanic, it is labiality: [o] becomes [a], and [a:] becomes [o:] In old English, it is palatality: [ae:] becomes [a:], and [a] becomes [ae]. It is also possible to find changes where loss of one tonality particle is offset by the acquisition of a particle of opposite tonality: In early middle English, [ae] becomes [a], a loss of palatality, and [a:] becomes [ɔ:], a gain of labiality.

In the third type of reciprocal change, one of the sounds changes in some way, and the other one becomes identical to what the first one was. The 'push chains' and 'drag chains' of Martinet (1955) are of this type. These changes are the only ones that I have found where one of the segments changes in tonality and the other in aperture. None of the Germanic data cited are of this type. However, a well-known example comes from the histories of French and of Greek. In those languages, [u] shifted to [ü], and then [o] became [u]--an increase in tonality for the high vowel was offset by a decrease in aperture for the original nonhigh one. This type of exchange can take place even within a single segment. Lass (1975) notes, for example, that in some of the northern dialects of English, prior to the GVS, certain occurrences of [o:] shifted to the 'more marked' [ü:], via [ö:]. This succession of changes within one segment is reminiscent of the individual changes of French and Greek. The move from [o:] to [ö:] constitutes a complication in tonality. No other segments respond to this change, and the subsequent shift to [ü:] represents a simplification in aperture. A segment, then, may enter into reciprocal change with itself.

2.3. The role of reciprocal change

How might reciprocal change fit into the general picture of historical sound change? It is uncontroversial that phonological systems are

subject to change and that some changes lead to more complex segment types, while others lead to simpler ones--what have been called 'marked' and 'unmarked' changes, respectively. Yet, there is an overall stability to sound change, such that complications or simplifications in one part of the system are offset by opposing changes elsewhere. Phonological systems are no different from other complex systems: Over time, intricate structures have a tendency to break down--entropy is a function of the universe. But complex structures also strive to maintain their acquired level of complexity. Simplifications a la markedness theory account for only half of the flux. Other factors must be at work if overall complexity is to be preserved. Some of the complications can be attributed to suprasegmental influence and others to assimilation, but there are still many context-free changes that do not fit into these categories. I have suggested that a simplifying change and a complicating one can pair up in some way, and they reciprocally affect each other. This is not to say that the changes must happen simultaneously. They could, of course. But I suspect that most reciprocal changes are sequential: either, simplification occurs, which is then followed by complication; or else, complication spontaneously happens, which is then followed by simplification. I must insist, however, that the changes be attributed to roughly the same period in the history of a language, although I am not prepared to quantify what constitutes an acceptable temporal span. Without some kind of temporal cohesion, reciprocal change becomes a vacuous notion.

Most important is the claim that the compensatory changes are not just random ones, whose only purpose is to keep the complexity of the system in check, but rather they are highly structured. Particle notation clearly reveals the symmetry of the changes. A segment or group of segments loses a particle, while elsewhere a particle (often of the same type) is acquired. It is as though there is a constant flow of energy moving among the vowels. The beauty of the Great Vowel Shift, for example, lies in this delicate balance.

Finally, I am not able to account for every instance of complication, nor can I show that, in every case, it is counterbalanced by a symmetrical simplification. There will be examples not explained by reciprocal change. However, for the language histories that I have examined, reciprocal change occurs frequently enough to indicate that we are not dealing with merely a few isolated, coincidental patterns. I believe that reciprocal change is a manifestation of a tendency observed again and again in phonology: Phonological systems strive toward symmetry.

FOOTNOTES

[1] In the standard framework, the equal-valued +'s and -s provide no inherent way for judging complexity. In the markedness system proposed by Chomsky and Halle (1968), the binary values must be replaced by M's and U's (for Marked and Unmarked), and a set of marking conventions provides the translation between the two systems. Yet these conventions are, in themselves, completely arbitrary. For example, one of the conventions states that the unmarked value of the feature [high] is [+ high], a convention intended to reflect the claim that high vowels

are unmarked vis-à-vis mid ones; however, if one were to decide to make mid vowels simpler, then one need merely change the marking convention such that the unmarked value for [high] would be [- high]. In particle phonology, the measure of complexity is a matter purely internal to the notational system. There is no way to change the effects of this metric, short of defining a totally different set of vowel parameters.

[2] The change from [e:i̯] to [e:] represents the spontaneous loss (absorption) of the glide of the diphthong; as a consequence, early Germanic ceases to have overlong diphthongs. In the particle analysis of the change from [a:] to [o:], a labial particle has been acquired by each mora of the long vowel. The resulting au au is equivalent to au u. (See note 4 of the Introduction.)

[3] Note that at this stage of old English aa is the particle representation for [a] as well as for each mora of [a:]. This structure is necessitated by the presence of [ae:]. The vowel [a] requires as many aperture particles as the lowest tonality vowel. (See the discussion of the law of maximum aperture in 3.6.3 of the Introduction.)

[4] Once again, [a:] must be represented as aa aa due to the presence of [ae:]. At stage 3, both morae acquire palatal particles. Recall that the resulting aai aai, as well as stage 4 ai ai, are equivalent to aai i and ai i, respectively.

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