

1 Change for the Better? Optimality Theory versus History

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Change is not made without inconvenience, even from worse to better.

Dr Johnson, quoting Richard Hooker

1.1 Introduction

Optimality Theory (OT) may have been described by Archangeli (1997: 1) as “THE Linguistic Theory of the 1990s,” but it is clearly making a bid, at least in phonology, for continuation of that favored status into the twenty-first century. OT analyses have now been developed for a vast range of phonological phenomena in the languages of the world; and as the architecture of OT has changed, and the edifice has grown, so competing possibilities have been proposed. The OT phonological community has also reached a point of generally acknowledging the strengths of the model (mainly in prosody, in the enlightening modeling of the interaction of competing motivations, and in the integration of typological evidence into phonology), and also its weaknesses (mainly the handling of opacity, specifically in morphophonological alternations; and in some areas of persistent in clarity about central tenets of the theory, notably the role of GEN, the shape of the input, and whether constraints are universal).

In this chapter, I shall try to highlight some of these issues as they affect the OT analysis of sound change. Historical linguists, who may well begin from a situation of relative theoretical neutrality, will be persuaded to make use of a particular formal model only if they are convinced that it offers the possibility of providing more enlightening analyses of change than would be possible in the absence of the model. It is therefore important to show what OT claims to be able to say about change, and how the OT approach has changed during the (relatively short) life of the theory.

This chapter consequently has two goals, though their development will be interwoven rather than sequential. On the one hand, I shall show that the OT approach to sound change has altered considerably since the first applications of the model to diachronic questions. Early OT accounts tended to assume that change was, in some sense, for the better, notably in the analysis of emergence

of unmarked effects; and these analyses tended also to be presented as a change for the better over other possible accounts in different models, in providing direct explanations of change. However, more recently, some of these claims have been diluted, so that not all historical linguists now working in OT necessarily expect or attempt explanations of change, but rather a neat method of modeling conflicting factors and motivations. In a sense, this means the OT approach to change is now less concerned with the details of, and the impulses behind individual changes, and more involved with a global view: hence, Bermúdez-Otero and Hogg (2003) focus on OT modeling of the “life-cycle” of phonological processes, while Minkova and Stockwell (2003) demonstrate that various rankings of four constraints give rise to different, though perhaps related, types of change.

This concentration on macroanalysis of language history might itself be seen as a change for the better; however, in the second theme of this chapter, I shall show that some of the areas of in clarity in the current formulation of OT are of particular relevance and concern for analyses of change. For instance, the well-known question over the acceptability of different constraints and constraint types means it can be hard to evaluate alternative accounts of the same change, and this overlaps with the unresolved question of the universality of constraints. Perhaps even more seriously, recent questions over the possible phonetic grounding of phonological constraints are of particular relevance to sound change, if we accept that changes often have their inception in phonologizations of automatic, phonetically motivated processes. Many of these points can be made with reference to alternative OT analyses of a single, central change, namely the Great Vowel Shift, which will therefore be the focus of much of the discussion below.

1.2 Optimality Theory and Sound Change: The Basic Ingredients

For the benefit of those readers who have not yet acquainted themselves with the (sometimes slightly arcane) paraphernalia and impedimenta of OT, a very brief outline of the model might be helpful (and see also Further Reading, below). OT is based around the idea of a set of constraints, CON: initially, and still in some current versions, these constraints are seen as universal and innate, but crucially violable. For each input, or mental lexicon form postulated on the basis of primary linguistic data, all possible parses, or outputs, are generated by a mechanism called GEN. These alternative, competing parses are then evaluated by the ranked set of constraints; the parse which violates fewest high-ranking constraints will win and be produced. However, although the constraints are universal, their ranking is not, and differences between languages therefore result from a different prioritization of the same constraints.

We might as historical linguists be faced with two sister languages, one of which has an onset in every syllable, while the other often has onsets, but not

in absolutely every case. These onset consonants routinely match; but where the second language has no onset consonant, the first consistently has a glottal stop. In OT terms, we conclude that in the first language (1a), the universal constraint *ONSET* (which requires all syllables to have onsets) is ranked so high that it will always be obeyed on the surface. If there is no onset in the common ancestral form, or in a borrowed form, an onset is inserted *ex nihilo* in the form of a glottal stop. In the second sister (1b), although the same constraint is inherited by children, it is less important than another constraint (normally stated as *DEP-IO* in current versions of OT), which requires the output to be faithful to (that is, essentially the same as) the input, and which specifically forbids the insertion of segments. So, in this case, onsets are welcomed wherever they are already available in the input, but the higher ranking of *DEP-IO* as compared to *ONSET* means it is more important to keep the one-to-one relationship between input and output than to resort to epenthesis and satisfy the requirement for an onset consonant. In the first language, the priorities are the other way around.

(1) a.

/atel/	<i>ONSET</i>	<i>DEP-IO</i>
[ʔatel] ↗		*
[atel]	*!	

b.

/atel/	<i>DEP-IO</i>	<i>ONSET</i>
[ʔatel]	*!	
[atel] ↗		*

The very great advantage of this constraint-ranking approach is its resolution of a venerable problem in linguistics, namely the existence of universal pressures which do not always create absolutely universal results. We can say that languages typically prefer to have filled onsets; but there is a continuum from those languages (like Arabic) that absolutely require them, through those where onsets will be allowed, although speakers do not go out of their way to produce them in every case. The status of universal tendencies of this kind was unclear in earlier models, but they are a straightforward and predictable part of OT, where the violability and rankability of constraints create different outputs depending on language-specific priorities. We can also model the range of results provided by all possible rankings of a set of constraints, and should ideally find that each ranking provides an attested output: we shall return below to an illustration of this so-called factorial typology from Minkova and Stockwell (2003).

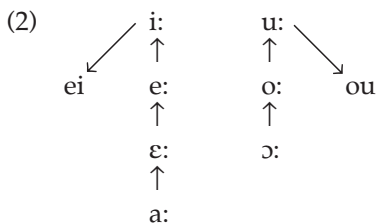
Given that different rankings will produce different outputs, a neat and straightforward means of modeling change presents itself, and it is not

surprising that OT phonologists seized on this relatively early in the development of the theory: “Under OT, the formal characterization of language change through time is that constraints are reranked” (Archangeli 1997: 31). That is, taking our “toy” example of the onset-requiring language, and its sister which can take onsets or leave them, we might assume that the latter represents the historical situation, and that the first sister has subsequently undergone a reranking whereby ONSET is now more highly ranked than DEP-IO. In other words, at some point a discontinuity arose between generations, such that parents arguably had a grammar with one ranking, and their children instead acquired an alternative grammar with the two relevant constraints ranked the other way round. Although this is undoubtedly a pleasing analysis, and has the added advantage of following very directly from the OT account of synchronic, typological variation, it does raise the problem of explanation; and this is a key issue to be explored in the next section. Armed with a very basic outline of the architecture of OT, and the consequent model of change, we now turn to a more complex change and some alternative means of modeling it in constraint-based terms.

1.3 Optimality Theory and the Great Vowel Shift

1.3.1 *The Great Vowel Shift: one thing after another, or just one thing?*

A diagram bearing at least a close resemblance to (2) below is almost an expected ingredient of survey courses on the history of English, and the Great Vowel Shift, which it portrays, is highly likely to figure on the average top ten list of sound changes in English, or indeed Germanic.



As presented, this change involves the diphthongization of the high vowels (which subsequently continue to lower to their present-day values of /aɪ/ and /aʊ/, and the stepwise raising of the long monophthongs. Later changes obscure aspects of this pattern, since Middle English (ME) /a:/ does not remain at /ɛ:/, but continues to raise to /e:/ (now often diphthongal [eɪ], as in *name*), while ME /ɛ:/ itself raised two steps to /i:/ in most cases (*sea, beat*; exceptions are *great, steak*), merging therefore with ME /e:/ (*green, sleep*) which

had itself raised by one step to /i:/. Other changes following the Great Vowel Shift seem to fit into the same pattern – so, as ME /u:/, having diphthongized in the early stages of the Shift, continued to lower to [au], earlier /au/ raised and monophthongized in words like *law*, filling the low mid slot vacated by /ɔ:/ when it earlier raised to /o:/ (*boat, coat*).

As this brief description has already shown, it is very hard to write about the Great Vowel Shift (GVS), or indeed any chain shift, without thinking in terms of systems containing specific slots. From these slots some elements will shift, leaving space for others to move in (the classical description of a drag chain); alternatively, elements already moving may put pressure on others, which are forced into a consequent shift away to avoid merger (giving rise to the traditionally termed push chain). Either way, the core of the GVS seen in this way is “a particular kind of chain shift, in which segments in a given phonological subspace play musical chairs and don’t go anywhere” (Lass 1988: 397). Indeed, Lass (1976) used the GVS specifically to argue for the inclusion and recognition of systems and inventories in phonological theory. Intriguingly, he also proposed a series of metarules and output conditions to analyze large-scale shifts of this kind; a “metarule” which effectively says vowels should raise seems presciently close to the “vowels are high” type of OT constraint.

Lass notes that “probably the majority of historians of English . . . have come to accept the GVS as something that can be talked about, on a par with other reifications of diachronic correspondence-sets like Grimm’s, Verner’s, Grassman’s Laws, the High German obstruent shift, and the like” (1988: 396); elsewhere, and indulging in a little reification himself, he characterizes such “major sound changes” as having “left the languages they affected very different from what they were before, either in inventory (Grimm’s Law, the High German Consonant Shift), or in morphophonemic complexity (the Great Vowel Shift)” (1976: 52). But although this acceptance of the unity of the GVS might be fairly general, it is not uncontested. Indeed, a slightly unorthodox but closely fought game of academic tennis has been going on over this point for the last 20 years: on one side of the net is Lass (1976, 1988, 1992, 1999), who argues for the unity of at least part of the conventionally described GVS, and on the other are Stockwell and Minkova (Stockwell 1975; Stockwell and Minkova 1988a, 1988b, 1990, 1997, 1999; Minkova 1999), who believe that the “GVS” is a misleading label for a series of changes which are essentially unconnected except in being examples of the kind of changes that routinely happen in the history of English, because English is the sort of language where that kind of change routinely happens.

Obviously, a challenge of this kind to the integrity of the GVS is a major issue (not least for this chapter, where I propose to discuss several accounts of a possibly non-existent change): as Lass (1992: 145) puts it: “For nearly a century the exegesis of the GVS has been one of our major cottage industries,” but “Certainly questions about the causes, beginnings, and structure of something that did not happen are rather thin stuff for serious scholars to be spending their time on.” In this context, it is reassuring to note that Stockwell and

Minkova do not deny the individual changes often grouped together as the GVS: “The facts, indeed, seem quite clear; the question is how to make sense out of them” (Stockwell 1975: 333). In other words, all parties to the discussion would agree that the changes in (3) can reasonably be postulated for the history of English; the difference is that Lass would also accept the geometrical representation in (2), which shows (some of) the same individual changes as linked.

(3)	ME		EModE		ModE
	i:	→	ei	→	aɪ
	e:	→	i:	→	i:
	ɛ:	→	e:	→	e:
	a:	→	ɛ:	→	e:
	u:	→	ou	→	aʊ
	o:	→	u:	→	u:
	ɔ:	→	o:	→	oʊ

In such an extensive series of arguments and counterarguments, there are of course further detailed points of disagreement, some of them fundamental to the analysis of the individual changes. For instance, while both Stockwell and Minkova and Lass agree that the original ME high vowels diphthongized to some intermediate form before lowering to /aɪ aʊ/, they propose different intermediate forms. Furthermore, Lass (following Luick’s original suggestion) argues that the first step in the GVS was raising of the high mid vowels /e:/ and /o:/, and provides dialectal data in evidence: wherever /o:/ had already moved out of the back vowel system through a northern change of /o:/-Fronting, leaving an “empty space” in the back column, /u:/ failed to diphthongize, giving Scots *hoose*, *moose* rather than *house*, *mouse*. Lass and Luick take the line that, since there is no parallel disparity with the front vowels, and no sound change which specifically targeted /e:/, the fronting of /o:/ and the failure of /u:/ to diphthongize must be connected. In other words, the GVS began as a push chain, as the raising high mid vowels put pressure on the high ones, which consequently diphthongized: in cases where no pressure was applied from below, the diphthongization did not happen. Stockwell and Minkova, on the other hand, argue that the change of diphthongization (which for them is a much lower-level process, a merger of possibly pre-existing diphthongal variants of the high vowels with pre-existing diphthongs from other sources) came first. It is also possible to detect a degree of rapprochement in later contributions to the debate, with Lass (1992: 149) maintaining that the “top half” of the traditional GVS (that is, the combination of high vowel diphthongization and high mid vowel raising) shows an inner cohesion and unity, but accepting that the “bottom half” might well be a series of independent vowel raisings which should be referred to as “pseudo-GVS” or “Post-GVS Raising” rather than Phase II of the GVS proper (a term he reintroduces, however, in Lass 1999). But the core of the disagreement remains the same now as in the earliest contributions. On one view,

either part or all of the GVS is a unified series of events, which “can be and has been shown to have what Luick . . . called an ‘innere Zusammenhang’” (Lass 1992: 148). On the other, there are several relatively minor and self-contained changes, which are due to the same underlying motivations of maximizing the perceptual optimality of diphthongs, or maintaining contrast; but these take place over too long a period to be recognized as forming a unitary shift, and the generally accepted GVS pattern is simply a “linguist’s creation through hindsight” (Stockwell and Minkova 1988a: 376). In that case, “the massive GVS becomes a classic example of structuralist overgeneralization more suited for a history of linguistics than for a history of the English language” (Minkova 1999: 84).

It would be presumptuous to assume that I could reach any definite conclusion on this debate, and more so in the space available here. On the other hand, a contested change, or series of changes, of this kind does provide an excellent focus for a discussion of the OT approach to change. As we shall see, there are several alternative analyses of the GVS in the literature, and it might be instructive to see whether modeling these change(s) in OT terms helps us reach a view on their relatedness. That is, we shall be concerned below with the efficacy of OT in modeling sound change; the several different approaches to the GVS each highlight a number of key issues on this matter. However, we shall also consider what might justify a selection of OT over other possible models in the analysis of sound change, and a relevant issue here is whether or not OT might help us decide on the most reasonable view of the “GVS.”

1.3.2 *Miglio (1998)*

Miglio (1998), like most early attempts to apply OT to sound change, is engaged with explanations: “Optimality Theory . . . can be . . . an important means to explain language change” (1998: 1). A typical early analysis of sound change in OT, simplifying for the sake of argument (see, further, McMahon 2000a, 2000b, 2002), might model the loss of a relatively marked segment via a markedness or well-formedness constraint disfavoring that segment. At Stage I, this constraint is ranked low, and speakers do not attend to it; they get by pronouncing the difficult segment somehow. But at Stage II, the markedness constraint has been reranked higher, and the difficult segment is no longer pronounced. Sound change therefore involves a gradual prioritization of markedness constraints over time, and its consequence is a shift towards less marked pronunciations (though changes may have effects elsewhere in the grammar which let other cases of markedness in). As Minkova and Stockwell (2003: 169) put it:

Optimality Theory is the ultimate capitalist economy. It conceives not just of change but of all phonetic realizations as the result of competition. The basic competition for change that has been envisaged is competition between markedness constraints and faithfulness constraints. The scenario is, the faithfulness constraints are

constantly battered by the markedness constraints; the latter are constantly climbing the corporate ladder and dislodging the entrenched corporate management.

The most significant difficulty for such early OT accounts of sound change involves the nature of reranking, the process of advancement of markedness constraints up the ladder in the quote above, and crucially whether this mechanism can be seen as explanatory: this is the chicken and egg problem of McMahon (2000a: 126–7). Why, for instance, did the loss of [k] in [kn-] clusters (*know, knee, knight*) happen? Does reranking happen in response mode, allowing children to build the simplest grammar, since they (and quite possibly their parents) were already not pronouncing [k]? Or is the reranking causal? Does it take place first, for whatever reason, so that the next generation has no choice but to produce [n-], even where they hear [kn-] in their primary linguistic data? From the point of view of language acquisition and what we know about the sociolinguistic input to language change, the latter is, of course, much less plausible than the former: the causal account of reranking might be appealing since it allows phonological theory to explain change, rather than having to rely on factors outside the grammar itself, but what it gains in this respect it loses very decisively in its reliance on mystical grammatical determinism. This seems to be the consensus in current OT treatments of change: better to see reranking as *post hoc* grammar tidying and as an effect of acquisition, however prosaic this might seem, than claim reranking is explanatory where this really only pushes the real explanation one step back.

Miglio (1998) attempts to extend analyses of this kind to the GVS, which in itself is a tricky proposition: chain shifts are a notorious locus of opacity, a major difficulty for OT accounts of synchronic phonology, and as changes they are logically impossible to deal with using only markedness, since by definition disfavoring a particular vowel, which might therefore be encouraged to raise or diphthongize, would lead us to expect that vowel to remain disfavored – not for the same slot to be refilled by another vowel shifting in from somewhere else. Miglio’s solution (without going into full details on this or the other accounts below, for reasons of space) is to identify “weak spots” in the system as probable triggers of change; “weakness” here might equate to markedness or to perceptual difficulty. In the case of the GVS, Miglio identifies /ɛ: ɔ:/ as the “weak spots,” because long lax mid vowels are typologically rare, and therefore highly marked. In fact, these vowels had been in the system for some time, but Miglio argues that they became more frequent and therefore more noticeable as outputs of the preceding sound change of Middle English Open Syllable Lengthening. The higher frequency of these vowels then triggered a constraint reranking promoting the constraint *[–ATR]mm, which disfavors long lax vowels (ATR, or Advanced Tongue Root, is here used to signify the lax–tense opposition). One might expect this to have caused vowel mergers; but the constraint DISTANCE, which is also quite high-ranked, favors the maintenance of contrasts.

Miglio's identification of the long lax low mid vowels as "weak spots," which consequently shift, and her invocation of constraints discouraging mergers, account for the raisings from low mid to high mid, and high mid to high, and for the diphthongization of the ME high vowels. However, Miglio also includes /a:/ > /ɛ:/ as part of the shift – although /ɛ:/ is one of the disfavored vowels which started the whole process. Here, Miglio must assume a further re-reranking, demoting *[-ATR]mm, and promoting a local conjunction of faithfulness constraints for [ATR] and height (we return to the issue of local conjunction in the next section); /a:/ then raises to low mid.

This is potentially an interesting result: after all, Stockwell and Minkova see the "GVS" as composed of a series of independent changes, and Miglio's inability to model the whole sequence without further reranking might square with their position. However, Stockwell and Minkova, and Lass, agree that the elements of the traditional Shift which are most likely to show unity are those involving the high and high mid vowels: neither suggests that diphthongization plus the raisings of both mid vowel series qualify as part of a unitary change, without the raising of /a:/, yet this is what Miglio's model would suggest. It is worth noting here that Ahn (2002) provides a closely parallel account to Miglio's, proposing that "the overall chain shift could have been initiated by the raising of lax vowels for phonetic reasons. Then, the subsequent raising and diphthongisation were consequences of Maintain Contrast requiring that the input vowel contrast be maintained in the output" (Ahn 2002: 153). Ahn also divides the Great Vowel Shift into two shifts, each stage characterized by a different constraint ranking; again, the second stage involves the raising of /a:/, and this time also the further lowering of the diphthongs from ME /i: u:/, to [ai aʊ].

There are several difficulties with Miglio's account. First, seeking the motivation for the GVS in the output of Middle English Open Syllable Lengthening (MEOSL), which, Miglio asserts, produced a superfluity of long lax low mid vowels, is potentially problematic given that MEOSL preceded the GVS by approximately 300 years – one of Stockwell and Minkova's objections to the GVS as a unitary change involves the more than 150 years between the top and bottom halves. Reranking also seems to be used fortuitously, and in particular there seems little motivation for the temporary rehabilitation of /ɛ:/, which has to be seen as less marked purely so low /a:/ can shift to it; though since, of course, there was a further step later, post-GVS, which raised this new /ɛ:/ to high mid /e:/, Miglio is going to have to re-re-rerank the constraints again. It is hard to see reranking as in any sense explanatory under these circumstances. Finally, if /ɛ: ɔ:/ are the weak points in the system which motivate the change, we must ask why only the front one is lost through the GVS, while its highly marked back congener continues into the present-day system. Further issues, involving novel mechanisms like local conjunction, and the "grounded" nature of general constraints like *DISTANCE*, will be pursued below.

1.3.3 *Miglio and Morén (2003)*

Miglio and Morén (2003) carries over two main issues from Miglio's earlier analysis of the GVS. Miglio and Morén also deal only with the diphthongizations of the high vowels, and the single-step raisings from low mid to high mid and high mid to high. They do not include the raising of /a:/; but as with Miglio's account, this seems to produce a strange split on either the Lass or Stockwell and Minkova view: if we attempt to model only Phase I or the "top half" of the traditional GVS as a unitary change, then the shifts of low mid /ε: ɔ/ should not be included; but if we include those later raisings, as Miglio and Morén do, there seems no good reason not to include the raising of /a:/ too.

Miglio and Morén argue that the English vowel system, leading up to the GVS, developed complete predictability of vowel length for all but the long mid vowels, which had developed a tense/lax distinction. Like Miglio (1998), though proposing different constraints, they ascribe the vowel shift to the disfavoring of long lax mid vowels, and an avoidance of merger. Essentially, Miglio and Morén see the GVS as both a lengthening and a raising change. Contextual lengthening takes place in certain environments, including open monosyllables (unfortunately, Miglio and Morén decline to discuss the rationale for this predisposing change: "The motivation for lengthening is not important here and is not shown" (2003: 206)). For the most part, this lengthening only involves tense vowels; but there is also "a combination of constraints forcing some mid vowels to be long" (2003: 206), so that both lax and tense mid vowels will undergo conditioned lengthening. Miglio and Morén then invoke a family DEPLINK-MORA of moraic faithfulness constraints, which spell out what happens when a segment of a particular type is forced to carry an extra mora, as in the coerced lengthening ("motivation . . . not important") of lax mid vowels. Assuming that DEPLINK-MORA [RTR, HIGH, LOW] (where RTR is Retracted Tongue Root) outranks DEPLINK-MORA [HIGH, LOW], "it is worse to add a mora to a surface lax mid vowel than it is to add a mora to a surface tense mid vowel" (2003: 209). Consequently, lengthened /ε/ must also tense to /e:/, raising perceptually. In turn, the pre-existing /e:/, when lengthened, has to raise to /i:/ – this time because it is worse to add a mora to any mid vowel than to add a mora to a high vowel, as DEPLINK-MORA [HIGH, LOW] outranks DEPLINK-MORA [HIGH]. Raising rather than lowering is guaranteed because IDENT [HIGH] outranks IDENT [LOW] among the faithfulness constraints.

There is one final piece of the puzzle, which is the fact that /ε/ becomes /e:/, rather than raising all the way to high – the usual chain shift paradox. Miglio and Morén assume a Local Conjunction of (IDENT [RTR] & IDENT [Low]). As Kager (1999: 392) puts it, "Under *Local Conjunction*, two constraints are conjoined as a single constraint which is violated if and only if both of its components are violated in the same domain." This conjoined constraint universally outranks its component constraints. In a chain shift, a double raising will violate more faithfulness constraints, like the IDENT ones considered here,

than a single-step shift. In the present case, (IDENT [RTR] & IDENT [LOW]) says “it is worse to change both [RTR] and [LOW] at the same time than it is to change only one or the other” (Miglio and Morén 2003: 212), allowing a one-step but not a two-step shift.

Miglio and Morén see the constraint interactions set out above as applicable to their Stage II, the active stage of the GVS, which “consists of a re-ranking of constraints to (i) disfavor long lax mid vowels, and (ii) cause the rest of the non-low vowels to raise or break (diphthongize) to avoid merging them. This causes a complex correspondence between input and output vowels that bear little resemblance to each other” (2003: 203). This second stage is emphatically not a change for the better, then, and marks a departure from the earlier close connection of change with decreasing markedness. On the contrary, local pressures and constraint interactions produce a highly opaque relationship between input and output, and this is then subject to a later restructuring of the input on the basis of the new output forms.

There are several difficulties with Miglio and Morén’s account, in addition to the undeveloped motivation for lengthening in the initial stages of the change noted above, and the problem that the aspects of the traditional GVS they model seem to correspond neither to the widely accepted “top half” of the chain or to the conventional Phases I and II. Staying with historical issues for the moment, Miglio and Morén discuss the relative chronology of the traditional GVS in some detail early in their paper, and clearly do not accept the Jespersen/Stockwell and Minkova position that diphthongization of ME /i: u:/ was the first step. However, they are equally uncomfortable with the Luick/Dobson/Lass argument that the high mid vowels initiated the overall Shift; they do not mention the pervasive (and persuasive) dialect evidence showing that, in northern areas where /o:/ had fronted earlier, /u:/ failed to diphthongize. Since their account of the GVS relies centrally on the assumption that the low mid vowels raised as the first step in the Shift, their solution is to argue that:

the overlap between the quality changes of the various vowels, as provided by direct (orthographic) and indirect (reconstructed) evidence, does not allow for a strict sequence of events whereby some vowels changed before others. We believe that the relevant changes of the GVS (long mid lax vowels becoming tense, long mid tense vowels becoming high, and high vowels diphthongizing) are best modelled phonologically by a unique grammar that depicts this part of the GVS as a synchronic chain shift. (2003: 195)

From the perspective of a historical linguist, it is disappointing that Miglio and Morén’s proposed OT account, and its limitations, should apparently override the very clear orthoepic-evidence for the considerable chronological priority of the changes of ME /i: u:/ and /e: o:/ over those of the low mid vowels (see Lass 1999). It would appear that sound change is productive ground for OT, unless the historical sequence of events is at odds with the preferred OT analysis; in which case, collapsing the lot into a single synchronic grammar

(regardless of the several generations between the stages in real-time terms) is taken as solving the problem.

If the GVS is a synchronic chain shift, we must ask whether Miglio and Morén are presenting an analysis of sound change at all. Miglio and Morén themselves, to judge from their abstract, do consider themselves to be dealing with change: they tell us that their paper involves “a discussion of how language change can be dealt with in OT. . . . The paper addresses the question of language change in general and of chain shifts specifically” (2003: 191). One could argue, of course, about just what they mean by “change” here: is it the reranking that moves from their Stage I (before the GVS), to Stage II (when the GVS is “active”)? Is it the input reanalysis that leads from the opaque input–output relationships at the end of Stage II, to the more transparent situation in Stage III? For historical phonologists, just as important as either of these would be the various steps contained within Stage II, the interlocking, or not so interlocking, stages of the GVS itself; but as we have seen, Miglio and Morén, though they appear to see the subshift of the long low mid vowels as representing the start of the mechanism, regard the whole of Stage II as essentially a synchronic chain shift, so this ambiguity is hard to resolve. Even if we accept that Miglio and Morén’s proposals are intended to apply to change, there is a final question of explanation. Throughout the paper, their emphasis is squarely on the ability of OT to “model” changes, though they do also claim to be “motivating the GVS changes by means of a combination of established lengthening phenomena and markedness considerations” (2003: 191). Motivating a change, as it turns out, is not the same as explaining it; and indeed, Miglio and Morén (2003: 227 fn.10) state explicitly that they “believe that formal phonology should explain how phenomena happen and not necessarily why: in this case a coherent model of the GVS is as close to an explanation as we want to get. The psychological and sociolinguistic factors pertaining to ‘why’ the change happened have no place in an OT model of the GVS.”

It seems entirely plausible that, in the early stages of development of a new model, proponents of OT should have claimed that its application to sound change might provide direct explanations: Miglio and Morén are now expressing a principled retreat from this position, towards a more limited, descriptive application of OT. This might seem also to correspond to a careful limitation of the types of constraints permissible in the grammar: Miglio and Morén are at pains to point out (2003: 227, fn.10) that the most important issue here is “the constraints’ claim to universality, given the make-up of the theory. . . . Where we ourselves had doubts as to the universality of the constraint, we have stated it openly.” This applies, for instance, to “*SHORT[TENSE] – Tense vowels must be bimoraic” (2003: 201), which Miglio and Morén describe as a “‘dummy constraint’” which “may or may not be a contender for universal status” (2003: 201). It does not seem entirely clear, however, what the difference is between a constraint like *SHORT[TENSE], which Miglio and Morén accept may be problematic, but nonetheless employ in their analysis, and DISTANCE or MINDIST, as used by Miglio (1998). Indeed, if the main criterion in adopting a constraint

is whether it is likely to be universal, one might expect the latter to be better candidates for innateness, since avoiding wholesale mergers might be in the language user's interests. It may be that Miglio and Morén reject constraints like *DISTANCE* because these can be seen as encoding some idea of motivation, which goes against their view that explanation is not to be aimed at: "the factors that influence a linguistic community towards merger of lexical categories or chain shifting are not intrinsic to the grammar of the languages, but sociolinguistic and unpredictable in nature" (2003: 224). But is a constraint like *INTEGRITY* (2003: 213), which disfavors breaking or diphthongization, really much different from one like *DISTANCE*, which disfavors mergers? In any case, if the whole goal is simply coherent description and not explanation, how important is the inventory of constraints? If we are not to try to explain anything, should we not at least attempt to describe everything we can?

This problem of determining the constraint inventory, in terms of both constraint types and tokens, is an important and recurring one in the literature on OT, in both its synchronic and diachronic applications. It is difficult, in the absence of any clear prioritization of constraint types, to argue for one analysis over another. If we allow only universal constraints, what arguments are we to use for their universality? And how much leeway should we allow over the types of constraints we accept? For instance, although Miglio and Morén reject "functional" constraints like *MINDIST*, they accept *Local Conjunction*, although allowing combinations of constraints contributes to the problem of limiting the constraint inventory in such a way as to make it plausibly innate (or indeed, realistically learnable). On the other hand, if we accept (see Haspelmath 1999) that constraints should be language-specific and learnable rather than innate, the issue of change becomes potentially more difficult and less restrictive, since relationships between grammars other than simple reranking become possible. That is, if constraints could be added or removed between the grammars of different generations, as children learn a grammar which is essentially independent in constraint inventory as well as ranking, the modeling of change follows much less clearly from the architecture of OT, and the possible advantages of using that model become less clear.

1.3.4 *Minkova and Stockwell (2003)*

The last account to be considered here does not have the problem of *Local Conjunction*, or of language-specific constraints, but does share with Miglio (1998) the adoption of constraints against merger, and for the maintenance of contrast. We have seen already that Stockwell and Minkova, in a series of papers, argue against the unity of the traditional GVS: instead, they suggest that in languages like English, with both long vowels and diphthongs, "the two constant tendencies are for diphthongs to dissimilate and, having dissimilated maximally, to reassimilate" (1988a: 373). If monophthongs regularly gain diphthongal variants, then those may develop in two ways: either the elements of diphthongs become more different from one another, to "develop a

healthier diphthongal form" (Stockwell and Minkova 1988a: 368); or they move back towards a monophthongal representation and merge with other monophthongs in the system. Such changes may, of course, be sequential and cyclic.

Minkova and Stockwell (2003) grows out of these earlier papers; and it is perhaps misleading to categorize it as an account of the GVS in OT terms, since as we have seen, the GVS is not something Minkova and Stockwell are inclined to believe in. It does, however, deal with chain shifts, along with three other change types, namely nucleus-glide dissimilation, nucleus-glide assimilation, and merger. This is a fascinating paper, partly because it does exactly what OT is meant to be extremely good at: that is, it takes a relatively small inventory of possible constraints, and shows that differential ranking produces different changes. Minkova and Stockwell (2003) exploit the idea of the factorial typology to show how the same motivating factors, differently prioritized, can give rise to these four types of change – which "can be independent of each other and should not be classified as the same unified historical phenomenon loosely referred to as shifts" (2003: 169).

Minkova and Stockwell isolate four factors which "jointly determine the behavior of English long vowels in processes commonly labelled chain shifts, or vowel shifts" (2003: 170): these appear in (4).

- (4) (a) Diphthong optimization in perceptual terms
 - (b) Diphthong optimization in articulatory terms
 - (c) Optimal spacing of adjacent entities – merger avoidance
 - (d) Vowel mergers and input–output faithfulness"
- (Minkova and Stockwell 2003: 170)

In turn, these factors relate to four OT constraints. First, perceptual optimality in diphthongs depends on there being considerable distance between the two elements; this auditory distance follows from the constraint *HEAR CLEAR*: "Maximize the auditory distance between the nuclear vowel and the following glide (measured in formant frequency" (Minkova and Stockwell 2003: 173). The best diphthongs will have endpoints that are easily perceived as different, while those with perceptually close endpoints are likely to be avoided.

The second constraint is **EFFORT*, which prioritizes articulations requiring less effort. Whereas *HEAR CLEAR* favored diphthongs with maximally distinct endpoints, "with respect to this constraint 'the best diphthong is a long vowel'" (Minkova and Stockwell 2003: 180). If a diphthong is to be maintained, then *HEAR CLEAR* will be ranked above **EFFORT*, whereas monophthongization will correspond to a higher ranking of **EFFORT* relative to *HEAR CLEAR*.

The other two crucial constraints involve the shapes of segment inventories, and the interplay of elements within them. *MINIMAL DISTANCE* encodes an instruction to "Maximize the auditory distinctiveness of contrasts" (Minkova and Stockwell 2003: 182); the overlapping but distinct *IDENT IO (CONTRAST)* "Preserve categorical contrasts" (2003: 184) disfavors mergers and splits. It might

initially seem odd that Minkova and Stockwell adopt these constraints, in view of their earlier claim (Stockwell and Minkova 1988a: 378) that

psychological and perceptual principles and explanations based on them, such as optimal intuitive organisation of the vowel space, or the discouragement of homophony, or displacement to avoid merger, are irrelevant. . . . The only principle that might be relevant is that the vowel space shouldn't be too crammed, that overcrowding results in mergers. But we don't think even *that* putative principle is worth trying to salvage. Such principles probably explain nothing in language change.

However, a closer reading reveals that their position has not changed: Minkova and Stockwell (2003: 183) also argue that MINIMAL DISTANCE and IDENT IO (CONTRAST) are “unlike the HEAR CLEAR and *EFFORT constraints, which we see as genuine *triggers* of change, based on universal phonetic properties”; further, “In the murky waters of historical data, appealing to phonetic properties as an ‘explanation’ can be justified, but an appeal to the well-formedness of the entire inventory as a trigger is not justified.”

Minkova and Stockwell argue strongly for a distinction between phonetic functional factors on the one hand, and systemic issues such as preservation of contrast on the other. They also argue that tracing these factors to distinct constraints allows them to be differently prioritized, giving a classic OT factorial typology as shown in (5).

(5) Nucleus-glide dissimilation:

IDENT IO (CONTRAST) >> HEAR CLEAR >> MINIMAL DISTANCE >> *EFFORT

Nucleus-glide assimilation:

IDENT IO (CONTRAST) >> *EFFORT >> MINIMAL DISTANCE >> HEAR CLEAR

Chain shift:

IDENT IO (CONTRAST), MINIMAL DISTANCE >> HEAR CLEAR, *EFFORT

Merger:

*EFFORT >> IDENT IO (CONTRAST), MINIMAL DISTANCE >> HEAR CLEAR

Four different rankings of these four key constraints provide four different outcomes in terms of the observable resulting changes. If it is most important to avoid splits and mergers, for instance, either dissimilation or assimilation within diphthongs may follow, depending on whether HEAR CLEAR or *EFFORT ranks higher – depending, that is, on the relative prioritization of what is good for the speaker versus what is good for the hearer. Merger will take place where the most important factor of all is ease of articulation; and chain shifts, like the putative GVS (or at least, perhaps, the “top half”) will arise when avoiding mergers and keeping contrasting units maximally distinct, are higher priorities than the convenience of either speaker or hearer.

Some of the issues which arise from this very neat demonstration of typological modeling overlap with those raised in relation to Miglio and Morén,

above. There is, for instance, arguably the same ambivalence over the explanatory power of OT with respect to change; Minkova and Stockwell (2003: 190 fn.28) themselves ask:

what was the motivation for the different constraint rankings that are invoked to account for the different historical results? This is the breaking point of any account, and the challenge that OT meets here is no worse than the challenge met by previous theories. . . . The re-ranking of constraints, like the application of a rule, is effected by individuals and their speech community over time, information unrecoverable by definition.

On the other hand, we have already seen that Minkova and Stockwell see the relative prioritization of the hearer's and the speaker's needs, via HEAR CLEAR and *EFFORT, as "genuine *triggers* of change" (2003: 183), while they are less comfortable with factors relating to the system rather than directly to the language user, describing MINIMAL DISTANCE as "a useful OT translation of 'preservation of contrast' which is only epiphenomenal in the description of chain shifts" (2003: 183), and IDENT IO (CONTRAST) as "a shortcut . . . naively, a cover term for the intuition that lexical contrasts should be respected, an injunction against mergers" (2003: 184). The same issues as discussed in section 1.3.3 therefore arise over whether these constraints, albeit expressing universal motivations, should really be part of the inventory.

Perhaps the most pressing concern is the nature of the two constraints Minkova and Stockwell support most strongly, HEAR CLEAR and *EFFORT, which on any definition are irreducibly phonetically grounded. One of the most controversial issues within OT at present is the very question of whether constraints should be phonetically grounded or not – and this is a matter of more general debate in phonology, since it has very serious implications for the relationship between phonology and phonetics, the relationship of phonology to Universal Grammar (UG), and hence the definition of phonology. Radically different approaches to this question can be found in Hale and Reiss (2000a, 2000b) and Carr (2000).

Hale and Reiss argue on grounds of principle that "[p]honology is not and should not be grounded in phonetics, since the facts that phonetic grounding is meant to explain can be derived without reference to *phonology*. Duplication of the principles of acoustics and acquisition inside the grammar constitutes a violation of Occam's Razor and thus must be avoided" (2000a: 167). They are keen for phonology to be neutral between modalities, for instance between speaking and signing, and are also concerned by the trend to extrapolate phonetic measurements directly into phonological units and arguments – they argue that this is seriously inadvisable, since we do not currently have a clear enough idea of how individual cues combine to produce percepts, so there is an uneasy relationship between actual measurements and our conclusions in terms of "difficulty" or "salience." Since phonology and phonetics are seen as necessarily distinct, phonological arguments cannot coherently be stated in phonetic terms: attempts to do so are (rather cleverly) described as "substance abuse."

Furthermore, Hale and Reiss argue explicitly that functional constraints like LAZY (= Minkova and Stockwell's *EFFORT) and MINIMAL DISTANCE should not be permitted because "functional principles can be replaced by their opposites, which we will call 'dysfunctional' principles, with no significant change in the set of grammars predicted to exist" (2000a: 180). Hence, these constraints could be replaced by "OBFUSCATE: merge constraints, use a small inventory of distinctive sounds . . .," and "NO PAIN – NO GAIN: maintain contrasts, use a large inventory, generate allomorphy . . ." (2000a: 180), with no significant difference in results. The formulations we typically choose depend on our view of human nature, not on anything phonological.

Carr (2000), on the other hand, argues that "[t]here is only one sustainable conception of UG, one that takes it to be *radically internal*, in the sense that it is an innate endowment that does not consist of perceptual capacities, behavioural dispositions, general cognitive capacities, or capacities that are not species specific" (2000: 87). If we accept this, then "phonological knowledge does indeed fall outside UG" (2000: 89). Carr accepts that, at least at first sight, some OT constraints might seem to be reasonable candidates for inclusion in UG, but argues that any which make reference to phonetics, or which are functionally inclined, will have to be excluded. This is the case, for example, for any constraint referring to relative perceptual salience: "the relation 'perceptually more salient than' is general-cognitive: it is the figure-ground relation. That relation cannot be said to constitute part of UG, since UG, by definition, excludes general cognitive capacities" (2000: 91).

This leaves OT with something of a difficulty. Hale and Reiss see phonology as part of Universal Grammar, and therefore as not plausibly phonetically grounded. Carr argues that phonology is phonetically grounded, and therefore cannot be part of UG. We therefore have a rather striking result: either way, innate and universal constraints based on phonetics are not viable. It appears that we must either choose innate phonological constraints, which cannot be grounded; or grounded constraints, which cannot be innate. This brings the issue of language specific-constraints, learnability, and the implications for the OT account of change, firmly into the foreground.

1.4 Change in the Making?

One of the most significant issues to arise from our discussion of OT and sound change, then, involves the phonetic grounding of constraints. This is important primarily because it throws into sharp relief a whole range of other, connected questions, which urgently need answers before historical linguists can feel confident about the use of OT to resolve historical problems (and which are all being debated, as we have seen, in the OT literature). The question of grounding is obviously related to that of innateness. As a general rule, the more functionally inclined a linguist is, the more likely s/he is to see OT constraints as grounded but learned: thus, Haspelmath (1999: 204) argues that "the

grammatical constraints are not innate, and are not part of Universal Grammar. They arise from general constraints on language use, which for the most part are in no way specific to language." But if the constraints are grounded in phonetics, perception, or some other universal but not phonological capabilities, just what is OT contributing? If OT allows clear modeling and hierarchization of a series of priorities (for instance, the convenience of the speaker versus the hearer), but those are not themselves phonological, what does OT become a theory of? As Hale and Reiss note, if we build in "a sufficiently rich and explicit theory of the human personality . . . and the human articulatory and perceptual systems . . . , phonology itself will turn out to be epiphenomenal" (2000b: 167). Alternatively, if we excise issues of phonetic motivation from our constraints, we lose many of the advantages OT offered in the cases considered above, by modeling the interaction of familiar preferences, like the constant struggle between speaker and hearer. There is a further paradox: if grounded constraints are based on universal factors, but are learned, new generations might acquire novel constraints, and hence our model of change becomes less restricted since reranking is no longer the only available means of grammar differentiation. However, if we reject grounding and opt for innate and specifically phonological constraints, how are we to limit the explosion of constraints and constraint types which has recently bedeviled the theory?

The issue of grounding is also helpful because it highlights further difficulties in establishing the basic ingredients of OT; the nature of the input, for instance, is currently quite unclear, undermining the development of learning theory (Hale and Reiss 1998; McMahon 2002). Hale (2000) points out that we do not seem to be very clear on the nature of the output either: does it mean "bodily output," actual phonetics, or is it an intermediate representation, the end of the phonological grammar? As for GEN, Haspelmath (1999: 204) holds that it "has been largely ignored, apparently because of the implicit presumption that it is not very interesting. However, from an innatist perspective it is the most interesting part of the theory, because it is the part that is the most likely to be innate." Here again, we find a strong connection with grounding, since its interpretation is unclear if we do not understand the level of representation to which constraint evaluation applies: "To advocate the inclusion in an OT grammar of constraints which make reference to issues such as the 'auditory consequence of gestural timing' without explicitly discussing the nature of a GEN component that would generate representations of the type that would allow for the evaluation of such constraints is not responsible science" (Hale 2000: 250).

Finally, these doubts and inclarities highlight the uneasy relationship between change and formal theory. It is intuitively tempting to see change as functionally motivated, and yet we find linguists who believe phonology is and must be part of UG (Hale and Reiss 2000a, 2000b), and those who argue it cannot be (Carr 2000), agreeing that it is incoherent to hypothesize innate, grounded constraints. This might mean that Miglio and Morén (2003), or Minkova and Stockwell (2003), are prescient in their arguments that formal

theories should not be expected to provide “causal explanations,” only at best “proximate mechanisms” (Minkova 1999). Whether OT can offer any actual explanations will depend, of course, on whether it is part of a theory of UG or not; and here we find another, perhaps surprising, twist in the argument.

Hale (2000) visualizes a continuum of phonological processes, with absolute universals at one end, impossibilities at the other, and a range of more or less likely phenomena in between. Hale argues that UG can be invoked to account for the absolute universals and perhaps for the unattested cases (though note here McMahon 2002, where it is argued that OT, in the absence of any restriction on the number and type of constraints permitted, can model impossible changes just as readily as rule-based models). However, he believes that “the middle portion of the continuum can be coherently accounted for without reference to the synchronic phonological system at all,” since “[t]he relative rarity of a given phonological process, cross-linguistically, is a simple function of how likely the misperception . . . required for the coming into being of that process is” (Hale 2000: 254). Hale’s radical proposal is to exclude markedness considerations from phonology, and to seek explanations of synchronic systems through understanding diachronic processes. It would appear that historical linguists can look forward to their domain of enquiry coming conclusively back into the limelight – but in the service of synchronic linguistics, rather than the other way around. If historical factors explain synchronic systems, then surely we cannot look to synchronic models, like OT, to explain language change – or perhaps even to model it. Will that be a change for the better?

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