

D. ERIC HOLT

REMARKS ON OPTIMALITY THEORY AND LANGUAGE CHANGE

Abstract. The present chapter frames Optimality-Theoretic approaches to phonological and morpho-syntactic change in the context both of theoretical linguistics and of the questions asked in traditional historical linguistics. Previous traditional, standard generative and OT accounts are discussed, including principles of change invoked (e.g., Transparency Principle, Naturalness Condition, Neutral Ground Hypothesis, Synchronic Base Hypothesis); changes to the grammatical component (addition, loss, reordering, inversion of rules; promotion, demotion of constraints); variation (lexical diffusion theory; partial constraint ordering); the relationship between restructuring/reanalysis, child language acquisition, lexicalization and lexicon optimization; and level-ordered grammar (Lexical Phonology and Morphology; stratal OT). The chapter concludes with a summary of the contents and main findings of each of the chapters of the volume.

Keywords: Phonological and morpho-syntactic change, generative grammar, Optimality Theory, restructuring, lexicalization, lexicon optimization, variation.

0. INTRODUCTION¹

Beginning shortly after the circulation of the earliest manuscripts in Optimality Theory (OT; Prince & Smolensky 1993, McCarthy & Prince 1993a,b), various researchers began to investigate its application to language change. Among the first historical issues investigated in English, Slavic, a number of Romance languages and others were the development of syllable structure, metrical structure, syncope and epenthesis, simplification of consonant clusters, changes in vowel and consonant length, diphthongization, Finnish morphological leveling, and many others, including syntactic changes. These accounts have appealed to a variety of theoretical mechanisms, including lexicon optimization, re-ranking or partial ordering of constraints on markedness, faithfulness, alignment, sonority and others. Additionally, the role of perception and reinterpretation by the listener has been addressed in some of these works, as has the relationship between historical change and the first language acquisition of constraint rankings in a child's grammar.

Existing historical OT analyses, though they frequently rely heavily on traditional argumentation to sustain them, are often innovative and have allowed for the establishment of a relation between the changes discussed in these works that could not or had not satisfactorily been seen as interrelated previously. Further, OT approaches have been successful at incorporating or recovering previous insights into the new theoretical machinery (e.g., functional notions). Additionally, the application of Optimality Theory to the explanation of historical sound change arguably provides us with a firmer base for understanding the given phenomena

analyzed, and suggests that this is an area for further fruitful investigation. Moreover, results from these studies have begun to inform synchronic OT analyses and help to shape our understanding of language more generally.

However, to date no volume exists that brings together research in this area as primary issue, rather than as part of a larger more general book or journal, and the works presented here comprise such an endeavor. The current volume grew out of the double session on OT and language change organized by the editor at the International Linguistic Association conference held at Georgetown University, April 7-8, 2000. This meeting served as the starting point for compiling the strongest contributions to this emerging field, and papers presented there constitute roughly half the chapters included in this volume (those by Boersma, Gess, Lleó, Miglio & Morén, Minkova & Stockwell, and Slade), with the remainder resulting from a subsequent call for submissions, all of which underwent a rigorous selection and review process. The resulting collection of research presented here aims to represent the current fruits of the labor of the application and extension of OT to studies on linguistic change, and reaches a certain level of maturity in the evolution of such studies in that the authors are now, nearly ten years after the appearance of the first works in OT, and at least eight since the first applications to language change (Jacobs 1995, 1996 [both presented in 1994]) and variation (Zubritskaya 1995 [presented in 1994]), able to assess initial and approaches in light of further reflection and more recent developments in OT.

The reader will discover that, far from accepting without scrutiny these more recent synchronic-oriented works, practitioners (and critics) of OT historical linguistics have much to say about the proper formulation of the OT architecture and componentry, and offer alternatives and solutions to many of the same hard questions that nonhistorical-oriented proponents (and critics) of OT raise. While not all of the contributors share the same views on both substantive and implementational matters, nor propose the same solutions to certain problematic theoretical issues, their work is genuinely interested in exploring the strengths and weaknesses of OT vis-à-vis previous generative approaches. Given this, I believe that the current volume makes a strong contribution to the study of the fields of language change, Optimality Theory, and linguistic theory more broadly.²

Furthermore, though the reader will observe a variety of approaches and a lack of uniformity in certain central assumptions, this should not be of special concern, as OT provides a general architecture and approach to grammar rather than specifying particular or inflexible content. Additionally, the issues under dispute (the type and content of all constraints; the nature of the interaction between phonetics, phonology, morphology, syntax and discourse; the role of acquisition, perception, comprehension and restructuring; the nature and content of underlying representations; and others) are *the* issues with which linguistic theory has been grappling for decades, and to expect absolute consensus of research in OT at this point (or of any other theory) is both unrealistic and unfair.

The fundamental question that the contributors to this volume ask is the following: Within a constraint-based approach, and one that intends to be universal, how is language change to be characterized? This is relatively new ground, and among the first wave of papers that applied OT to sound change were Jacobs (1995,

1996) and Hutton (1996), and among the first dissertations were those by Gess (1996, on Latin to Old French) and Holt (1997, on Latin to Hispano-Romance). As might be expected a priori under a constraint-based approach, these researchers attribute a divergent ranking of constraints to the characterization of the stages of the languages they study. That is, that the history of these languages is viewed as being composed of a series of stages, each of which exhibits a specific constraint hierarchy. This, of course, is meant to be understood in diachronic terms, not in serially derivational ones, which would be antithetical to the tenets of OT, whose strongest form allows for only a single step from base to surface. (However, several contributors to this volume argue that a multi-level OT is necessary; see below, particularly the review of Ritter 2000a, for further and critical discussion.)

Slight reranking of the constraint hierarchies, that is, variation in the relative importance of the constraints from one language to another and from one time period to another, elegantly and simply captures, according to these authors' views, cross-linguistic variation in the syllable structure and phonological/phonetic forms of these languages. Likewise, several steps in the historical development of certain phenomena are argued to be best understood as resulting from effects of perception and (re-)interpretation by the hearer, that is, via restructuring of the lexicon (e.g., Holt 1997). Another benefit that sometimes arose from the application of the constraint-based OT to language change was that several phonological processes and historical changes could be seen as interrelated for the first time, as in the interrelatedness of the loss of contrastive vowel length in Latin with the subsequent simplification of moraic (syllable-final and geminate) consonants in Vulgar Latin and Hispano-Romance (Holt 1997; further pursued in this volume).

The organization of the remainder of this chapter is as follows: In §1, I discuss the need for theoretical approaches to historical change in addition to traditional ones; give an overview of the principal questions that previous generative treatments sought to answer and the results they obtained; and discuss the rise of and subsequent critical assessment of Optimality Theory (including Ritter 2000a). In §2, I discuss how the questions raised by the earlier generative approaches have been treated in previous OT accounts, including via recourse to the concepts of lexicon optimization and of alterations to the constraint hierarchy; and in §3, I summarize the contents of this volume and highlight the major theoretical issues that the authors of each chapter address, and I offer an indication of their major findings.

1. GENERATIVE GRAMMAR AND HISTORICAL CHANGE

This section presents a discussion of the need for the application of advances in theoretical linguistics to historical change, in addition to traditional/philological approaches, and discusses the conception of historical change in generative grammar (§1.1); certain problems associated with early models are presented that led to further extensions of the theory (§1.2). In the final subsection, discussed are factors that led to the rise of OT, as well as recent critiques of this constraint-based model, and I conclude with a brief indication of how research in diachronic linguistics has converged on many of the same issues (§1.3).

1.1. *Historical change in generative grammar*

How historical change should be characterized remains controversial. There are many open questions, in any framework, such as “Why do languages change?”, “How may these changes best be formulated or modeled?”, “Why are some changes absolute, while others seem to affect only a subset of the potential targets?”, and many others that are still open questions within any framework. For illustrative and expository purposes, I restrict our attention here to the earliest investigations of Romance (one of the best-studied language families) by such researchers as Diez (1874), Meyer-Lübke (1895) and Menéndez Pidal (1904), and more recently Lapesa (1986), Lloyd (1987), Malkiel (1963-4) and Penny (1991). Though these works are largely descriptive, the data these authors collected, the observations they advanced, and the laws they formulated are still the fundamental foundations upon which current investigations must build (here, of Romance, but the point is also valid generally). Malkiel (1963-4:144) acknowledges this, while at the same time recognizing that a further step must be taken to reach another level of adequacy:

Romance scholarship, throughout the first decades of this century, has concentrated almost exclusively—to the extent that its spokesmen bothered to attack problems of phonology—on minute geographical delimitations and on the painstaking accumulation of shreds of historical evidence, neglecting—with rare exceptions—the equally urgent task of concomitant theoretical refinement. The collection of raw data must, of course, continue at undiminished pace, but the discussion of theoretical fundamentals underlying any profitable attempt at elucidating these facts can no longer be with impunity postponed.

While philologists and traditional linguists, on the one hand, and generative linguists, on the other, do not share the same understanding of ‘theoretical refinement’ and ‘theoretical fundamentals’, both schools strive for more than mere taxonomy and description, and the advent of generative grammar (Chomsky 1957, 1965) coincides chronologically with the thinking propounded by Malkiel. Historical change in this period is now characterized differently; Hartman (1974:123), discussing phonology (though his remarks apply equally well to morpho-syntax) summarizes this shift in perspective well:

Kiparsky (1965[a]) and King (1969)—with the impetus of Halle (1962)—have given us a theory of language change that differs from earlier theories in that it implies that language history is two-dimensional: that is, a historical grammar is not simply a list of sound-change laws in chronological order, but a diachronic series of synchronic grammars. Each synchronic grammar consists of a list of ordered rules, and historical changes include not only rule addition, but also rule loss, rule reordering, rule simplification, and restructuring of underlying forms. It is these additional types of change—principally rule reordering and simplification—that make phonological history different from synchronic phonology and thus interesting in its own right.

Following is a discussion of the standard generative (SG) grammar approach to language change, which draws largely on McMahon (1994:ch. 2). According to the SG approach of the time, “what really changes is not sounds, but grammars” (Postal 1968:270); the same could be said of morpho-syntactic change as well. Once the system of rules and the underlying forms of two (genetically related) languages were established, changes in the phonology (or other component of the grammar) between

the two languages or varieties were logically limited to changes in the form, order or inventory of rules, or in the underlying representations. Further, the early generative belief in evaluation procedures based on measurements of simplicity also led to the belief that all changes had to be simplificatory, translating more complex to simpler and more economical grammars (McMahon, 36).

Although language change, under this view, cannot be defined within a single grammar but is at best a description of a relationship between grammars (Reiss, this volume), one might make the argument (as Reiss does), that in this narrowly defined sense, language change should not be the subject of linguistic theory. However, as McMahon (2000a:232) states, there are good philosophical reasons for considering sound change as falling within the remit of any decent phonological theory. First, ‘sound change’ and ‘synchronic phonological process’ overlap quite considerably in membership, such as vowel shifts, metatheses, and insertion and deletion of segmental material. Second, there is a practical problem of distinguishing synchrony from diachrony, since variation can plausibly be seen as a consequence of language change in progress.

Returning to the precise mechanisms of change pertaining to the rule component, there were argued to be cases of rule *addition* (that is, innovation), *loss*, *reordering* and *inversion*. The first, addition, was the only type of change that could affect adult grammars (and presumably occurred only at the end, rather than in the middle, of the application of the system’s rules, so that it would have only its effect, and allow communication with speakers who lacked the innovation); the others occurred between generations of language speakers. A case of loss is that of Yiddish (presented in King 1969:46ff and reviewed in McMahon, 37-8), which apparently lost the rule of final obstruent devoicing that belonged to its ancestor Middle High German; hence we have *tog* ~ *teg* ‘day(s)’ (with nonalternating, and now lexicalized, *gelt* ‘money’ and *avek* ‘away’) alongside Middle High German *tac* ~ *tage*.

Reordering is exemplified here by the interaction of final devoicing and vowel lengthening before voiced obstruents (Kiparsky 1978, reviewed in McMahon, 38-9). For earlier speakers, the final obstruent of underlying /lob/ ‘praise (nom.)’ first devoiced to intermediate [lop], a form to which vowel lengthening cannot apply. (Compare /lobes/ (gen.) → [lo:bes].) However, for Modern German, both forms contain a lengthened vowel, which may be accounted for formally as the reordering of the two rules in question; vowel lengthening applies first (/lob/, /lobes/ → intermediate [lo:b], [lo:bes]), with subsequent final devoicing of the first form to surface [lo:p]. Kiparsky argues that reordering depends on the notion of maximal rule application, and the transition to Modern German shows reordering out of a bleeding order, in that final devoicing now no longer robs contexts for the application of the lengthening rule, leading to a system of increased simplicity. (However, note that a measure of opacity is introduced to the grammar as well, as there are now lengthened vowels before obstruents that are not surface-voiced.)

Finally, rule inversion (Vennemann 1972) is presumed to have taken place when original surface forms are reinterpreted as underlying forms, and a rule is innovated that mimics the surface alternations (but which may then overapply). Thus, in certain dialects of English, /r/ was deleted before consonants and pauses (e.g., *bear*[ø]d, *car*[ø], i.e., with [r] absent), but was retained when the following word

began with a vowel (e.g., *the ca[r] arrived*). At this point, some speakers appear to have restructured these words to lack the final /r/ (e.g., *car* /ka:/), and inverted the rule, instead positing a rule of [r]-insertion after certain vowels and when another vowel followed (i.e., *the ca[r] arrived*), rather than deletion. This leads to ‘intrusive’ [r], however, where words that etymologically lacked /r/ are now pronounced with [r] when a vowel follows, e.g., *saw[r]ing*. How the issues of rule inversion and rule loss should be treated in OT is a task specifically addressed by Bermúdez-Otero & Hogg in this volume; likewise, various types of innovations are considered by many contributors.

The other mechanism of language change in classical generative phonology is that of the restructuring, presumed to be limited to the acquisition process of children. Discrete breaks in language learning between generations occur because children may formulate a radically different set of rules than that of their parents, and reorganize all the late accretions and modifications of the parents’ speech into a more systematic, simpler version of the grammar (Halle 1962, discussed in Labov 1972), and this may have a profound effect on the lexicon. A prototypical case is presented in King (1969), reviewed in McMahon (41-4): in earlier stages of some varieties of English, /hw/ contrasted with /w/ (e.g., *whales* ≠ *Wales*); later, however, in these dialects /hw/ became [w] via a rule, and these sounds were merged. Adults could only add this rule, and so retained /hw/ underlyingly in words like *which* and *whales*, though they pronounced both with initial [w]. Children in this linguistic environment, however, would receive primary linguistic data that lacked [hw], and in constructing their grammar would converge on a revised and simpler grammar where [w] was the surface realization of /w/ (that is, there has been a historical phonemic merger.) The rule /hw/ → [w] has been lost, but its effects are now incorporated into underlying representation, and a simpler rule system therefore results. Also favoring such a restructuring would be Postal’s (1968) Naturalness Condition, which demands that underlying representations be identical to phonetic representations unless required otherwise by evidence.

Standard generative approaches in the realm of morpho-syntax were analogous. These compared successive grammars of a language, and modeled any changes in surface structure as due to changes in the syntactic rules; likewise, children could construct a simpler grammar that differed from that of their parents, and reanalysis led to restructuring of both the lexicon (deep structures) and the grammar (the transformational component).³

A case of rule addition in syntax may be taken from Early Irish, where an innovation introduced the infinitive as a distinct category and which gave rise to a series of Raising structures, whereby both subject and object may move from the embedded clause to become matrix subject, object or object of preposition.⁴ A case of rule loss in syntax is proposed in Harris (1980), where a single rule that inverts the order of subjects and indirect objects (‘Inversion’, ‘Flip’, ‘Psych Movement’) is argued to be gradually lost in Old English and in Udi (Northeast Caucasian).⁵ An additional example may be that of Caribbean Spanish, where, in contrast to the international standard, subjects and verbs are not inverted in question formation (e.g., *¿Cómo tú te llamas?* ‘What is your name?’, rather than standard *¿Cómo te llamas tú?*) A case of rule reordering in the syntactic component, as argued in Klima

(1964; presented in McMahon, §5.2.2.2) is that of the distribution of *who* and *whom* in English, where, in some varieties speakers say *Who did John give it to?* (in contrast to earlier *Whom did John give it to?*) but *To whom did John give it?* Klima analyzes this as a reordering of the transformations of *Wh-Movement* and *Case-Marking*. The phenomenon of rule inversion may perhaps be exemplified by certain cases of morpho-syntactic hypercorrection (though not all hypercorrections involve rule inversion, and vice versa), as in the nonstandard overuse in English of *whom* (presumably by overapplication/reanalysis of a rule of objective case assignment), and perhaps the extension (overgeneralization) of second person singular *-s* in nonstandard Spanish to the preterit forms (e.g., *comistes* ‘you ate’, like present tense *comes*, versus standard *comiste*). A perhaps clearer case of inversion, a morphological one that has been completed, is that of the indefinite article in English (*a* ~ *an*): originally there was a nasal deletion rule that applied before consonants (e.g., *an car* > *a car*), but now the underlying form is *a* with nasal insertion before words that begin with a vowel (e.g., *a car*, but *an apple*). (See Vennemann 1972 for further discussion of this and other examples of rule inversion.)

For purely syntactic cases, the following would seem to be amenable to an analysis of rule (here, transformation) inversion. Consider the ‘vulgar’ English sentence *Him and me left* (King 1969:144). King posits a change in the lexicon of this variety from *he, I* to *him, me*; when *he, I* occur, it is because a different Case Marking transformation (one of nominative marking) has applied, inverting the standard rule of object marking. Another possible example comes from Bach (1967, discussed in King, 153), where it is argued that *have* and *be* in English are eliminated from the base (lexicon) and introduced via transformational rules.⁶

Restructuring of the syntactic component is the other way a language may change. This is argued to be the case of the development of the class of modal verbs in English (though the details of specific analyses are often controversial); see work by Lightfoot (1979, 1988, 1991, 1999), in the earlier of which he proposes a Transparency Principle (TP; similar in spirit to Postal’s Naturalness Condition), according to which “...derivations [should be] minimally complex and initial, underlying structures to be ‘close’ to their respective surface structures” (1979:121; critiqued in McMahon §5.3); the purpose of the TP is to control the amount of opacity and abstractness in the syntax, and that when a certain level (never predictable, unfortunately) of complexity is reached (via the development of changes viewed in retrospect as ‘predisposing’), learners will no longer tolerate it and will consequently restructure their grammars. This is because “grammars practice therapy rather than prophylaxis” (Lightfoot 1979), similar to the relationship between sound change and analogy. Further, language change is explained by accounting for how the input the language learner receives changes, along with an adequate model of acquisition (Lightfoot 1999).⁷

Slade and LaFond, this volume, take up these issues, and others (including some studied under the rubric of grammaticalization; Hopper & Traugott 1993) in some detail; Slade in his account of the development of *do*-support in English (where reanalyzed semantically-empty *do* comes to be inserted in a number of new syntactic

contexts, perhaps akin to rule inversion); and LaFond in his characterization of the development of the distribution of null subject pronouns in Old French.

1.2. Problems with early generative accounts and further extensions to the theory

McMahon points out several problems with these classical generative approaches, some of which are touched on briefly here. As for the claim that languages are evolving to an ever more simple state, there is no evidence at all to support such an assertion, and it is clear that some rules introduce increased complexity into the grammar (as by creating irregularity), while others seem not to be simplificatory (as in a sound shift); further, an exact measure or definition of simplification appears to be a relative rather than absolute matter. These early approaches also tended to model synchronic grammar as a compendium of historical rules, with restructuring and rule loss invoked infrequently, and certainly much less frequently than under the later Lexical Phonology and Morphology (discussed below), as well as under many of the OT analyses presented here. Consider the following (Chomsky & Halle 1968:49):

...underlying representations are fairly resistant to historical change, which tends, by and large, to involve late phonetic rules. If this is true, then the same system of representation for underlying forms will be found over long stretches of space and time.

As McMahon indicates (44), this supposes an extremely static model of grammar, and is one under which the divergence of dialects and languages is limited principally to the order of these late rules. Under such an assumption, for instance, the Romance languages would presumably largely share a common lexicon (as in Harris 1969, where Modern Spanish *leche* has as its underlying form /lakte/, equal to its Latin etymon), which while true from an etymological perspective is untenable from a psychological one. Later generative approaches sought to move beyond a mere recapitulation of history, that is, beyond the simple description of the changes in a language's history, toward an explanation of them, including both the actuation problem (why a change might begin) and the transmission problem (how a change, once initiated, spreads). While exhaustive and totally predictive explanation is probably beyond our capacity (Lass 1980), we perhaps should aim for explanations that are probabilistic or statistical in nature (McMahon, 45). This view is echoed in many of the contributions to this volume.

The later movement of lexical diffusion theory (Wang 1969, et seq.) offers a treatment of the transmission problem, and is an issue taken up in part in the OT approaches such as those of Zubritskaya (1995), Anttila (1997a,b) and Gess (1996), as well as those in this volume by Gess, LaFond, Reiss and Slade. Of course, the proper formulation of synchronic variation (whether for phonology or for syntax) is still a matter of debate in generative approaches, as in either a rule system or constraint ranking (at least under the orthodox version of each of these schools of thought) unique outputs ought to obtain.

A later development of generative theory, Lexical Phonology and Morphology, was also applied to historical change (e.g., Kiparsky 1988, 1995, Kaisse 1993, Zec 1993). Proponents of this model generally assume a less abstract analysis according

to which underlying and surface forms are typically rather similar, and that the rules that operate in a grammar involve the integration of phonology and morphology according to various lexical and phrasal levels. Such an approach elegantly captures Labov's (1981) approach that 'resolved the Neogrammarian controversy', according to which all changes were phonetically gradual but lexically abrupt; however, there were changes that clearly were phonetically abrupt but lexically gradual. In Labov's important paper, he argued that sociolinguistic synchronic variation can be interpreted as sound change in progress, and that there are in fact two types of change, those that behave as the Neogrammarians posited, and those that were lexically diffusive in nature.

For Lexical Phonology, Neogrammarian-type changes are seen as those due to rules that apply in the phonetic or postlexical component, that lay beneath the level of conscious awareness of the speaker, are gradient, predictable, and may apply across words; lexically diffusive changes are seen as those due to rules that may have exceptions or be morphologically conditioned, yield a discrete output, and apply within words. The idea that Neogrammarian changes could become diffusing changes over time is argued by Kiparsky to fall out naturally from the stratal organization proposed for the grammar. That is, rules (often phonetic in nature) typically first enter the grammar in the postlexical component, but may then move up the grammar by entering the lexical component and so acquire exceptions and other characteristics of lexical (here, lexically diffusing) rules. Moreover, lexical diffusion may be viewed as the analogical generalization of lexical phonological rules (Kiparsky 1995:641). Thus, Lexical Phonology offers a pathway whereby sound changes are incorporated into the synchronic grammar (McMahon, 65) via this two-stage theory according to which phonetic variation inherent in speech is selectively integrated into the linguistic system and is passed on to successive generations of speakers through language acquisition (Kiparsky 1995:642). Further, while earlier generativists saw rule generalization as the removal of features from a rule (so that it applied to a broader class of segments or in a broader set of environments), Lexical Phonology (coupled with underspecification theory) allows us to view a rule becoming more general due not (necessarily) to a change in the rule itself, but to the characteristics of the stratum of the phonology in which it is applying (Kaisse 1993:354).

OT research has also begun to address these issues, and several of the contributions to the present volume offer solutions, most of which, however, require refinement of the current strong OT position that there is a single pass from input to output — that is, that a stratal model of OT is necessitated by consideration of at least certain historical facts (see, e.g., the contributions to this volume by Gess, Jacobs, and Bermúdez-Otero & Hogg, as well as Kiparsky 2000a). Likewise, many current researchers in OT assume that a learner's phonetic input may lead to both reranking of constraints as well as to lexical restructuring via a principle of lexicon (and concomitantly, grammar) optimization. (See discussion in §2.1 below.)

1.3. *The rise of Optimality Theory, and assessment of it*

In later years, there came to be a growing dissatisfaction with the rule-based approach to generative grammar; ever since the inception of generative grammar there had been the need to posit constraints, filters or conditions alongside rules, and the interplay among these had been viewed as problematic. Another criticism was that we ought to have observable evidence that the grammar is indeed composed of a series of rules. In fact, we have evidence only for the output (what we actually orally produce and aurally perceive), and only indirect or theory-internal evidence for the input (underlying representations) such as morphological alternations.

These and other criticisms led to the development of alternative frameworks in which constraints play the principal or only role, to wit: the Theory of Constraints and Repair Strategies (Paradis 1988, 1993); Harmonic Phonology (Goldsmith 1994); and, of course, Optimality Theory, which has gained a robust following in part because this purely constraint-based approach makes strong claims about the nature of constraints and the interrelation of languages via constraint ranking.

However, after nearly 10 years since the appearance of the first manuscripts, there has been much revision of the original proposals, as well as much reflection on and assessment of OT, including a growing dissatisfaction with at least certain aspects of it. An important recent appraisal of OT, as the present-day standard theory, recently occupied a triple issue of *The Linguistic Review* (Ritter 2000a), and the work presented in the present volume addresses many of the same substantive issues that concern both proponents and critics of OT, and arguably sheds light on appropriate modifications to the theory as well. After all, OT is essentially an *approach* to grammar, one that can be appealed to in many ways in modeling natural language, rather than a model in itself (Ritter 2000b:116; Rennert 2000:135; Clements 2000:195), and evaluation of historical data may be required to establish a fuller understanding of the organization of synchronic grammar, particularly of the features and representations necessary to properly characterize it.

Let us now briefly consider the relevance for the present topic of several of the articles in Ritter (2000a). Davis (118) attributes one of OT's major achievements to its ability to understand conspiracies of disparate rules as specific operations to create a well-formed word in a specific language. Further, OT's approach of comparing possible output candidates allows the analyst to gain further insight as to why candidates fail (Ritter 2000b:111). In many, if not most, OT studies on language change, suboptimal output candidates, but 'nearly optimal' according to the rank of the constraints that eliminate them, subsequently become optimal ones when constraints are reranked. Of course, we do well to heed the caution voiced in McMahon's contribution to Ritter (as well as in her present contribution), that without further justification of *why* constraints have been reranked, an appeal to reranking is problematic, as it may be an essentially nonexplanatory and post hoc descriptive method, with the motivation for change lying outside the theory (231). (See also the present contributions by Gess and Reiss.) Further, McMahon makes the eminently sensible observation that OT analyses of changes are only as insightful as the constraints they employ, and that as long as there is no restrictive theory of the constraint set and reranking depends on external factors (whether

phonetic, functional or sociolinguistic), OT will not present a restrictive theory of sound change. In a related vein, Mohanan critiques the strong OT position that all constraints are universal; instead, he pursues the notion of constraint assemblies (162), according to which a constraint is composed of a universal core and a set of noncore ingredients, rather than being one of the finite set of universal constraints. (See also Hammond 1999:§1.5.3 for the notion of constraint schemata as a way to limit what a constraint might be.) The contributors to this volume take such issues seriously, and present analyses that attempt to overcome these shortcomings and objections.

As for the other component of classical OT, parallel rather than serial derivation (that is, input $\rightarrow$ output in one pass, instead of in several), there have been critiques of this tenet as well. Clements (195) believes that it is advisable to allow some of the desirable features of serialism to be incorporated into OT (like the straightforwardness with which certain cyclic phenomena may be analyzed due to level ordering), and that while constraints and their interaction form the foundation of the theory, the choice of parallel versus serial input-output mappings is an implementational matter. Likewise, Odden (323) argues that some degree of actual derivationality is required in OT, whereby distinct cycles of constraint evaluation are needed at the word and phrase levels. This line of reasoning is also taken up by Kiparsky, who argues for a constraint-based version of Lexical Phonology and Morphology (LPM-OT) in which are posited separate, serially related OT constraint systems for stems, words and sentences (351). Kiparsky further argues that this allows for a more restrictive and well-defined constraint inventory, that is, one without need for recourse to output-output, sympathy or paradigm uniformity constraints, which Kiparsky believes severely compromise OT. Instead, constraints are limited to input-output faithfulness, which Mohanan (151:n. 11) views as the corollary to the Naturalness Condition, as these demand that phonetic representations be identical to underlying ones unless required otherwise by a higher-ranked constraint. Inasmuch as the Naturalness Condition is relevant for historical linguistics (as I suggested above, and return to in §2.1 in discussing lexicon optimization), these are relevant points that ought to be pursued further.⁸

Indeed, several of the papers in this volume (those of Bermúdez-Otero & Hogg, Gess, Jacobs, and Minkova & Stockwell) give up the classical OT assumption of a monostratal grammar, and instead argue that a level-ordered OT can better model certain linguistic changes while at the same time allowing us to avoid recourse to problematic (in their view) theoretical machinery and to retain the key insights of the research program developed under Lexical Phonology.

Finally, consider the following (Archangeli 1997:31):

Under OT, the formal characterization of language change through time is that constraints are reranked. A prevalent view of diachronic language change is that change occurs when there is imperfect transmission from one generation to the next. Combining these two claims implies that constraints can only be reranked when the evidence for a particular ranking is not very robust. Thus, OT makes clear predictions both about the effects of change and about the type of change that might occur.

As McMahon (234) comments, the question naturally arises as to why an earlier form would be maximally harmonic under an original ranking of constraints, while a

later form is more harmonic under a re-ranked constraint hierarchy. Moreover, does a change in a grammar provoke surface changes in response, or do surface changes result in the next generation of learner-speakers developing a different grammar? These are additional questions that the contributors to this volume pursue, and which I begin to treat in the next section.

2. PREVIOUS OT APPROACHES TO VARIATION AND CHANGE

If rules are replaced by constraints, and serialism by parallelism (as the null OT hypothesis), reconsideration then becomes necessary of the classical generative assertion that change in (or between) grammars is due to some change in the rule component of the grammar or to a restructuring of the lexicon. Two broad issues arise: how to characterize in OT the traditional generative approach to the various types of rule change (addition, loss, reordering, inversion), as well as how to implement the traditional generative notion of restructuring of underlying forms.

The latter issue, treated at length in the next section, has come to be discussed in OT under the rubric of lexicon optimization, discussed immediately below with regard to historical change. The following section then treats the issue of rule change versus constraint reranking.

2.1. *'Lexicalization' or 'restructuring' and lexicon optimization*

In effect, the OT principle of lexicon optimization says that given the surface form of a morpheme and knowledge of the grammar, a learner will select the optimal underlying representation for that morpheme:⁹

(1) Lexicon optimization (Prince & Smolensky 1993:192):

Suppose that several different inputs $I_1, I_2, \dots, I_n$ when parsed by a grammar G lead to corresponding outputs $O_1, O_2, \dots, O_n$, all of which are realized as the same phonetic form Φ — these inputs are all *phonetically equivalent* with respect to G . Now, one of these outputs must be the most harmonic, by virtue of incurring the least significant violation marks: suppose this optimal one is labeled O_k . Then the learner should choose, as the underlying form for Φ , the input I_k .

Inkelas (1995) paraphrases this as follows:

[O]f all the possible underlying representations that could generate the attested phonetic form of a given morpheme, that particular underlying representation is chosen whose mapping to phonetic form incurs the fewest violations of highly ranked grammatical constraints.

This idea is not new to OT, of course, though such a principle does run counter to the claim made in many traditional generative approaches that underlying representations should be as underspecified as possible (due to a principle of lexical minimality); maximal elimination of redundancy is either permitted or required in these models because the rules of the grammar are sufficient to generate the correct output forms of the language. (See Steriade 1995 for discussion of the tenets of various branches of underspecification theory).

Under lexicon optimization in OT, however, underlying forms (inputs) may be fully specified; only alternating structure is unspecified, as the grammar's EVALUATOR (EVAL) will consider optimal those candidate output forms with fewer violations of faithfulness constraints like MAX ("do not delete any segment/feature") and IDENT ("do not change any segment/feature"). This has the effect of maximizing the harmony of the grammar, roughly defined as the minimization of constraint violations. In nontechnical terms, this means that a speaker mentally stores that which he or she hears produced; positing of a more abstract underlying form will only occur when there are phonologically or morphologically related groups of words whose shared segments vary only in certain features.¹⁰ Though this places a higher burden on lexical representation, it reduces that placed on the grammar.

This is similar in spirit, if not identical, to the Natural Generative Phonology tenet (and Postal's Naturalness Condition, discussed above) that lexical representations of nonalternating parts of morphemes are identical to their phonetic representations (e.g., Vennemann 1973, cited in Golston 1996, who concurs; see also Hooper 1976). A pre-OT statement of this principle is given in Girelli (1988),¹¹ who assumes that speakers (beginning with children) adhere to the Neutral Ground Hypothesis, which he states as follows:

(2) Neutral Ground Hypothesis (Girelli 1988:116)

When a segment alternates for some features in different contexts, in the lexicon it is specified, with unmarked values for the features for which it alternates.

That is, where a segment alternates it is unmarked for those features for which it alternates (157).

What kinds of evidence might be brought to bear on the justification of lexicon optimization (and of the Neutral Ground Hypothesis) as relevant and necessary to linguistic theory and to historical change? Some support for this approach comes from child language, where we find that full specification is the standard assumption, at least for the earliest stages of acquisition (Kiparsky 1970, Kiparsky & Menn 1977). Likewise, Jaeger (1986) argues for the assumption that words are stored in a form close to their pronunciation. She states that "the most straightforward hypothesis about young children's representations is that they are isomorphic with their pronunciations, with perhaps some mismatches due to production constraints" (72). She concludes by saying that nearly all studies of speech production and perception indicate that something close to surface forms exist in memory and that words are stored with much redundancy, enabling access from a number of paths (71). Likewise, Jusczyk (1997) adds that it is also assumed that specific characteristics of a given utterance are somehow removed during speech processing (e.g., intonation, voice quality, etc.), leaving a normalized lexical representation that is basically a phonetic description of the information heard in the utterance.

While this increases lexical storage, it reduces the work of the grammar, an idea consistent with the analysis of Bever (1975). Bever discusses the psychological reality of grammar, and proposes that once coordination of the outputs of perception and production systems is achieved, "the grammar need not play any direct role in

on-line processing; that is, grammatical rules are not necessarily executed as steps during processing, nor does processing require computing the kinds of representations that are associated with derivations of sentences” (cited in Jusczyk 1997:194). (It is, of course, an open question whether a constraint-based approach is or may be more psychologically real than a rule-based one. Consideration of this point is beyond the scope of this essay.)

Studies of child language that employ and discuss OT like those of Hale & Reiss (1996a,b) and Smolensky (1996) follow the assumption that children’s lexical representations are fully specified (though these authors are diametrically opposed in other fundamental aspects of their analyses; see also Reiss, this volume). Yip (1996) likewise argues for full specification.

From this discussion, the relevance of the concept of lexicon optimization for historical change should be obvious. When the listener hears an output form that differs from its underlying representation, it will consider storing that phonetic output in mental representation. This will occur if the output in question always occurs with the same phonetic form; lexicalizing it reduces violations of those constraints that mediate the faithful correspondence between the input and the output (MAX, IDENT or DEP (“do not insert any feature/segment”)) because whatever change might happen in fact always happens. Therefore, by making that information part of underlying representation the learner maximizes the harmony of the grammar by eliminating these faithfulness constraint violations.

This is very similar to Neogrammarian theory of phonological change, as reviewed in Kiparsky (1965a, 1965b:1). He discusses Hermann Paul’s *Prinzipien der Sprachgeschichte* (1886), who states that phonological change takes place continually as articulatory representations are revised to match shifts in execution due to the natural tendency toward articulatory drift, which may occur provided that the resulting auditory deviation does not reach the level of conscious perception.

For instance, devoicing of final obstruents in German is learned via observation of alternations of the type *bun[t]:bun[d]e*; however, words like *ab*, *ob*, *weg* (i.e., *a[p]*, *o[p]*, *we[k]*) never alternate, so their final segment will always surface as voiceless (by a process of devoicing). Consequently, succeeding generations may omit the specification [+voice] from the underlying representation of the final segment of these forms, bringing about restructuring in this part of the lexicon (Kiparsky 1965b:17).

Indeed, this process is known as ‘lexicalization’ in traditional historical linguistics. That is, what for one generation of speakers is taken as a rule-produced variant is misinterpreted as a lexical item by younger speakers, who never make the inference of the underlying form of their elders. (See also much work by Ohala, as well as Andersen’s 1973, 1989 abductive-deductive model, discussed explicitly in the contributions of Gess and LaFond.) Lexicalization is, then, the loss of a more abstract underlying representation for the retention of the surface phonetic shape now entered as the primary lexical representation of the item (Maher 1980:113). The case of English /hw/ → [w] → /w/ discussed in §1.1 may serve as a further concrete example of this phenomenon.

This principle is adopted into OT under the term lexicon optimization. With regard to historical change, on the assumption that younger members of a linguistic

community are important in spreading change (i.e., the transmission problem; see §1.1), newer generations of listeners will lack evidence that a phonetic feature (or its absence) is due to a phonological process or alternation, and will consequently posit the surface form as a lexical item (or, faced with morphological alternations, the nonalternating structure common to the related forms).

Hutton (1996) includes discussion of what he calls the Synchronic Base Hypothesis, which has obvious ties to lexicon optimization, and is stated below:

(3) Synchronic Base Hypothesis:

All input candidates produced by GEN [i.e., the Generator; deh] are based on the current output form. Earlier forms of the language are no longer available as underlying representations on which GEN operates.

This means that historical forms are not inherited genetically, but are eliminated from the lexicon. Put another way, it means that language change is not a matter of derivation, but of substitution of one input for another (contra much early work in standard generative grammar; cf. the above cited quote from Chomsky & Halle 1968:49). Though Hutton does not explicitly state so, it also seems to imply that the listener stores the output form of one stage of the grammar as the input for changes that take place in the immediately following stage (cf. discussion above of the Neogrammarian approach to phonological change). For example, a form like Modern Spanish *leche* [letʃe] ‘milk’, would not derive synchronically from the form /lakte/ (as in Harris 1969, discussed above), though its Latin etymon is indeed *LACTE*, despite its semantic relation to words like *lácteo* ‘milky, lacteous’ and *lactar* ‘to lactate’. This is because the phonological shape of the historical source is too far removed from the modern form, and so the historical form may not serve as its underlying representation. While none of the researchers of this volume explicitly discusses the Synchronic Base Hypothesis, its connection to lexicon (or input) optimization should be clear.

At this point arises an interesting intersection with the issue of constraint ranking and reranking. That is, there is an interesting extension of the argumentation regarding lexicon optimization under the strict OT assumption that a grammar is composed of ranked violable constraints. Concretely, given an initial ranking of faithfulness and well-formedness (markedness) constraints, not only does the phonetic output lead the listener to posit surface-true lexical items, it also apparently leads the learner to demote (or not) constraints from their original ranking.¹² That is, for a constraint with an initially high ranking, the lack of phonetic evidence that it is violated will allow the listener to leave it in its original position. Likewise, when a listener does hear phonetic forms that violate a certain constraint, she will demote the constraint to allow for the grammaticality of the output form heard. I assume that newer speakers are not aware of a change in the ranking of constraints; instead, they learn what the final ranking of constraints should be based on the phonetic evidence,¹³ each generation in effect constructing their community’s language anew.

Hutton provides discussion of an issue relevant to this point: he proposes that individual constraints may be demoted once the phonetic conditions on the output cease to be relevant. In other words, a constraint may become redundant. When this

occurs such constraints are relegated to the lowest division of the constraint hierarchy, where what he calls the ‘unranked occulted constraints’ reside. Though this is argued not to be possible even in principle according to Prince & Smolensky (1993), whether there are unranked constraints or not is an open question, one that we will see below has been challenged by Anttila for synchronic variation studies, in addition to the challenge posed by Hutton for historical studies. A related matter is that discussed above regarding the impact of lexicon optimization on the acquisition process.

Several contributors to this volume underscore the value of minimizing the distance between input and output and so rely upon some notion of lexicon optimization. See, for instance, the contributions of Bermúdez-Otero & Hogg, who prefer the term ‘input optimization’, as in their multi-level model there is an input for each level (only the first is at the level of the lexicon); Reiss,¹⁴ and Holt. Likewise, the issue of constraint demotion (as in Tesar & Smolensky’s 2000 Constraint Demotion Algorithm) is treated in the contributions by LaFond and Slade, and the related issue of constraint demotion versus constraint promotion is addressed in the contributions by Holt and Lleó. Whether both should be permitted (either for language acquisition or historical change, though the two are probably impossible to keep fully separate) is an open question and matter of debate, and is certainly an area worthy of further investigation whose finding will be of interest to OT researchers of both diachronic and synchronic issues.

Changes to the constraint hierarchy, and their possible relationship to the traditional generative grammar notion of changes to the rule component, are discussed further in the next section.

2.2. *Changes to the rule component versus changes to the constraint hierarchy*

If constraints often mimic the effects of rules, then the apparent analog in OT of a change to the rule component would be a change to the constraint hierarchy. However, it is not always clear that this is the case, especially when lexicon optimization is invoked, as it often is.

Hutton, in continuing his metatheoretical discussion and treatment of phonological change (though he does cite individual cases of change), discusses the possible changes that might affect a language’s constraint hierarchy. As Hutton states, OT envisions a grammar as a state, not a derivation (either synchronically or diachronically).¹⁵ Although the constraint hierarchy is in a state of equilibrium, it may undergo reranking. For Hutton, the reranking of constraints does not drive historical change, but instead results from it. (See also the contributions by Gess, LaFond, McMahon, Reiss, and Slade, this volume, for discussion and endorsement of this view.) Hutton suggests that while the hierarchy may be altered on the basis of random internal factors (which is the case he suggests for unconditioned changes), it is more likely to be altered on the basis of conditions on the output (that is, external factors). Possible alternations are given below:

- (4) Alternations to the constraint hierarchy:
- a. Promotion of constraints
 - b. Demotion of constraints
 - c. Creation of new connections between constraints
($A, B \rightarrow A \gg B$)
 - d. Dissolution of connections between constraints
($A \gg B \rightarrow A, B$)
 - e. Alteration of the dominance relationship between two constraints
($A \gg B \rightarrow B \gg A$)

The latter three are subtypes of (a) and (b), since they necessarily involve promotion or demotion of constraints, at least when considered within a single generation or for a single speaker. (That is, (c)-(e) may be spurious, as when a new generation sets its constraint hierarchy, it only demotes (and possibly promotes) constraints from the initial-state ranking.) Type (e) has been denied by Cho (1995), who instead proposes a stage of free variation. If this is possible, it may be akin to the nonranking suggested below by Anttila in partially-ranked grammars. As Hutton states, when the ranking of a constraint changes, it is often unclear whether this should be understood as the promotion of a lower-ranked constraint or the demotion of a higher-ranked one. While Tesar & Smolensky (2000) argue for a learning algorithm where only constraint demotion is possible (in part because it reduces the options available to the learner and constrains the task of acquisition), it is an empirical question yet to be decided definitively, and certain historical changes may require recourse to constraint promotion. (See, e.g., Green 1997, Holt 1997:chs.2-3, and Lleó this volume, who suggests that constraint promotion may only be available in the case of exogenous (i.e., external or foreign) influence on a language.)

Hutton argues that conditioned language change should not be based solely on random changes in the constraint hierarchy, for this would seem to divorce such changes from the phonetic characteristics of the output.¹⁶ To put Hutton's terms another way, these changes are often if not always based on constraints that are grounded in functional motivation. He suggests that without some sort of restriction on the way one form replaces another (as with the Synchronic Base Hypothesis), sound change would be completely random. I suggest that this may be viewed as a case of lexicon and grammar optimization, in that phonetic output forms are as close as possible to phonological inputs, and that when modifications are made, they are reanalyzed by the listener to be the new input. This maximizes the harmony of the grammar because output forms that more closely match the input will incur fewer constraint violations.

Zubritskaya (1995), one of the earliest OT analyses of synchronic variation, explores the idea that whole families of functionally similar constraints interact in such a way that a change operates as a gradual weakening or strengthening of that family. Her conception of sound change is that it is restructuring of the constraint hierarchy, the reasons for which are not always clearly understood. In her treatment of the loss of palatalization assimilation in consonant clusters in Modern Russian, the constraint requiring assimilatory spreading (MAXIMIZE LICENSING in her

account) is reranked below the family of constraints that militate against secondary articulation (that is, palatalization by having a secondary coronal articulation):

$$\begin{array}{rcccl}
 (5) & & \text{MAXLIC.} \rightarrow & & \\
 & *Dor & \gg & *Lab & \gg & *Cor \\
 & | & & | & & | \\
 & Cor & & Cor & & Cor
 \end{array}$$

Given this fixed markedness hierarchy (that is, it is worse for dorsal segments to be palatalized than labials, and both are more marked than palatalized coronals), Zubritskaya argues that the directionality of the sound change of loss of palatalization assimilation is determined by the implicational relation described. She suggests that not only is the directionality of change natural (from more to less marked) but that it is the only direction possible. The speaker does not have to learn the directionality of a sound change with respect to functionally similar environments since the directionality is determined by the universal markedness ranking. Such markedness hierarchies, then, allow one to make explicit predictions about the possible directionality of a sound change. She suggests that optionality in the choice of output (that is, synchronic variation) is to be modeled via competition between a single constraint and a whole constraint family.

Other early work that argued for the interaction of families of constraints in historical change includes Jacobs (1995, 1996), Gess (1996), Green (1997), and Holt (1997). Jacobs presents perhaps the earliest work on historical change in OT. In the first study, Jacobs treats Old French lenition, while the latter work discusses a change in syllable structure as well as the loss of the possibility of enclisis of object pronouns. Jacobs characterizes lenition as the reranking of PARSE (MAX in the more current Correspondence model of OT; McCarthy 1995b) and MARKEDNESS constraints (which he calls ‘anti-association’ constraints); his account of the change in syllable structure and phonological enclisis relies on a reordering of ALIGNMENT and PARSE constraints. In addition, for the loss of certain word-final consonants he also employs NOCODA.

Gess (1996), to the best of my knowledge the first dissertation to employ OT in modeling historical change, analyzes certain changes in the development of syllable structure in French. To this end he employs NOCODA constraints, which he formulates in terms of ALIGN-RIGHT (that is, the requirement that certain features be aligned with the rightmost edge of the syllable). He shows that what determines the erosion of syllable-final consonants is the reranking of the distributional constraint on sonorants with respect to PARSE constraints, and argues that permanent sound change occurs when an innovative ranking in the postlexical phonology is transferred to the lexical phonology (which he assumes are actually different grammars, in keeping with the strong OT position of single-pass parallelism, rather than having the output of the lexical component serves as the input of the postlexical component); this transfer is equivalent to lexical diffusion (18). (Gess returns to similar matters in this volume, and greatly enriches this approach, emphasizing phonetics and the role of the speaker in what he now views as a level-ordered

grammar.) Green's (1997) dissertation likewise touches on historical matters, though its main concern is an examination of the prosodic structure of the closely related Goidelic languages Irish, Scots Gaelic and Manx. Green suggests that phonological change happens when a constraint against a marked phonological pattern is promoted above other constraints. Holt (1997, and this volume) advances a similar argument in accounting for certain changes from Latin to Hispano-Romance, where it is argued that there was a gradual increase in the restriction of sonority with respect to the moraic status of consonants, characterized formally as the progressively lower ranking of MAX versus a family of constraints that bar consonants of certain sonority from being moraic ($*C_\mu$: appropriately decomposed). That is, the degemination of both obstruents and sonorants, as well as the weakening and loss of syllable-final consonants, are claimed to be due to the step-wise reranking of $*C_\mu$ vis-à-vis the faithfulness constraints.

The treatments discussed thus far have followed the standard OT view that constraints are crucially ranked. However, this is clearly an empirical issue. Anttila (1997a,b) proposes that both categorical and variable outputs, as well as statistical preferences for a given form over another, depend on how successfully certain grammatical properties harmonize. For the case he studies, variation of Finnish genitive morphology, at issue is syllable prominence, which he defines as a combination of stress, weight and sonority. Under his analysis, if a stem yields a very harmonic form (in terms of stress, weight and sonority) it shows no variation, while if it yields several almost equally-optimal forms, variation arises.

Anttila captures this insight in the following way: Given three constraints for a language A, B, C, and the rankings $A \gg B$; $A \gg C$, we really have only a partial ranking, since there is no ranking relation between B and C. This relationship may be represented as follows:

Tableaux 1. Sample tableaux

/input/	A	B	C
a. [Candidate output 1]	*	*!	
☞ b. [Candidate output 2]	*		*

/input/	A	C	B
☞ a. [Candidate output 1]	*		*
b. [Candidate output 2]	*	*!	

It is important to note here that these two tableaux correspond to a single grammar; this is in contrast to the more typical situation encountered in OT analyses in which, when two or more candidates tie with respect to some constraint, the Evaluator (EVAL) continues to the immediately dominated constraint to evaluate optimality and eventually determines a clear and unique winner. The difference is that in those cases it is assumed (that is, it has been shown by the analyst for the grammar) that there is a total ranking of constraints, in which case categorical and unique results obtain. In the model proposed by Anttila, when no such total ranking

has been established by the learner/speaker/linguist, multiple tableaux exist that correspond to a single grammar. In the case where there are more constraints whose rankings are underdetermined there will be more tableaux. A variable form is one that is optimal according to one of the tableaux thus constructed. Statistical preference is derived from the number of tableaux according to which a given form is optimal.¹⁷

As Anttila states, partial ordering offers a new perspective on the hypothesis that variation is due to competing grammars in the community or individual; whether his model is one of competing grammars depends on how a grammar is defined. If a grammar is defined as a total ordering of constraints then we have multiple grammars; however, if a partial ordering qualifies as a grammar there is a single grammar. (Slade and LaFond in this volume appeal to similar notions to account for variation, which they see as change in progress. In a similar vein, Boersma offers a variation-and-selection model for predicting the direction of sound change whereby constraints that do not contribute to determining the optimal candidate are ranked randomly with regard to one another, with specific ranking orders distributed among the population of speakers.)

Likewise, further consideration of the relationship between constraints, and the possible changes in their ranking, may be required upon adoption of a multi-level OT. If a Neogrammarian sound law may become a diffusing lexical rule, or a postlexical rule a lexical one, it would seem a natural assumption that constraints could move up the levels of the grammar as well. That is, if Bermúdez-Otero & Hogg, Gess, Jacobs, Kiparsky, and others are right in arguing for separate levels each with its own constraints and ranking, we then need to account for how a constraint may, if it does, pass from one level to another (presumably from a higher or phrasal one to a lexical or morphological one), as well as how underspecification may be involved. The nature of the parser and of the learning mechanism, along with lexicon optimization, are almost certainly necessarily involved in a major way, but there are many unresolved (and unasked) questions, only some of which will be addressed in this volume. (See Bermúdez-Otero 1999:§3.3.3.2 for a solution that relies on input optimization, also pursued in this volume with Hogg.)

Finally, the precise correlates of the standard generative notions of rule addition, loss, reordering and inversion do not, apparently, correspond well with specific permutations of the constraint hierarchy. For instance, it does not appear to be the case necessarily that reranking of constraints is equivalent to reordering of rules, though the appearance of what would have been termed rule addition or loss may result from such a change to the constraint hierarchy. Bermúdez-Otero & Hogg's contribution to this volume treat (via a model of interleaved OT) cases that have been analyzed as rule inversion and rule loss, while Gess, LaFond, Slade and most of the other authors treat various innovations that might be analyzed as cases of rule addition, but this matter is left open here.

2.3. *Summary*

This concludes the review of the issues that previous OT work on historical variation and change have addressed and must continue to pursue. These remarks have been somewhat brief, but they give a representative picture of the current thinking of several researchers on these matters. In the course of this volume the authors will explore many of the issues and options suggested above and present other ways of approaching sound and syntactic change, and although we will not always reach the same conclusions regarding historical variation and change, I believe there are many shared insights that will provide fertile ground for future research.

The next section provides a somewhat fuller overview of the contents of the volume and aims to summarize the main findings and conclusions of each chapter.

3. OVERVIEW OF VOLUME CONTENTS

The volume contains thirteen chapters in addition to this introductory essay. Most treat phonological changes, two treat syntax explicitly (Slade and LaFond), and two treat analogical change (Bermúdez-Otero & Hogg and Reiss); several others touch on issues of morphology as well, and all touch in significant ways on matters of broader theoretical import. This distribution of content is consistent with the current state of affairs in OT research more generally, although there is an increasing amount of morpho-syntactic investigation being carried out in OT. Likewise, the languages treated are almost exclusively well-known European languages (English, Germanic, French, Spanish, Latin and Russian), though many other languages are drawn into the discussion of various phenomena. This too is fairly representative of current work on diachronic studies; future research will ideally rectify the imbalance in attention paid to European versus other languages, and should yield new insights, as should the incorporation of sociolinguistic factors. As mentioned, different trends within OT are represented, with functionalist papers alongside at least one anti-functionalist one (Reiss); in addition, at least one paper explicitly departs from the mainstream view that constraints are innate (Gess), and two are outrightly skeptical of OT (McMahon and Reiss). The papers gathered here, then, are significant because they offer the interested reader a wide range of perspectives, and will permit the reader to gauge the prospects of OT to make a major contribution to our understanding of language change in general. The results, while open to debate and discussion, are promising. Directions for future research include the systematic study of possible and impossible changes (based on extensive crosslinguistic examination) and of the role of phonetics in sound change, attempts to study change at the level of the individual (instead of at the level of idealization or of the grammar of a language), the incorporation of sociolinguistic and discourse-oriented factors, and others.

PAUL BOERSMA treats “The odds of eternal optimization in Optimality Theory”. Boersma takes issue with suggestion that if all sound change were due to optimizations of functional principles (i.e., minimization of articulatory effort, minimization of perceptual confusion), then sound systems should have increasingly

improved during the course of history, to the point that they should have reached a stable optimum. Since the facts show otherwise (sound systems tend never to stop changing), the conclusion must be that optimization cannot be a major internal factor in sound change; however, Boersma argues that it depends on how we define optimization. In this chapter, Boersma shows that the cyclicity attested in the Germanic consonant shifts, to explore one example in detail, is not due to coincidence, but that, given random ranking of invisible constraints in OT, this cyclicity is expected in a large fraction of all sound changes. Further, Boersma improves upon a previous goal-oriented approach, finding that his current implementation under OT offers a blind (nonteleological) underlying mechanism to account for the selection step. Under the strict-ranking decision scheme of Optimality Theory, in which variation can be described as a result of a set of mutually unranked constraints and the possible rankings within this set are distributed evenly among the population of speakers, we see the emergence of a pressure in the direction of a particular sound change. That is, Boersma offers a variation-and-selection model for predicting the direction of sound change, under which sound changes may go on forever, as internal optimization often does not lead to a globally optimal sound system, a position supported by the evidence from attested and reconstructed changes in the Indo-European consonant systems. Thus, optimization by internal functional principles can be a major source of sound change after all. If all sound change is guided by these internal functional principles, then *all* sound changes in progress are part of a cycle, as languages have been around long enough to send all other changes into a stable optimum. External factors, however, may create new initial states, and the majority of these will head towards a stable optimum, while a much smaller fraction move towards a cycle of eternal circular optimization.

In his chapter “On re-ranking and explanatory adequacy in a constraint-based theory of phonological change”, RANDALL GESS offers a critical examination of the notion of constraint ranking and phonological change. He proposes a four-stage (and three-level) model that captures the incremental nature of sound change, arguing that at least some changes (here, certain changes in Old French) arise from production-oriented phonetic innovations. Gess suggests that an explanatory theory of phonological change must address both the nature of such innovations and the knowledge that underlies them, and believes that cue preservation constraints offer a suitable format to do so. Gess further sets the goal of a theory of phonological change to be that of explanatory adequacy, whereby each descriptively adequate correspondence between diachronic stages is selected on the basis of the actual events that gave rise to it, including the relevant innovations, their integration into the phonology, as well as the external factors that contribute to these. Like other contributors, Gess believes that explanatory adequacy depends on a theory of language acquisition, as well as of phonetic implementation and of variability. Like McMahon and Reiss (contributions to Ritter 2000a, and this volume), he believes that reranking of constraints is not adequate as an explanation for change; for him, reranking is the result, not cause, of change. Specifically, the output of one generation’s register-dependent cue-preservation constraint ranking (that is, at the post-lexical level) is stored as lexical forms, over which new phonological

generalizations will hold (that is, at the lexical level), and so too will be new the ranking of the constraints that express them. Further, Gess argues that such a distinction between levels is natural once we realize that the different levels correspond to different types of knowledge, with ‘lexical’ knowledge pertaining to declarative knowledge of well-formedness and conditions that hold over lexical entries, and ‘post-lexical’ knowledge pertaining to both register-dependent and independent knowledge of (social) contextual variability and obligatory and morphophonological alternations, respectively. Finally, in an explicit comparison with rule-based theory, Gess believes that OT comes out favorably, since constraints connote static knowledge, but rules connote production.

RICARDO BERMÚDEZ-OTERO & RICHARD M. HOGG, in their contribution “The actuation problem in Optimality Theory: Phonologization, rule inversion and rule loss”, outline OT’s contribution to understanding the actuation of both phonetically-driven innovations and analogical change. Like Ohala, they assume that parser malfunction may lead to the phonologization of mechanical phonetic effects; consequently, for them, as a theory of grammar, OT necessarily plays a secondary role in accounts of phonologization. (Reiss shares this view as well.) However, OT makes a significant contribution by modeling the restrictions that universal markedness principles impose upon phonological innovation, and the authors show that markedness generalizations are not mere epiphenomena of performance-driven change. As regards analogy, Bermúdez-Otero & Hogg argue that ‘input optimization’ (which is similar to, but broader than, lexicon optimization) offers new insights; restructuring usually occurs when learners cease to encounter positive cues to abandon the default state, where input and output are identical. They claim that OT predicts this, while a rule-based approach cannot without imposing contradictory demands on acquisition theory. The interleaved OT model that they propose is applied to rule inversion (of anaptyxis and epenthesis of vowels) and rule loss in the late West Saxon dialect of English, and preserves and develops the best insights of Lexical Phonology into the life cycle of phonological processes. OT has an advantage here in its success in encoding grammatical generalizations without appealing to underspecification and lexical minimality, which presuppose an overpowerful learner. Thus, the major contribution of interleaved OT to diachrony is dissolving conceptual difficulties that surround input restructuring in rule-based Lexical Phonology by replacing lexical minimality with lexicon optimization; the result is that the formal requirements of optimality (i.e., minimal constraint violation) and the functional demands of learnability (i.e., minimal abstractness) converge.

APRIL MCMAHON, in her contribution “When history doesn’t repeat itself: Optimality Theory and implausible sound changes”, argues that at present it is not clear that OT *cannot* model impossible or implausible sound changes, and that in absence of better controls on constraints, we must suspend the claim that OT is superior to rule-based accounts. Specifically, McMahon treats a highly implausible case, that of palatal diphthongization in the West Saxon dialect of English. The change *can* be modeled in a rule-based model, but is typically rejected by phonologists in favor of alternative analyses or a purely orthographic interpretation. McMahon claims that OT can model this phenomenon equally well, and though it is

true that the constraints she employs are ad hoc, it is hard to see how these should be identified as such or how to exclude them; moreover, the continuum of plausible, implausible and impossible processes has not yet been the focus of much direct attention in OT. An important issue is how well the OT criticisms of rule-based approaches can be sustained, and McMahon discusses arguments typically leveled against them. These are argument of economy of formalism (that the use of constraints alone is more parsimonious and elegant than the use of rules and constraints, avoiding the duplication problem), the argument that only OT captures and explains the fact that history repeats itself (that is, that certain phenomena recur frequently), and the argument that there is no way to distinguish the formulation of impossible from commonplace rules. McMahon notes that the first argument has been weakened in practice as OT analyses routinely include mechanisms that mimic rule application (e.g., various types of correspondence, level ordering and even rules themselves), so that the other arguments become increasingly important. However, just as it is impossible to distinguish a rule that expresses a highly natural process from one that is highly implausible by counting features or looking at the format, so we cannot, in McMahon's view, tell a respectable, universal and violable constraint from a language-specific one that is invented gratuitously to deal with a particular development, by simply examining the constraints. She further suggests that we might not want to dispute that any constraint is possible, but to focus on developing a method of evaluating entire, competing OT analyses, including issues of constraint interaction of inputs; that is, what would need to be assessed, then, is the shape of the whole derivation, including the implications of it for acquisition. (See Archangeli 2000 for one approach to an evaluation metric for OT grammars.)

In "Language change without constraint reranking", CHARLES REISS argues that a characterization of language change solely as constraint ranking is incoherent; rather, at least some lexical restructuring is necessary. Further, since constraint reranking cannot be defined within a single grammar (nor could rule addition or loss, either, for that matter) but is at best a description of the relationship *between* grammars, diachrony is not the subject of linguistic theory thus narrowly defined. Historical change is still interesting, however, because change is a property of the mapping relationship between 'input' and 'output' grammars in acquisition. The model of analogy presented by Reiss is not a grammatical one, but a modular approach that instead shows that analogy arises through the interaction of effects of language change, the nature of the acquisition process, the nature of the parsing task and aspects of human cognition specific to language, but still nongrammatical. For Reiss, analogy is diachronic 'replacement' of a form that is regular in terms of historical (but not synchronic) phonological development by one that is irregular. In the case of Old Icelandic treated, there is no change to the constraint hierarchy (which remains the same in relevant respects both before and after the analogical change), as the same surface alternations continue, just instantiated by different lexical items; instead, for this case we need only posit changes in the underlying representations. Similar examples are adduced from Korean and Spanish. In short, analogy, both of the paradigm leveling and four-part sort, is lexical restructuring, and under a modular approach, it is not only possible but expected to occur, as partial indeterminacy of parsing is ambiguity that may lead to restructuring.

Indirectly, Reiss' work aims to contribute to the formulation of a more elegant version of OT that is internally consistent and can do without the problematic output-output constraints, which are at odds with certain fundamental assumptions of OT.

DONKA MINKOVA & ROBERT STOCKWELL discuss "English vowel shifts and 'optimal' diphthongs: Is there a logical link?". They treat the Great Vowel Shift, as well as the London, New York City and Southern American English Shifts, and analyze the four changes that occur on bimoraic peaks in English: nucleus-glide dissimilation and assimilation, chain shift and merger. For these authors, while all bimoraic peaks are subject to the same articulatory and perceptual forces (HEARCLEAR, *EFFORT and MINIMALDISTANCE), distinct results stem from the phonemicization of these forces as markedness constraints and their ranking both to faithfulness constraints and to each other. Motivation for many changes that occur as part of a larger series of events seen in hindsight as chain-shifting should be sought in the size of the acoustic trajectory between the diphthongal endpoints; the direction of change emerges as a result of independently defined cumulative phonetic effects. While Minkova & Stockwell's approach is conceptually grounded in earlier references to 'distancing' or 'nucleus-glide differentiation', their account is more explicit in terms of which phonetic properties are relevant and what their phonological consequences can be. In sum, diphthong optimization can indeed always be expected to trigger one of the four shifts; however, why one or another of the constraints takes the lead is a matter of register-dependent innovations (à la Gess, this volume) making their way into the grammar.

In "Merger avoidance and lexical reconstruction: An Optimality-Theoretic model of the Great Vowel Shift", VIOLA MIGLIO & BRUCE MORÉN offer a model of the Great Vowel Shift (GVS) within Optimality Theory that allows for a discussion of how language change can be dealt within OT. Rather than being a philological contribution to highly complex GVS, their model reduces the various stages of the GVS (long mid lax vowels becoming tense, long mid tense vowels becoming high, and high vowels diphthongizing) to a synchronic chain shift, and is treated, therefore, as other synchronic changes of the same type, a move justified by the considerable overlapping of the periods in which these changes are supposed to have taken place and the uncertainty about their chronological reconstructions. Consequently, their paper addresses the question of language change in general and of chain shifts specifically, and the authors propose that language change can be formalized as taking place in three stages: an inert stage depicting a specific ranking of universal constraints; a second stage where at least one constraint has been re-ranked; and a final stage, where the next generation of speakers reanalyzes the output so as to obtain a more harmonic relation with the input. As far as the GVS is concerned, the first stage is characterized by predictable vowel quantity and quality for all but the long mid vowels; the second stage consists of a re-ranking of constraints to disfavor long lax mid vowels and cause the rest of the non-low vowels to raise or diphthongize to avoid merger. The result is a complex correspondence between input and output vowels that bear little resemblance to each other. The final stage is the reanalysis of the input/output vowel pairs such that they are more similar to one another; this reanalysis is manifested as a re-ranking of constraints and as a

restructuring of the relation between surface and underlying forms. The advantage of this analysis consists in motivating the changes of the GVS by means of a combination of established lengthening phenomena and markedness considerations involving the instability of long mid lax vowels. This motivates what the authors believe to be a “push-chain” effect and does not rely exclusively on phonetic diphthongization followed by reinterpretation, as previous pull-chain hypotheses did. Moreover, their analysis is consistent with typological predictions of factorial constraint rankings of well motivated constraints. Miglio & Morén couch their analysis of the GVS in a theory of acquisition and is not merely an arbitrary or abstract change in the adult grammar. That is, there is an intricate relationship between the GVS and the acquisition of the Middle English vowel system, such that underlying contrasts in feature specification must be maintained on the surface despite both phonetic and phonological pressure to collapse the contrasts. This certainly follows the spirit of many researchers in this area who view the GVS as the need to avoid mergers.

HAIKE JACOBS treats “The emergence of quantity-sensitivity in Latin: Secondary stress, Iambic Shortening and theoretical implications for ‘mixed’ stress systems”. Jacobs develops an OT description of the evolution of the stress system from Pre-Classical to Classical Latin, and these grammars are compared and described in terms of constraint reranking. Jacobs attributes the causes of the change from a left- to a right word-edge stress system to a conflict that arose between the demarcative and morphological function of stress. Jacobs further evaluates the descriptive and explanatory adequacy of OT as a formal model of linguistic change, and determines that rather than adding otherwise unmotivated constraints to a single-pass OT, a derivational OT approach allows for a straightforward account of the development in Classical Latin of a mixed stress system, in which primary stress is quantity-sensitive but secondary stress is not.

CONXITA LLEÓ, in “Some interactions between word, foot and syllable structure in the history of Spanish”, analyzes the loss of unstressed vowels in Old Spanish from an OT perspective, and shows that previous taxonomies of vowel prominence reveal some important facts, but do not provide an explanatory account of why certain unstressed vowels were deleted while others were preserved. Here the conditions of vowel loss are made explicit, and include the position of the unstressed vowel in relation to the primary and secondary stress, as well as phonotactic constraints on complex codas and morphological conditioning that bans deletion of lexical material. Likewise, the process of medial vowel loss which had already begun in Latin had the goal of optimizing the prosodic format of words, a phenomenon similarly continued in Romance, with Western Romance being more affected. This increased syncope in Old Spanish is interpreted as the result of Germanic influence, whose stress-timed characteristics made stressed and unstressed syllables differ more markedly in prominence, and the later increase of apocope is interpreted as taking place under the influence of exogenous forces, specifically of the French. Lleó believes that the most important finding of her analysis is that prosodic constraints like FOOTTROCHEE and exhaustive parsing, as well as morphological constraints, dominate syllable structure constraints, the latter of which had a rather variable position in the hierarchy of constraints in different

periods of Spanish (going from a rather dominant to a low-ranked position, and back again to a very dominant one). Another crucial finding is the dominant position that STRESS-TO-WEIGHT occupied over many centuries. Finally, an important conclusion that Lleó draws is that OT makes changes in the grammar explicit and the possible extrinsic influences that lead to such grammatical changes transparent. Specifically, in the consideration of historical Spanish phonology, OT crucially contributes to the issue of whether changes are intrinsic to the grammar or take place under the influence of a foreign grammar. By making the interaction between constraints explicit, it brings the debated Germanic and French influences into a new light. The article closes with a discussion of the formalization of grammatical change by constraint demotion and promotion, and Lleó suggests that constraint demotion is the normal means of endogenous sound change, whereas constraint promotion might have to be appealed to in the case of external conditionings for change.

In D. ERIC HOLT's "The emergence of palatal sonorants and alternating diphthongs in Old Spanish", the author treats the consequences of the loss of contrastive vowel length in Late Latin, where the moraic status of consonants was eliminated according to increasing sonority. Thus, obstruent geminates are reduced and syllable-final velars and *l* are vocalized, and then the sonorants *nn*, *ll* are simplified. However, in Galician/Portuguese the result was *n*, *l* in but in Spanish it was palatal *ñ*, *ll*, where merger avoidance was at issue. Further, the reanalysis of Latin stress led to the formulation of a constraint requiring a stressed syllable to be heavy; with heavy Germanic influence in pre-Old Spanish, manifested in the grammar as the imposition in a dominant position of a constraint that disfavored long lax vowels, the result was diphthongization of /*ε*, *ɔ*/ to [je, we]. It is argued that the listener/learner plays a crucial role, as do systemic factors, in shaping the path of phonological evolution.

In the contribution "The emergence of contrastive palatalization in Russian", JAYE PADGETT treats the well-known contrast in Russian between palatalized and non-palatalized consonants that originated a thousand years ago. At that time consonants were palatalized before front vowels (*danʲɪ* 'tribute'), and when 'jer' vowels disappeared in certain positions, palatalization remained, creating a palatalization contrast across most consonant types. At the same time, a rule is established by which /i/ surfaced as [i] after non-palatalized consonants. This chapter analyzes these two sound changes within Dispersion Theory, which differs from other current models of phonology in its fundamentally systemic orientation; that is, constraints evaluate not only isolated forms, but sets of forms in contrast. The analysis of the Russian facts here illustrates how this theory works, and it is seen that reference to these systems of contrast is key to the statement of constraints governing the perceptual distinctiveness of contrasts on the one hand, and constraints directly penalizing merger (neutralization) on the other.

In BENJAMIN SLADE's chapter, "How to rank constraints: Constraint conflict, grammatical competition, and the rise of periphrastic *do*", syntactic variation and change are studied from the perspective of OT. Slade views variation as competition between grammatically incompatible structures, which presuppose different underlying grammars, and further argues that the S-curve pattern often observed in syntactic change results from systematic change in the set of ranking relations

among universal constraints. The case he treats, the rise in English of *do*-support in a variety of syntactic environments (affirmative declaratives, negative declaratives, affirmative interrogatives and negative interrogatives), is therefore viewed as an instance of constraint reranking. Slade hopes to shed light on the nature of transitional phases in which speakers employ multiple constraint rankings that generate alternative syntactic constructions, and argues that the use of *do* is related to the development of modal verbs, the loss of verb movement and introduction of unbound inflection into the language. Further, the observed variation in Early Modern English between semantically empty and contentful *do* means for learners that *do* appears to be optional, and so co-existing grammars are posited (i.e., internal diglossia results). The relationship between the innovative and conservative grammars is characterized as one involving partially-ordered constraints (Anttila 1997a,b) that fall into a complete and total ranking upon a given generation/evaluation cycle, and which also allow for the derivation of relative proportional frequency of occurrence of a given innovation across contexts. Finally, in a comparison with a Principles & Parameters/Minimalist account, Slade argues that under such a model, the progressive loss of verb raising and the corresponding increase in *do*-support involve three essentially unrelated changes, and that his OT analysis constitutes a more formally and logically coherent account.

In “Historical changes in verb-second and null subjects from Old to Modern French”, LARRY LAFOND discusses diachronic changes in the realization of verb-second (V2) and the distribution of null subject pronouns during the periods of Old, Middle and Modern French. In the account he develops, he argues that the Constraint Demotion Algorithm (CDA) of Tesar & Smolensky (2000) is the mechanism of grammatical change, and that it is implemented in response to certain predisposing factors that were responsible for the initial actuation of change. LaFond argues that this account overcomes limitations of previous studies, which failed to distinguish between actuation, transmission and restructuring of the grammatical system. In contrast to traditional accounts in which the gradual disintegration of the system of inflectional endings supposedly led to the increased use of subject pronouns, here LaFond argues that this is a superficial approach that fails to take into account competition between syntactic and discoursal constraints; for these reasons, the changes under consideration should not be viewed as changes in parametric settings, but as reranking of the same violable and universal constraints across the grammars of Old, Middle and Modern French. LaFond further contends that it is important to see that the cause of change rests somewhere between the variation and preferences in expression as determined by the speaker’s grammar and the ambiguity and preferences in interpretation on the part of the hearer (à la Andersen’s 1973 abductive-deductive model of change). Further, reranking is the result, not the cause, of change, which in this case occurred in two stages. In the first, a constraint OBLIGATORYHEADS (OB-Hd) was demoted below ECONOMY OF MOVEMENT (STAY); in the second, DROPTOPIC was demoted below PARSE, with the insight regarding null subjects pursued that generational reanalysis (via constraint demotion) attempted to match frequencies of null subjects found in the ambient linguistic data.

At the end of the volume is a bibliography, prepared by RANDALL GESS, of works that deal with language change from an OT perspective.

University of South Carolina

4. NOTES

¹ I'd like to thank the many people who helped improve the present essay, among them, Ricardo Bermúdez-Otero, Don Cooper, Dorothy Disterheft, Randall Gess, April McMahon, Alfonso Morales-Front, Regina Morin, Tom Walsh, Lisa Zsiga, and the anonymous reviewers for Kluwer. I gratefully acknowledge research and editorial support from the former Department of Spanish, Italian & Portuguese and the newly consolidated Department of Languages, Literatures & Cultures of the University of South Carolina, and I thank Theresa McGarry for invaluable help with formatting and copyediting.

² The authors of this volume all suppose familiarity with the basic tenets and functioning of an OT grammar and analysis. The reader in need of exposure to the workings of OT are referred to Kager 1999, Archangeli & Langendoen 1997 and Roca & Johnson 1999:ch. 19, as well as the foundational works of Prince & Smolensky 1993 and McCarthy & Prince 1993a,b.

³ I should make it clear that I realize that contemporary theories of syntax do not assume very deep derivations composed of the application of a series of rules, instead relying on the general operation "Affect α ", or something akin to it. The discussion that follows is merely intended to show how earlier syntactic theories accounted for historical evolution via rule change. If there are no "rules", however, these cannot be the locus of change; rather, under the flatter theories of today, a given surface change relies on a change/restructuring in lexical entries (David Lightfoot, Nigel Vincent, personal communication). This is largely true of current approaches to phonological change as well, and certainly accords with the views of the authors of this volume.

⁴ The data are treated in Disterheft 1997, though they are not analyzed there specifically in terms of rule addition.

⁵ I thank David Lightfoot for making me aware of Harris' article. Harris' analysis is criticized as unsatisfactory and stipulative in Lightfoot 1991:158ff, where an alternative account is given that attempts to address the why and how of the change in surface word order.

⁶ Vennemann 1972:§7 also includes discussion of a case in the history of English that suggests syntactic rule inversion involving a shift in word order in main clauses (OV > VO). There also appear to be cases of syntactico-discoursal inversion, e.g., certain 'shifts of markedness', whereby a language that has an unmarked construction A, used in most circumstances, alongside a marked construction B, used only in certain circumstances, over time comes to invert this situation, after which we can say that B is now unmarked while A is now marked. Just such an example is Givón's 1977 account of biblical Hebrew. This language originally had an unmarked VSO structure that was used for most purposes, alongside a marked SVO structure that was used for certain special purposes. Over time, more and more discourse functions came to be transferred from the VSO structure to the SVO structure; as a result, SVO became the norm, with VSO coming to be reserved for certain special functions. Another possible example is the rise of ergativity. In a number of ergative languages, it has been argued that ergativity arose by some kind of markedness shift: an originally marked structure (e.g., stative, passive, possessive) came to be used more and more frequently until it becomes the norm, with the originally unmarked accusative structure becoming confined to certain special circumstances, or even lost altogether. (See Dixon 1994:§7.1 for discussion.) I am indebted to Larry Trask for these latter examples.

⁷ I should perhaps make clear that the approaches to syntactic change that I have sketched here pertain mainly to early models of generative syntax, and so are out-of-date in many respects; under more recent developments to syntax (e.g., Principles & Parameters, Minimalism), other accounts of syntactic change emerge, including Lightfoot's work. Such theories are discussed in the contributions to this volume by Slade and LaFond.

⁸ Rubach & Booij 2001 likewise seek to avoid recourse to output-output constraints and sympathy theory in their treatment of Polish iotation, which they view as allomorphy. They argue that the task of the grammar is to account for the distribution of allomorphs rather than derive them from a single underlying representation. As a result of historical evolution, the allomorphs are arbitrary, but their

distribution allows clear generalizations to be formulated, and this can be captured in OT (for them, monostratal) via the interaction of phonological and morphological constraints.

⁹ I omit from discussion in the text the notion of richness of the base (Prince & Smolensky 1993, et seq., discussed also in Kager 1999:ch.1), under which no constraints are placed on the underlying forms posited; instead, the constraint hierarchy should yield as optimal the same form regardless of the input to the generator (GEN). Reiss 2000 finds this to be an interesting computational property of the theory, but rejects richness of the base as linguistically irrelevant. For historical change, it seems certain that we must assume that speakers possess some fixed input, though perhaps only after optimization of their lexicon. See Padgett to appear:\$4.2 for discussion of this and related matters.

¹⁰ See Harrison & Kaun 2000, however, for a partially opposing view according to which underspecification is motivated by patterns that hold across the lexicon, even in the absence of surface morphological alternations.

¹¹ Girelli analyzes several segments in Brazilian Portuguese (e.g., *s*, *l* and *n*) whose realizations vary by context (for *s*, [s, z, ʃ]; for *n*, [n, ɲ]; for *l*, [l, w, j]).

¹² There is debate over the initial ranking of faithfulness and well-formedness constraints; see Hale & Reiss 1996a,b and Reiss (this volume) for critical discussion (in favor of the ranking faithfulness » markedness), and Smolensky 1996 for the ranking markedness » faithfulness, the latter being perhaps the more accepted initial ranking for practitioners of OT. I believe that the general point remains valid regardless of one's assumptions on this matter.

¹³ Maher 1980:113 also argues that it is necessary to recognize the surface phonetic form as a theoretically relevant level.

¹⁴ Reiss 1997 treats analogical change from an OT perspective. In this account, Reiss invokes aspects of acquisition, the role of sociolinguistic diffusion and the nature of language change. He argues that a parsing-based account is superior to an output-output correspondence one because it offers a more constrained theory of grammar. Reiss' contribution to this volume follows this line of pursuit.

¹⁵ For the notion of a diachronic grammar, see Traugott 1972; for critical discussion, see McMahon 1994:\$5.2.2.3.

¹⁶ Changes of this type do appear to occur, being unconditioned sound changes. Hutton argues that these are due to more or less spontaneous alterations to the constraint hierarchy. He cites as an example the First Consonant Shift (Grimm's Law) in Proto-Germanic, in which IE /b^h, d^h, g^h/ > /β, ð, ɣ/, /b, d, g/ > /p, t, k/ and /p, t, k/ > /f, θ, x/.

¹⁷ Anttila assumes that in any given pass from input to output the constraints in question fall into line and yield a strictly dominated total hierarchy. Additionally for Anttila, for the learner, the case of converging on a totally ranked constraint hierarchy constitutes a more difficult task than on a partially ranked one. See also Anttila & Cho 1998.