

Chapter 1 OCP in Optimality Theory

1.1 Optimality Theory (Prince and Smolensky 1993)

Optimality Theory (OT: Prince and Smolensky 1993) proposes that Universal Grammar (UG: the innate knowledge of language shared by all human beings) consists of a set of violable constraints, and that the difference in the grammars of different languages is achieved by distinct ranking of those constraints.

OT has been a convincing linguistic theory from its inception because it better achieves the aims of linguistic theory than previous theories. The ultimate goal of the theory of linguistics is to account for the part of the human cognitive system which generates language by trying to explain language universality (the common properties of all human languages), and language variation (the possible variation of the properties among languages). OT elucidates the former by introducing a set of violable constraints as the content of UG, and the latter by stating that the grammar of each language is comprised of a distinct ranking of those constraints.

This superiority of OT has especially been displayed in typological linguistics by addressing the questions: what kinds of constraints are actually involved in producing the output, and what are the different rankings of those constraints in each language? When we consider all the possible rankings of the relevant constraints for a given phenomenon, the factorial typology with respect to the phenomenon is explained in OT. For example, suppose the three constraints A, B, and C are involved in accounting for a certain phenomenon. Then, there are logically six possible rankings of them:

- (a) A >> B >> C;
- (b) A >> C >> B;
- (c) B >> A >> C;
- (d) B >> C >> A;
- (e) C >> A >> B;
- (f) C >> B >> A.

Given these six rankings, all languages can be classified into six types: from Type (a) through Type (f).¹ Thus, language universality is explained by the fact that all languages share the constraints A, B, and, C, and language variation results from the six different constraint rankings.

OT is the foundation of this dissertation which investigates language universality and language variation from the aspect of the Obligatory Contour Principle (OCP) on features.

1.2 Objectives

The goal of this dissertation is three-fold. First, I reconsider the effects of the Obligatory Contour Principle (OCP: the principle for prohibiting two identical adjacent elements (Leben 1973, Goldsmith 1976, McCarthy 1986, and Mester 1986)) on features within the OT framework.

Building on the fundamental principle of OT which states that all the constraints are universal and violable, I will furnish a typological study of the effects of constraint ranking in order to make it clear that the differences in the effects of the

¹ It is of course often the case that some of the logically possible rankings are missing when we analyze the typology of an actual phenomenon with actual languages. It is quite common that some logically possible rankings just do not exist in the grammar of any known language accidentally.

OCP are totally derived from the distinct ranking in each language. Through the typological study of OCP effects on features, I will show that the OCP constraints² are universal, i.e. a property of UG, and that language variation with respect to the effect of the OCP on features is represented by different constraint ranking.

The universality of the OCP, one of the first phonological constraints proposed for Universal Grammar (UG), has been challenged (Goldsmith 1976, Odden 1986, 1988). Since not all languages display alternations to avoid two adjacent identical elements, and since constraints have been considered to be inviolable in autosegmental phonology, previous research has not been able to account for why the OCP is not universally satisfied if it is truly a principle of UG.

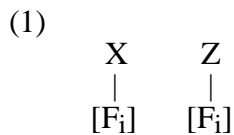
On the other hand, OT posits that all the constraints in UG are violable. Whether a constraint is violated depends on the particular constraint ranking of each language. Thus, the reason that the universality of the OCP is called into question in autosegmental phonology is not necessarily a problem in this new theory. The effect of the OCP is seen in the languages in which the constraint for the OCP is highly ranked, while it is not in the languages in which the constraint for the OCP is ranked relatively low.

Thus, the first goal mentioned above is significant not only because OT provides the solution to the unresolved problem of the universality of the OCP, but because the examination of the OCP within the OT framework relates the universality of grammar of human language to language variation. Such an approach to the OCP, and to grammar regarding the OCP would not have been possible without OT.

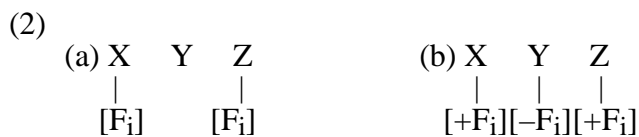
² For the moment, let us put aside the question: whether the OCP is a primitive constraint, or rather the result of constraint interaction such as self-conjunction of markedness constraints. I will discuss the issue in section 2.

The second purpose of this dissertation is to ascertain the status of features. The OCP can be studied at different levels: segmental; featural; or suprasegmental. I will concentrate on OCP on features in this dissertation. Through the typological study of OCP effect on features, I will argue that features must be treated as independent elements of segments.

The OCP on features differs from the OCP on segments in various ways. For instance, the repair strategies are different. OCP on segments can be repaired by assimilation, dissimilation, epenthesis, deletion, metathesis, and so on, as Yip (1988) points out. On the other hand, some of these phonological processes cannot repair violations of the OCP on features. For example, epenthesis cannot fix the violation of the OCP on features. Consider the following hypothetical example in which two identical features are adjacent:



Although another segment can be epenthesized between the two segments, X and Z, the two identical features are still adjacent (2a) unless this epenthetic segment bears the negative value of the same feature (2b):



Following recent phonological research (e.g. van der Hulst and Smith 1985, Schane 1987, Kaye, Lowerstamm, and Vergnaud 1985, Rice and Avey 1989, etc.; see

Steriade 1995: 151-152 for discussion), I assume that all features are privative. Therefore, the interpretation given in (2b) is impossible. Hence, epenthesis cannot rescue OCP on features.

Thus, OCP on features must be considered distinctive from that on segments. Consequently, the status of the features must be focused upon as independent elements of segments.

There are other reasons why features must be independent elements of segments. For example, we observe repair strategies for OCP on features such as featural fusion, featural and segmental deletion, and featural deletion and insertion. Among these, in order to account for featural fusion, features must be autosegments in correspondence relations. In other words, featural fusion necessitates featural correspondence which is independent of segmental correspondence. I will discuss this issue later in this section.

Since the advent of autosegmental phonology, features have been thought to depend on segments. In autosegmental phonology (Goldsmith 1976), all the elements of features and suprasegments attach to segments on different tiers. Dependence or independence of those elements on segments is determined by whether they can freely stand by themselves without the existence of segments. For example, suprasegmental materials such as tones or morae are sometimes observed to remain even after the segments on which they are dependent delete, resulting in either the realization of the tones on the remaining segments, or in compensatory lengthening. On the other hand, except for features such as [nasal], most features are deleted along with their segments. For instance, place, manner, voice, stridency, and so on are not so often retained after the deletion of their segments. That is why features are usually regarded as dependent on segments.

Following this tradition, features have also been treated as dependent on segments in OT. However, current research such as Lombardi (1995a), Lamontagne and Rice (1995), Itô, Mester, and Padgett (1995), Causley (1997), and Morén and Miglio (1998) treat features as independent elements. Following these researchers, I claim that features are independent elements because repair strategies for OCP on segments and OCP on features are different as I have already mentioned earlier in this section.

The conclusion of features as independent elements leads to the third goal of this dissertation—that is, to theorize about the constraints relevant to features. I will claim that a set of faithfulness constraints are instantiated specifically for features since features are independent elements which stand in their own correspondence relations. As I introduced above, there are several repairs for OCP on features such as featural fusion, featural and segmental deletion, and featural deletion and insertion. Among them, the set of independent featural faithfulness constraints are necessary to account for featural fusion. We cannot account for featural fusion only with the set of faithfulness constraints established for segments. I will illustrate how featural fusion entails the independent set of faithfulness constraints for features in section 2.3.2.2 in detail.

As McCarthy (1996a, 1997a) points out, it is important to decide how to treat features in OT because this determines whether or not an independent set of faithfulness constraints for features exists. When features are considered to be dependent on segments ("features as attributes" in McCarthy's (1996a, 1997a) terms), then only faithfulness constraints applying to segments are found in UG. Therefore, featural faithfulness constraints have been formulated as an identity relationship between segments, i.e. IDENT[F].

On the other hand, when the features are treated as independent elements ("features as entities" called by McCarthy (1996a, 1997a)), faithfulness constraints specific to features are instantiated into the grammar. Some current research such as Lombardi (1995a), Lamontagne and Rice (1995), Itô, Mester, and Padgett (1995), Causley (1997), and Morén and Miglio (1998) claims that there are many phenomena which could not be explained without faithfulness constraints specific for features (MAX[F], DEP[F], etc.).

Through the typological study of OCP effect on features, I will argue that features must be treated (at least sometimes) as independent elements, and that they require a separate set of faithfulness constraints.

In addition to those three main goals, this dissertation provides support for and extends three new theoretical aspects in OT:

- (i) Motivation for Local Conjunction and restrictions on the conjoinability of constraints;
- (ii) Extension of Sympathy Theory to general opacity;
- (iii) Multiple input-output faithfulness relations within a language.

The first aspect, Local Conjunction (Smolensky 1993, 1995, 1997), is the proposal that two lower-ranked constraints can be conjoined into one higher-ranked constraint. Previous research on Local Conjunction shows that the data of some languages cannot be explained without Local Conjunction. I review the literature to consider what can motivate the conjunction of two constraints, and what restrictions on conjunction exist. (based on Fukazawa and Miglio 1996, to appear, Miglio and Fukazawa, 1997).

The second aspect, Sympathy Theory was introduced by McCarthy (1997b, 1998). The transition from rule-based (derivational) phonology to OT gives rise to what is called "the residual opacity problem". Sympathy Theory solves this problem within the OT framework. In Sympathy Theory, a new type of faithfulness relation among candidates is established, and failed candidates can contribute to the selection of the optimal candidate. Itô and Mester (1997) claim that the notion of opacity ought to be reexamined in OT to make Sympathy Theory fully generalizable. They argue that sympathy relations among candidates must be observed in cases other than those left over from serial derivation. I claim that deletion of the stop feature in Yucatec Maya consonant clusters is evidence for this assertion. The Yucatec Mayan data are not a case of residual opacity from serial derivation. Nevertheless, they can be accounted for neither in autosegmental phonology nor in OT without the introduction of Sympathy Theory.

The third issue is the existence of multiple input-output (IO) faithfulness relations within the grammar of a language. Building on Correspondence Theory (McCarthy and Prince 1995), I state that multiple sets of IO faithfulness constraints must necessarily be recognized in languages with lexical stratification: the partitioning of the lexicon into distinct subsets with different phonological characteristics (Fukazawa 1997a, 1998a, and Fukazawa, Kitahara, and Ota 1998, to appear). Japanese is one of those languages. The proposal promoted here is superior to previous approaches, because it fully respects one of the most fundamental principles of OT: a single invariant ranking of constraints represents the grammar of each language. The superiority of this proposal is also empirically evident in the analysis of Japanese hybrid words which consist of more than one sub-lexicon (Fukazawa, Kitahara, and Ota 1998, to appear).

Throughout this dissertation, these three additional theoretical contents above and the typological studies of OCP effects on features, faithfulness constraints and faithfulness relations in grammar will be examined. In other words, the general theme of this dissertation is not only to study OCP effects on features but also to discern the theory of faithfulness constraints and the impact of the faithfulness constraints on grammar. Thus, this dissertation contributes to several theoretical issues such as local conjunction, Sympathy Theory, multiple faithfulness relations as well as investigates the typological studies of the OCP effect on features on the basis of the general theme of faithfulness in grammar.

1.3 Summary and Overview

In this chapter, I have first introduced Optimality Theory (OT) which will be the fundamental theory of this dissertation. The basic tenet of OT states that UG consists of a full set of violable constraints and the difference of the constraint ranking represents the difference of the grammar of each language. I apply OT to investigate OCP effects on features because OT will be crucial to achieve the three main goals and three additional objectives in this dissertation.

The first goal is to make clear that different constraint rankings account for observed cross-linguistic differences of the effect of the OCP on features. The effect of the OCP on features is observed in some languages, and is not observed in others. Such difference among languages can be explained in OT, because constraints are violable. We can assume that the constraints for OCP are lower ranked in a language in which the effect of the OCP is not observed, and that the constraints for OCP are higher ranked in a language in which the effect of the OCP is observed. The difference of the effect of the OCP among languages cannot be explained without OT.

The second goal is to make clear the status of features as independent elements of segments. I have argued that the OCP on features is different from the OCP on segments with the example of repair strategies which they cannot share, namely, epenthesis. Epenthesis can repair the effect of the OCP on segments, while it cannot repair the effect of OCP on features.

The second goal leads to the third goal which is to show the necessity to introduce the independent set of faithfulness constraints specifically for features. I have introduced featural fusion as one of the repair strategies for the effect of the OCP on features, and claimed that an independent set of faithfulness constraints is inevitable in order to account for featural fusion.

In addition to those three main goals, I have introduced three additional theoretical contributions in this dissertation, i.e. Local Conjunction, Sympathy Theory, and multiple faithfulness relations in grammar. I indicate that faithfulness constraints and faithfulness in grammar are the general themes throughout this dissertation on the basis of investigation of the typological studies of the OCP on features, the OCP on features in OT, the status of features in OT, the independent set of featural faithfulness constraints, local conjunction, Sympathy Theory, and multiple faithfulness relations in grammar.

To achieve the goals which I have mentioned in section 1.2, this dissertation is organized as follows. In section 2.1, I review previous research on the OCP. First, I review the literature in autosegmental phonology in section 2.1.1 to show that the OCP is introduced as a constraint, and that the universality of the OCP is problematic in autosegmental theory. Section 2.1.2 observes the status of the OCP within the framework of OT by examining current research on the OCP in the theory. Unlike other research on the OCP in OT which considers the OCP as a primitive constraint in

UG, Itô and Mester (1996), and Alderete (1997) independently claim that there is no such single OCP constraint. According to them, the OCP is a result of self-conjunction of markedness constraints. Thus, the question of whether the OCP is an actual property of UG by itself, or whether the properties of UG give rise to the effect of the OCP is addressed.

The typological investigation of the effects of the OCP on features is presented in section 2.2. Section 2.2.1 proposes that there are four types of languages depending on the specific constraint ranking. In section 2.3, I will consider what kinds of constraints are necessary to account for the typology. The constraints for OCP on features, and the faithfulness constraints for featural identity are examined.

With the constraints proposed there, I demonstrate a ranking for each type of language. In Type 1, we observe the sequence of two identical adjacent elements due to the low-ranking of OCP constraints. In Type 2, 3, and 4, the OCP constraints must be respected because they are highly ranked. To avoid an OCP violation, different strategies are observed depending on the ranking of the rest of the constraints. Type 2 exhibits featural fusion; Type 3 has both featural deletion and insertion; and Type 4 has both featural and segmental deletion.

Chapter 3 will present an actual analysis for Type 2 in section 3.1, for Type 3 in section 3.2, and for Type 4 in section 3.3 so as to confirm the rankings proposed in section 2.3.

Chapter 4 probes the OCP on features in Yucatec Maya consonant clusters. Through the analysis of the data, I will argue that Local Conjunction and Sympathy Theory are necessary to describe the language thoroughly. Previous research on Local Conjunction is reviewed to both motivate its existence and to point out some

restrictions of the conjoinability of two constraints. Also, McCarthy's Sympathy Theory (1997b, 1998) is introduced, and the concept of "Opacity" is reconsidered within the OT framework.

Chapter 5 explores the OCP on features in Japanese. Rendaku (Sequential Voicing: the initial obstruents of the second members of the compounds becomes voiced), and Lyman's Law, which defines when Rendaku does not occur (when the second members of the compounds originally contain voiced obstruents), are the focus of this chapter. To account for the data, I will propose that there are multiple input and output faithfulness relations in Japanese so that a set of faithfulness constraints is propagated for each relation. This follows research on Correspondence Theory (McCarthy and Prince 1995, Urbanczyk 1995, 1996, and Benua 1995, 1996, 1997a, b).

Chapter 6 concludes by indicating implications of the themes and the issues proposed in this dissertation and by discussing directions for future research.