

Chapter 6 Conclusion and Implication

This chapter summarizes the entire contents of this dissertation to reconfirm its significance and contribution, and discusses the direction for future investigation to develop and extend the architecture proposed in this dissertation.

In chapter 1, I made clear the objectives and the theoretical framework in this dissertation. I first introduced Optimality Theory (OT) which is the fundamental theory of this dissertation. I discussed why I chose OT to investigate OCP effects on features. It was because the basic tenet of OT, stating 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, is crucial to achieve the three main goals and three additional objectives in this dissertation.

The first goal was to make clear that the difference of the constraint ranking accounts for the difference of the effect of the OCP on features. In other words, by observing the constraint ranking in each type of language, I accounted for the universality of the grammar of language, and the language specificity with respect to the effect of the OCP on features.

The second goal was to make clear the status of features as independent elements of segments. First, I argued that features must be treated as independent elements, because the OCP on features are different from the OCP on segments by providing one example of the difference of the repair strategy between the two. Epenthesis can repair the effect of the OCP on segments, while it cannot repair the effect of OCP on features.

I also indicated the third goal that necessitates an independent set of faithfulness constraints specifically for features. Featural fusion is one of the repair

strategies for the effect of the OCP on features. I stated that to correctly account for this repair, an independent set of faithfulness constraints is inevitable, especially UNIFORMITY[F].

In addition to those three main goals, I introduced three additional theoretical contributions in this dissertation, i.e. Local Conjunction, Sympathy Theory, and multiple faithfulness relations in grammar. I indicated that faithfulness constraints and faithfulness in grammar are the general themes throughout this dissertation on the basis of an 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.

In chapter 2, I presented a typological study of OCP effects on features. First, I reviewed the previous research of the OCP both in derivational autosegmental phonology and in OT, and pointed out the general debatable issues there. In derivational autosegmental phonology, the universality of the OCP was disputable, since some languages observe the effect, while others do not. If the OCP is a property of UG, then, it is difficult to account for this asymmetry. In OT, the asymmetry is explained, because all the constraints in UG are violable in each language depending on its ranking. I made clear that the problem in rule-based theories regarding the universality of the OCP is not problematic at all in OT.

In section 2.1.2, I also observed how the OCP has been treated within the OT framework. The first question asked was whether the OCP is a primitive component of UG or a derived one. The former has been widely believed. On the other hand, the latter is currently proposed by Itô and Mester (1996) and Alderete (1997) with the idea of the OCP as the self-conjoined markedness constraint. According to their

claim, there is no constraint in UG such as the OCP, and it is derived as the result of a self-conjoined markedness constraint. The domain of the conjunction is specified depending on the grammar of each language. Although I adopted the self-conjoined markedness approach in this dissertation, I did not deny the possibility of the primitivity of the OCP constraint.

Also, I followed the idea that the self-conjoined OCP specifies the domain for the effect. However, I made clear that specification of the domain needs to be further investigated. I tried to analyze Dakota coronal dissimilation without depending on the specification of the domain in section 3.2. Although the analysis of the language was successful, it is necessary to analyze more languages to conclude whether and how the domain of the effect of the OCP should be specified.

Following the discussions mentioned above, chapter 2 introduced the classification of the languages into four types in terms of the distinct constraint ranking of the OCP constraints on features, the other markedness constraints, and the faithfulness constraints for segments and features.

Especially, I noted that it is necessary to consider features not only as dependents on segments ("features as attributes") but also as independent elements by themselves ("features as entities") in order to make a set of faithfulness constraints independently for features. Without them, the typological study in this dissertation would not have been possible.

Some previous research on faithfulness constraints regarded features as attributes, and this idea has been widely adopted. However, the necessity of the treatment of features as entities has been pointed out in current research (Lombardi 1995a, Itô, Mester, and Padgett 1995, Rice and Lamontagne 1995, and Causley

1997). Thus, I have made it clear in chapter 2 that there are two possible ways to regard the features: either as attributes or as entities.

The next question to be asked is whether features can behave both as attributes and as entities simultaneously within a grammar. In other words, does a full set of faithfulness constraints specifically for features such as {MAX[F], DEP[F], etc.} exist in the grammar, and does the set of faithfulness constraints for segments also include the faithfulness constraints for features as the attributes such as IDENT[F]? Zoll (1996) has already indicated the possibility that both MAX[F]/DEP[F] and IDENT[F] co-exist in the grammar. I would like to further investigate this point in the future.

As mentioned in section 1.1, the goal of linguistics (seeking the delineation of language universality and language variation) is being achieved based on the typological study of each linguistic phenomenon within the OT framework. Chapter 2 contributes to the theory in this sense by providing a typological study with respect to the phenomenon of OCP on features.

On the basis of the discussion and the proposal in Chapter 1 and 2, in Chapter 3, actual languages were analyzed in order to confirm the validity of the typology proposed. Section 3.1 analyzed Ponapean labials as a representative of a Type 2 language in which featural fusion takes place. In Ponapean, when two tier-adjacent labials share the same backness, they are fused into one feature, due to the lower ranking of UNIFORMITY[F], and the higher ranked OCP[lab] and other relevant faithfulness constraints.

I discussed that the proposed constraint ranking for Type 2 in section 2.3.3.2 can account for the OCP effects as Morpheme Structure Constraint (MSC) by showing that there is a valid ranking which can clarify both the possibility of the well-formed structure, and the impossibility of the ill-formed structure. I especially made

clear that establishment of an independent set of faithfulness constraints are crucial to correctly account for featural fusion in Ponapean in section 3.1.

In section 3.2, Dakota coronal dissimilation was analyzed as a Type 3 language in which deletion of a feature and insertion of a feature are observed. As mentioned above, I tried to test the assumption that the data could be accounted for without specifying the domain of the effect of the OCP. In the case of Dakota, it was successful. In Dakota, a sequence of two coronal features is banned only in verbal morphemes, while two coronal features can be adjacent in regular forms. The asymmetry was accounted for on the basis of the constraint interaction of TETU and positional faithfulness.

In section 3.3, I discussed the phenomena of deletion and spirantization in Basque consonant clusters with the proposed ranking of the constraints for Type 4 languages. The reason for segmental deletion was explained based on the fact that OCP[stop] and DEP[cont] are highly ranked, and MAX[stop] and MAX-IO are lower ranked in Basque. The feature [stop] deletes not in the onset but in the coda in the sequences in Basque due to a higher-ranked positional featural faithfulness constraint on [stop] in the onset, MAXONS[stop].

This section also illustrated the asymmetry between the sequence of two stops and that of a stop and an affricate. In the case of stop alternation, the first segment (stop) deletes. On the other hand, in the sequence of an affricate and a stop, the first segment (affricate) spirantizes into a fricative. This asymmetry of appearance of the phonological alternations is based not upon the difference of the constraint ranking but upon the difference of the manner features between a stop and an affricate. To spirantize, a stop must violate a higher-ranked constraint DEP[cont], while an affricate does not have to. A single invariant ranking can account for this asymmetry.

The complicated data of Yucatec Mayan consonant clusters were precisely broken down in Chapter 4. I claimed that Local Conjunction and the faithfulness relationship among the candidates proposed in Sympathy Theory are crucial devices in the analysis of this language. By introducing those new enterprises, I showed that the constraint ranking in the grammar of Yucatec Maya accounts for both the alternation of an affricate in a homorganic sequence into a homorganic fricative, and that of a stop in a homorganic sequence into a pharyngeal fricative.

Let us summarize what we found from the established constraint ranking in the Yucatec data:

First, in the sequences of a stop and a non-homorganic stop and a fricative and a homorganic stop, no phonological alternation is observed. The ranking demonstrates that the sequences themselves are well-formed in the language .

Second, the alternation of a stop or an affricate in a homorganic cluster is triggered by the higher-ranked local conjunction. To satisfy the conjunction, one of the two members of the conjunction, OCP[stop] is satisfied. Hence, the alternations of both a stop and an affricate by deleting the feature [stop] results in a violation of MAX[stop]. I made it clear that the motivation of the alternation in this language could not be accounted for without introducing local conjunction. This is because OCP[stop] or OCP[Place] can be violated since each of them are not so highly ranked. It is crucial that these two OCPs, OCP[stop] and OCP[Place] are simultaneously violated in the same domain to trigger the alternation.

Third, deletion of [stop] is observed in the coda (the first segment in the sequence). This is due to a positional featural faithfulness constraint MAXOns[stop].

Fourth, changing the place feature in addition to changing the manner feature are observed in the case of a stop, which changes to [ʔ], while only changing the

manner feature is observed in the case of an affricate. Since the input place feature does not change in the case of the affricate alternation, the faithfulness constraint for the place feature, i.e. MAX[Place] must be highly ranked in the language, because it can be violated in the sequence of the affricate.

Thus, I asserted that changing the place feature in the stop alternation is derived from a new type of faithfulness relation between some failed candidate (i.e. sympathy candidate) and the output by introducing McCarthy's Sympathy Theory. I claimed that Yucatec Mayan stop alternation was an instance of phonological opacity, building on Itô and Mester's (1997) proposal that phonological opacity is not only derived from the serial derivational cases, but also all the opaque case in which some candidate which never surfaces plays a crucial role in selecting the optimal candidate.

Fifth, I have shown that fusion of two features, and epenthesis of a segment to break the cluster, are impossible alternations due to the highly-ranked constraints, UNIFORMITY[F] and DEP-IO.

I conclude that Yucatec Maya belongs to Type 3 in the typology due to the ranking proposed to analyze the language. The ranking of the basic constraints in Yucatec Maya is comparable to the constraint ranking for Type 3, although additional factors are also at work.

I also scrutinized Local Conjunction and Sympathy Theory independently. As for Local Conjunction, I particularly focused on its motivation in the grammar, and the restriction of the conjoinability of the two constraints into a local conjunction, following Fukazawa and Miglio (1996, to appear), and Miglio and Fukazawa (1997). The suggestions regarding the motivation of Local Conjunction and the conjoinability of the two constraints made in this chapter should be further developed by adding more data analyses.

Sympathy Theory (McCarthy 1997b, 1998), which was originally proposed to solve the residual opacity problem from serial derivation in a rule-based theory, has been extended into a more universal theory which can account for more general cases as well as residual problems from serial derivation. The existence of the faithfulness relationship between the optimal candidate and the failed candidate has been recognized in the analysis of Yucatec stop alternation which heretofore had remained unexplained in both autosegmental phonology in OT. If the proposed new type of faithfulness relationship among candidates in Sympathy Theory is a property of the grammar, then, we should observe it in other data besides residual problems from a rule-based theory. More work is needed to uncover such cases.

Chapter 5 investigated Japanese phonology from the angle of the OCP effects on [voice]. I focused on Rendaku (sequential voicing) and Lyman's Law which prevented Rendaku from taking place.

Moreover, I showed that both Rendaku and Lyman's Law (Itô and Mester 1986, 1998), which are observed only in the Yamato (native) stratum, are examples of stratum-specific phonological phenomena in Japanese. I have also indicated that lexical stratification, as in Japanese, has been problematic in previous theories of phonology.

I proposed that a full set of faithfulness constraints are propagated for each sub-lexicon in Japanese, and all those constraints have the potential to rank separately. Unlike other approaches such as the model of re-ranking of faithfulness constraints, my proposal solved the problem of lexical stratification without compromising one of the fundamental tenets of OT: a single invariant ranking of the constraints represents the grammar of each language. I have also introduced empirical

evidence for the split faithfulness relations based on the analyses of Japanese hybrids of Fukazawa, Kitahara, and Ota (1998, to appear).

Chapter 5 indicated that there are still remaining issues to discuss regarding the idea of the multiple input-output faithfulness relations as follows:

- (i) How are the multiple sets of Input-Output faithfulness constraints instantiated in a child's grammar?
- (ii) Although evidence against the core-periphery structure of Japanese lexicon has been provided, there is still a tendency toward this structure. What gives rise to it?
- (iii) Are the hybrids the only evidence for the multiple IO faithfulness in Japanese grammar?
- (iv) Are multiple IO faithfulness constraints established in the grammars of all the languages which exhibit lexical stratification?

As I mentioned in chapter 5, Fukazawa, Kitahara, and Ota (1998, to appear) have replied to the first and second questions. The first matter has been answered by claiming that contradicting phonological data trigger multiplication of faithfulness constraints and ranking of constraints in the process of acquisition.

The second one was explained by concluding that the core-periphery structure of the lexicon is not an inherent property of the grammar but the aftermath of an assimilation process involved in the formulation of the loanword lexicon. This issue will be pursued further with respect to historical change in Japanese phonology.

I leave the exploration of the answers to the third and fourth questions above for future research.

Overall, this dissertation investigated many theoretical aspects mentioned above with respect to the typology of the OCP effect on features. Although it seems that each theoretical or empirical aspect pointed out in this dissertation will have to be investigated more deeply, the entire theme through this dissertation is on faithfulness and the status of faithfulness in grammar: what the faithfulness constraints are, what the faithfulness constraints for features are, what kinds of or how many kinds of faithfulness relations exist in grammar, how they interact with other constraints in grammar, how they are split depending on the sub-lexicon language-specifically, the question of the universality of the faithfulness constraints, how the particularity of faithfulness depending on the grammar of each language is acquired and so on.

This chapter also summarized how this dissertation contributes to the development of OT; hence, to the development of linguistic theory, by reviewing each proposed endeavor in this dissertation one by one. It also probed the directions of how to expand and deepen each proposed theme so as to contribute to the further development of linguistic theory.

I will extend each thesis which I discussed in this dissertation into an individual project in future research in order to continue to advance our understanding of how the language faculty is organized. I will pursue my study of linguistics as science which investigates the mystery of the human's cognitive system generating language.