Origins of Typological Gaps in Parallel and Serial OT

Shin-ichi Tanaka*

1. Background

The existence of ‘implicational universals’ in typology had been one of the mysteries in linguistic studies since Roman Jakobson (1962) first identified them. To take syllable structure as an example, the fact that a language has CVC or V implies that it has CV as well, and the fact that it has VC implies that it also has CV, CVC, and V. As a consequence, CV is a prototypical syllable structure and the least marked of all, and the existence of more marked structures implies that of less marked ones in a language. These facts mean that there is no language whose inventory of syllable structures is *{CVC, V, VC}, *{CV, VC}, *{CVC, V}, *{CVC, VC}, *{V, VC}, *{CVC}, *{V}, *{VC}, etc. Such types of languages are said to represent typological gaps.

The goal of accounting for typological gaps has been carried over to generative grammar, in which a grammar is defined as the function of generating all and only possible forms in a natural language. This is also true for Optimality Theory (henceforth, OT), whose goal is to predict all possible and impossible linguistic patterns. For analysts using this theory, it is very important to examine typological gaps in terms of constraint interaction, precisely because it is one of the required procedures for proving the validity of proposed constraints and rankings. This reasoning comes from the hypothesis in OT that all constraints are universal, and the examination of constraints in terms of factorial typology is fundamental and indispensable to deductive reasoning in OT.

However, what matters is how to exclude impossible patterns within the framework of OT, that is, the mechanisms or resources for ensuring typological gaps within its grammatical components.

This article claims that, contrary to the common hypothesis, accounting for typological gaps involves restrictions in GEN through EVAL as well as restrictions in CON, in line with studies on local optimality in Harmonic Serialism, known as ‘serial OT,’ such as McCarthy (2000, 2007, 2008a,b, this volume), Kimper (2008), Pruitt (2008), Jesney (2009), etc. Specifically, by comparing a ‘parallel OT’ approach with local conjunction and a ‘serial OT’ approach with local optimality, we show that a certain type of gap in dissimilatory
patterns can be predicted properly only by the latter approach.

In organization, we first sketch an overview of two major types of mechanisms or resources for typological gaps in OT in general, i.e., restrictions in CON and absolute ungrammaticality (section 2). Then, in the framework of Harmonic Serialism, we introduce another type of mechanism or resource, i.e., restrictions in GEN through EVAL, for gaps in well-known processes like cluster simplification, trimoraic syllable simplification, and dissimilation (section 3). We examine the typological consequences of ‘parallel OT’ and ‘serial OT’ and draw out some implications for OT as a typology theory: ‘serial OT’ using local optimality is empirically more valid than ‘parallel OT’ in the case of either trimoraic syllable simplification or dissimilation.

2. Origins of typological gaps: CON’s and GEN’s restrictions

2.1. Constraint asymmetry

In general, possible linguistic patterns are sensitive to possible constraints. Because constraints are asymmetrical in nature, possible linguistic patterns exhibit asymmetry and constitute gaps in typology.

Constraint asymmetry is implemented in the CON component in Universal Grammar. It is drawn from some positional effects on both faithfulness and markedness constraints: positional faithfulness and positional markedness. The former allows faithfulness constraints to apply only to phonetically prominent or psycholinguistically salient positions such as syllable onsets, root-initial syllables, and stressed syllables (Beckman 1998, 1999). In contrast, the latter allows markedness constraints to refer or apply only to certain designated positions; for example, Onset, NoCoda, *Voiced-Coda are concerned with syllable margins (Prince and Smolensky 1993, 2004 and Kager 1999), and Non-Finality, Lapse-at-Peak, and Lapse-at-End with the edge or the head of a stress domain (Kager 2007).

(1) Positional effects on constraints

   i.e., no constraints like Faith/Coda, Faith/Root-Final, or Faith-Unstressed

b. positional markedness: Onset, NoCoda, *Voiced-Coda, Non-Finality, Lapse-at-Peak, Lapse-at-End
   i.e., no constraints like Coda, NoOnset, *Voiced-Onset, Non-Initiality, Lapse-at-NonPeak, or Lapse-at-Mid

As is clear from (1), positional effects do not allow faithfulness and markedness constraints to apply to non-prominent and non-designated positions, respectively; in other words, their application is asymmetrical, which follows from the fact that positional faithfulness and positional markedness, roughly speaking, tend to be antagonistic – the two sides of the same coin.

Now let us think about what this asymmetry in constraint shape means in terms of factorial typology. To take up *Voiced-Coda and Ident [voice] as an example, it is generally said that final devoicing applies to some languages, like Dutch and German, and not to others like English (Kager 1999). There are only two types as given in (2a), in which devoicing either applies to codas or does not apply at all. However, there is no language like (2b) where onset consonants only undergo devoicing instead of coda ones or where devoicing applies across the board.

(2) Final devoicing

a. possible patterns

<table>
<thead>
<tr>
<th>/bed/</th>
<th>*Voiced-Coda</th>
<th>Ident [voice]</th>
</tr>
</thead>
<tbody>
<tr>
<td>bed</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>ped</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>*! bet</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>pet</td>
<td>*!</td>
<td>*</td>
</tr>
</tbody>
</table>

b. impossible patterns

<table>
<thead>
<tr>
<th>/bed/</th>
<th>*Voiced-Onset</th>
<th>*Voiced-Coda</th>
<th>Ident [voice]</th>
</tr>
</thead>
<tbody>
<tr>
<td>bed</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>*! ped</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>bet</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>*! pet</td>
<td></td>
<td>*!</td>
<td>*</td>
</tr>
</tbody>
</table>

Such languages constitute typological gaps, precisely because there is no such constraint as *Voiced-Onset in
(2b). Note also that by either ranking of the constraints in (2a), *[ped] and *[pet] are never produced typologically, because they are ‘suboptimal’ or harmonically bounded by [bed] and [bet].

Implicational universals and gaps in syllable structure, which were mentioned at the beginning of section 1, can also be accounted for by the fact that there is no constraint like Coda or NoOnset. See Prince and Smolensky (1993, 2004) for their fascinating demonstration of why languages whose inventories of syllable structures are {*CVC, V, VC}, {*CV, VC}, {*CVC, V}, {*CVC, VC}, {*V, VC}, {*CVC}, {*V}, {*VC}, etc. do not exist. This point is complemented in Tanaka (2009) by taking the Richness of the Base as well as constraint interaction into account.

2.2. Ranking asymmetry

Another source for accounting for implicational universals or gaps in typology is asymmetry in constraint ranking. In other words, possible linguistic patterns are sensitive to possible rankings of constraints. Ranking asymmetry is implemented in the CON component in Universal Grammar, as was the case with constraint asymmetry.

One such implementation is the operation of harmonic alignment, which was introduced in Prince and Smolensky (1993, 2004). This operation induces a fixed set of constraint rankings if two prominence scales are given. For example, it draws out the fixed set of rankings in (3) from the positional scale Nuc(leus) > Mar(gin) and the sonority scale Vow(el) > Son(orant) > Obs(truent).

(3) Harmonically-aligned set of rankings
   a. *Obs/Nuc ⇒ *Son/Nuc ⇒ *Vow/Nuc
   b. *Vow/Mar ⇒ *Son/Mar ⇒ *Obs/Mar

Let us take up (3a). Taking Faith into consideration as well as *Obs/Nuc, *Son/Nuc, and *Vow/Nuc, we would obtain 24 possible rankings without the operation of harmonic alignment. This is because the 4 constraints can combine to create 4! rankings. However, the harmonically-aligned ranking in (3a) and Faith combine to produce only 4 rankings: 1) Faith ⇒ *Obs/Nuc ⇒ *Son/Nuc ⇒ *Vow/Nuc, 2) *Obs/Nuc ⇒ Faith ⇒ *Son/Nuc ⇒ *Vow/Nuc, 3) *Obs/Nuc ⇒ *Son/Nuc ⇒ Faith ⇒ *Vow/Nuc, and 4) *Obs/Nuc ⇒ *Son/Nuc ⇒ *Vow/Nuc ⇒ Faith. And all of them are attested: 1) is a type of language like Berber where any segment of obstruents, sonorants, and vowels can be a syllable nucleus; 2) is a well-known pattern in English where sonorants and vowels can be syllabic; languages in 3) allow only vowels to be a nucleus, a very common pattern; and finally, 4) appears to be possible in terms of this ranking but is actually excluded for another reason as Gouskova (2003) proves. In any case, the 20 rankings other than these 4 are excluded from possible patterns and thus form systematic gaps in typology. The same reasoning holds true for (3b).

Other cases of harmonically-aligned sets of rankings are also found in areas such as syncope (Gouskova 2003) and stress (Tanaka 2003).

2.3. Absolute ungrammaticality

One more type of resource that may cause gaps in typology is absolute ungrammaticality in a broad sense of the term. This idea is not related to substantial theoretical constructs like constraints or rankings in CON, which derive from the nature and structure of natural languages, but to definitions of the function and calculation of Universal Grammar. Relevant to typology is the following three issues.

One is that there are restrictions on GEN such that only linguistic alphabets or sound sequences are produced in the output. Thus, realizations of sounds such as non-linguistic human speech, animal yelp and chittering, and inanimate noises are naturally excluded; that is, non-linguistic sounds are in a gap even if they are human speech.

However, the so-called ‘null parse’ of human linguistic speech can be a legitimate output candidate as Ackema and Neeleman (2000) and Rice (2005, 2009) argue. Absolute ungrammaticality is often referred to in this strict sense. ‘Null parse’ is an output candidate that does not realize any information contained in the input, and creates a situation in which certain constructions are not universally impossible but absent in some languages while present in others. See the above-mentioned literature for relevant cases.

The final possibility is the case of harmonic bounding, mentioned in (2a), where two output candidates score equally on all constraints but one and the candidate winning out on this particular constraint blocks the other under any ranking. In this way, harmonically-bounded sound patterns naturally constitute gaps in typology. Harmonic bounding is a case for restriction on EVAL and may occur irrespective of constraint asymmetry and ranking asymmetry, let alone local optimality, which will be discussed in the next section.
3. Local optimality in Harmonic Serialism: GEN’s restrictions through EVAL

3.1. Gaps in cluster simplification and trimoraic syllable simplification

Constraint asymmetry and ranking asymmetry are common origins of gaps among parallel and serial versions of OT. However, there is one more source for typological gaps that can only be used in ‘serial OT’ or Harmonic Serialism: local optimality.

Harmonic Serialism differs from ‘parallel OT’ in that optimality is computed derivationally, instead of on a single pass through GEN and EVAL. This means that an input form undergoes a new pass through the GEN→EVAL loop every time only a single change of the form is made. Being thrown into a new pass continues until the form reaches the point of no change or ‘convergence.’ Thus, optimality is defined locally on each pass, as compared to global optimality in ‘parallel OT’.

The typological consequences of this idea are fully examined by McCarthy (2008a) and Pruitt (2008), among others, who are concerned with cluster simplification and metrification, respectively. For example, cluster simplification (i.e., assimilation or deletion) is known to exhibit the onset-coda asymmetry cross-linguistically; onsets tend to be the trigger of change while codas tend to be the target of change. In short, there are three types of languages typologically with respect to cluster simplification: one with the repair of assimilating codas to the following onsets as in (4a) (Japanese: /but-kakeru/ → [bukkakeru] ‘throw over and splash’), another with the repair of deleting codas as in (4b) (Diola Fognay, spoken in Niger-Congo, Senegal, and Gambia: /let-ku-d3aw/ → [leku3aw] ‘they won’t go’), and the other with no change (English: /sit-kam/ → [sitkam] ‘sitcom’). Tableaux 1 and 2 are ‘harmonic improvement tableaux,’ used in ‘serial OT.’¹

(4) Possible and impossible cluster simplifications

a. /patka/ → paHka → [paka]: assimilation (Tableau 1)
b. /patka/ → paHka → [paka]: coda deletion (Tableau 2)
c. /patka/ → *paHka → *[paka]: no onset deletion

‘H’ here denotes whatever is left when the place feature of /t/ has been removed, i.e., a placeless segment. On the first pass in both (4a) and (4b), [paka], whose original coda has undergone deletion, cannot be an output candidate, because deletion of a consonant requires two

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Tableau 1

<table>
<thead>
<tr>
<th></th>
<th>Codacon</th>
<th>HavePlace</th>
<th>Max[place]</th>
<th>Max</th>
<th>NoGem</th>
</tr>
</thead>
<tbody>
<tr>
<td>/patka/</td>
<td>patka</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st pass</td>
<td>paHka</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>patha</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>2nd pass</td>
<td>pakka</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>paka</td>
<td>*!</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau 2

<table>
<thead>
<tr>
<th></th>
<th>Codacon</th>
<th>HavePlace</th>
<th>NoGem</th>
<th>Max[place]</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>/patka/</td>
<td>patka</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st pass</td>
<td>paHka</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>patha</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd pass</td>
<td>pakka</td>
<td></td>
<td>NoGem</td>
<td>Max[place]</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td>paka</td>
<td>*!</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
steps by definition, as shown in (4b). That is, only a single change can be made on the same pass in Harmonic Serialism, or you can “do one thing at a time” as McCarthy (this volume) states, so that deletion of the whole segment, i.e., [paka], must be preceded by deletion of its place node, i.e., [paHka]. This is also the case with assimilation, which is implemented by deleting the place node ([paHka]) and then filling in it from the following onset ([paka]), as shown in (4a). This idea of two-step deletion and assimilation is a crucial hypothesis of McCarthy’s (2008a) about how GEN works, which is only possible in Harmonic Serialism. Note also that the derivation /patka/ → *[paka] (no change) is of course carried out under the ranking of HavePlace >> CodaCon.

Interestingly, there has not been any known language in which the following onsets are deleted, instead of codas, in a way like /patka/ → *[pata].2 This gap can be accounted for simply in (4). To obtain the output *[pata] with onset deletion, the input /patka/ must change into *[patHa] on the first pass, and then it might turn into *[pata] on the second pass. However, as is clear from the shaded boxes in (4), *[patHa] is harmonically bounded by [paHka], or never emerges from the input under any ranking. Thus, derivations like /patka/ → *[patHa] or /patka/ → *[patHa] → *[pata] are impossible, and this is the precise reason why these patterns are in a typological gap.

By the same reasoning, the hypothesis of two-step deletion also accounts for possible and impossible strategies to repair the unlicensed superheavy syllable *CVVC. Types of such repair strategies are two-fold. One is vowel shortening, attested in Cairene Arabic, which turns *CVVC into CVC; the other is epenthesis, attested in Mekkan Arabic, by which *CVVC derives into CVV. CV; however, there is no attested language, according to McCarthy (2008a), that repairs *CVVC into CVV by deleting the coda consonant. Of course, no change occurs in languages that license the CVVC structure.

This gap is correctly captured by the analysis with two-step deletion, as in (5a). In order for the derivation /pat-ka/ → *[paa.ka] to be possible, it should require the intermediate form containing H, as in /pat-ka/ → *[paH.ka] → *[paa.ka]; however, *[paH.ka] is harmonically bounded by [paat.ka] on the first pass and hence would never derive into *[paa.ka]. This is why coda deletion never happens cross-linguistically as a strategy for repairing *CVVC.

(5) Possible and impossible repairs for *CVVC

a. /pat-ka/ → *[paaH.ka] → *[paa.ka]: no coda deletion in ‘serial OT’
(Tableau 3)
b. /pat-ka/ → ![paa.ka]: impossible coda deletion in ‘parallel OT’
(Tableau 4)

In contrast, vowel shortening applies under the ranking

---

**Tableau 3**

<table>
<thead>
<tr>
<th>/paat-ka/</th>
<th>*CVVC</th>
<th>Dep</th>
<th>Max (μ)</th>
<th>Max</th>
<th>Max [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st pass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/paat-ka</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/paaH.ka</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>2nd pass</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/paat-ka</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/paa.ta.ka</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Convergence occurs on the 2nd pass)

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**Tableau 4**

<table>
<thead>
<tr>
<th>/paat-ka/</th>
<th>*CVVC</th>
<th>Dep</th>
<th>Max (μ)</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>paat.ka</td>
<td>*</td>
<td></td>
<td></td>
<td>!</td>
</tr>
<tr>
<td>pat.ka</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>![paa.ka]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>![paa.ta.ka]</td>
<td></td>
<td></td>
<td></td>
<td>!</td>
</tr>
</tbody>
</table>

---
of *CVVC, Dep ∪ Max (μ) ∪ *CVVC. Epenthesis applies in the ranking of *CVVC, Max (μ) ∪ Dep; and no change occurs in the ranking of Dep, Max (μ) ∪ *CVVC.

Unfortunately, however, ‘parallel OT’ as it stands predicts that coda deletion would be a possible repair strategy if the ranking were *CVVC, Dep, Max (μ) ∪ Max as in (5b). In other words, it overgenerates the type of repair that has not been attested in any language. This point counts as evidence showing that ‘serial OT’ is empirically more valid than ‘parallel OT’ from the perspective of typology.

See Pruitt (2008) as well for more arguments in favor of Harmonic Serialism through examinations of typological gaps in metrical structure.

3.2. Gaps in dissimilation and their theoretical implications

Another case for Harmonic Serialism is found in the typology of dissimilation. Typological research into dissimilation has been conducted from various viewpoints by Odden (1980), McCarthy (1986), Yip (1988), Suzuki (1998), Fukazawa (1999), and numerous others. But what we focus on here is the presence/absence of a certain type of threshold in dissimilatory processes that is discussed by Tanaka (2005): there are many languages in which one marked element is allowed but two marked ones are not, while there is no language in which one or two marked elements are allowed but three marked ones are not—another typological gap.

Influential works by Alderete (1997) and Ito and Mester (2003) convincingly show that dissimilation can be offered a principled account by ‘parallel OT’, abolishing a ‘cover constraint’ like the OCP that relies on multi-dimensional phonological representations. Their approach to dissimilation is to introduce into the grammar an operation of ‘local conjunction,’ which derives a locally self-conjoined constraint *X* from an existing constraint *X*. This constraint prohibits n-numbered Xs in a certain local domain.

As Ito and Mester (2003: 24-25) state, local conjunction is a recursive operation, which means that even a recursively self-conjoined constraint like *X3, *X4, *X5, etc. is possible in principle, as well as *X*. Thus, it predicts that there could be a language where two Xs are licensed but three (or more) are banned; likewise, it would be possible for three Xs to be licensed but four (or more) to be prohibited, etc. These predictions are made by the following possible rankings of *X* and Faith, as shown in (6).

(6) Possible dissimilatory patterns predicted by local conjunction

<table>
<thead>
<tr>
<th>a. Unconditionally licensed:</th>
<th>b. Two Xs licensed but three prohibited:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faith ∪ *X3 ∪ *X2 ∪ *X</td>
<td>*X3 ∪ Faith ∪ *X2 ∪ *X</td>
</tr>
<tr>
<td>c. One X licensed but two prohibited:</td>
<td>d. Unconditionally prohibited:</td>
</tr>
<tr>
<td>*X3 ∪ *X2 ∪ Faith ∪ *X</td>
<td>*X3 ∪ *X2 ∪ *X ∪ Faith</td>
</tr>
</tbody>
</table>

Now, (6a) and (6d) are attested patterns; that is, there are some highly marked segments observed such as clicks and implosives, which some languages allow but others do not, regardless of the number of the segments. (6c) is also a well-attested pattern whose features have been described extensively in the OCP literature mentioned at the beginning of this section. (6b), however, has been totally unattested, a seemingly impossible pattern in natural languages, although approaches with self-conjunction predict it would be possible.

One way to avoid this problem is to adopt the ‘activationalist’ view of local conjunction, as Ito and Mester (2003: 24-25) point out. The idea is that locally-conjoined constraints are not members of CON in Universal Grammar but are activated and allowed to exist only on a language-specific basis. They state that “as learners acquire the grammar of their language, they activate individual conjunctions on a case-by-case basis” (Ito and Mester 2003: 61). However, they confess at the same time that “this answer remains somewhat shallow.”

Other attempts to restrict local conjunction are also suggested by Fukazawa and Miglio (1998) and Fukazawa and Lombardi (2003) from a typological point of view, but the problem of interest here does not seem to be solved by the proposed restrictions therein.

In contrast, in Harmonic Serialism, such a problem does not arise. Let us demonstrate this point by using relevant constraints, possible rankings, and possible input forms. The tableaux in (7) demonstrate how the “two Xs licensed but three prohibited” pattern is excluded properly, where X is assumed here to be a voiced obstruent.

(7) Possible dissimilatory patterns predicted by local optimality.

<table>
<thead>
<tr>
<th>a. /pataka/ → [pataka]</th>
</tr>
</thead>
<tbody>
<tr>
<td>/pataka/</td>
</tr>
<tr>
<td>pataka</td>
</tr>
<tr>
<td>bataka</td>
</tr>
</tbody>
</table>
In this article, we have reviewed four types of grammatical mechanisms for capturing typological gaps in OT—constraint asymmetry, ranking asymmetry, absolute ungrammaticality, and local optimality—and have shown that restrictions in GEN through EVAL are necessary as well as those in CON. Furthermore, from examining typological predictions and consequences in trimoraic syllable simplification and dissimilation, we have drawn a conclusion that a ‘serial OT’ approach with local optimality has a better empirical basis than a ‘parallel OT’ approach.

Recognizing its limitations in ‘parallel OT’ as it stands, OT has reexamined and revised its own basic architecture of grammatical components in the current trends. One such trend is Harmonic Serialism, which abolishes parallelism and reconsiders the interaction between GEN and EVAL. Another trend is Harmonic Grammar, recently developed by Pater (2009) and Potts, Pater, Jesney, Bhatt, and Becker (2009), who claim from the viewpoint of typology and learnability that ranked constraints are substituted by weighed constraints, i.e., constraints with numerical values. It remains to be seen whether Harmonic Grammar can account for the types of gaps in section 3 or whether there is any type of gap that shows that either Harmonic Serialism or Harmonic Grammar is an empirically more valid approach than the other. Further study is awaited to fully evaluate the typological consequences of both theories, but in any case, a valid harmonic theory must

However, this move seems a regression of the local conjunction theory as a whole. In fact, ‘parallel OT’ has needed, and has taken full advantage of, local conjunction to account for processes other than dissimilation—opacity effects such as chain shifts (Kirchner 1996, Yamane 2002, Moreton and Smolensky 2002) and derived environment effects (Lubowicz 1998, 2002, 2003). So giving up accounting for dissimilation with self-conjunction leads to weakening of the theory’s expressive power.

On the other hand, opacity effects are the very phenomena by which a serial rule-based theory and also ‘serial OT’ are given empirically and conceptually strong bases (McCarthy 2007). That is why the entire accounts for opacity with local conjunction in ‘parallel OT’ would better be replaced by the ones in ‘serial OT,’ if the latter has proven to be typologically more valid with respect to trimoraic syllable prohibition and dissimilation.

### 4. Conclusion

In this article, we have reviewed four types of grammatical mechanisms for capturing typological gaps in OT—constraint asymmetry, ranking asymmetry, absolute ungrammaticality, and local optimality—and have shown that restrictions in GEN through EVAL are necessary as well as those in CON. Furthermore, from examining typological predictions and consequences in trimoraic syllable simplification and dissimilation, we have drawn a conclusion that a ‘serial OT’ approach with local optimality has a better empirical basis than a ‘parallel OT’ approach.

Recognizing its limitations in ‘parallel OT’ as it stands, OT has reexamined and revised its own basic architecture of grammatical components in the current trends. One such trend is Harmonic Serialism, which abolishes parallelism and reconsiders the interaction between GEN and EVAL. Another trend is Harmonic Grammar, recently developed by Pater (2009) and Potts, Pater, Jesney, Bhatt, and Becker (2009), who claim from the viewpoint of typology and learnability that ranked constraints are substituted by weighed constraints, i.e., constraints with numerical values. It remains to be seen whether Harmonic Grammar can account for the types of gaps in section 3 or whether there is any type of gap that shows that either Harmonic Serialism or Harmonic Grammar is an empirically more valid approach than the other. Further study is awaited to fully evaluate the typological consequences of both theories, but in any case, a valid harmonic theory must
be ‘disharmonic’ with respect to gaps in natural languages.

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Notes

1) McCarthy (2008a) defines the crucial constraints here in the following way. 1) CodaCon: assign one violation mark for every token of place that is not associated with a segment in the syllable onset; and 2) Max [place]: let input place tier \( p_1, p_2, \ldots, p_n \) and output place tier \( p_1, p_2, \ldots, p_n \) and assign one violation mark for every \( p_i \) that has no correspondent \( p_j \). Definitions of the other constraints are common among usual practices.

2) See McCarthy (2008) for a treatment of only a few rare languages which amend ill-formed clusters by assimilating onsets to the preceding codas, i.e., *[patka]* \( \rightarrow *[patta]* \).

3) An apparent exception to this observation is languages with the so-called trimoraic ban, *\( \bar{\mu}\bar{\mu}\bar{\mu} \), or *CVVC mentioned in (5a), which allows CV with a single mora and CVV or CVCC with two moras but prohibits CVVC or CVCC with three moras. This prohibition appears to be the case where two elements are OK but three are not. However, it does not have so much to do with dissimilation as with structural complexity, in the same way as *Complex and *Geminate (NoGem in (4)) with respect to syllable structure. Furthermore, there are enormously quite a few types of dissimilation processes exhibiting the “one licensed but two or more prohibited” pattern, whereas the trimoraic ban is the only case of the “two licensed but three or more prohibited” pattern as far as I know. Although dissimilation and structural complexity may ultimately be reduced to one principle, it seems quite natural to assume at present that the “two licensed but three or more prohibited” pattern is almost missing in typology.

References


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