

Correspondence Theory vs. Cyclic OT: Beyond Morphological Derivation*

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1. Introduction

Two competing approaches have been developed in Optimality Theory (Prince & Smolensky 1993) to account for phonological similarities between morphologically related surface forms. The first is an output-output correspondence approach (e.g., Benua 1997; Burzio 1994, 2005), which makes use of the formal framework of the Correspondence Theory implementation of faithfulness (McCarthy & Prince 1995). The second is an approach based on theoretical insights from Lexical Phonology and other cyclic approaches to phonology (Kiparsky 1982; Mohanan 1986; Hargus & Kaisse 1993), called here cyclic OT, but also known as stratal OT, LPM-OT, and derivational OT (e.g., Kiparsky 2000, to appear; Rubach 2000; Bermúdez-Otero & Hogg 2003). The two approaches are formally quite different, but they have typically been difficult to distinguish empirically.

Here, these two models are compared as potential accounts of loanword adaptation, a phenomenon that is useful to consider because it serves as a test case beyond morphological derivation, the domain for which both models were developed. Like morphological derivation, loanword adaptation involves phonological similarity to another surface form (in this case, the source of the loan), as well as faithfulness rankings that differ from those involved in basic input-output correspondence. Loanword adaptation differs from morphological derivation in that the surface forms showing phonological similarity effects are related, not on the basis of shared morphological content, but instead by the process of incorporating a foreign surface form into one's native language.

I demonstrate that a correspondence-theoretic approach can successfully be extended to model loanword adaptation, but there is a loanword pattern that the cyclic OT approach cannot model. The drive to maintain phonological similarity to the Ls form sometimes causes

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the adaptation process to leave otherwise Lb-illegal structures intact in loanwords, a situation called here *special contrast*. As is shown below, cyclic OT cannot handle loanword adaptation with special contrast because of the serial relationship between phonological cycles. Sending a loanword through the Lb core cycle, whether it occurs before or after the loanword-specific cycle, forces the repair of all Lb-illegal structures even in loanwords. The implication of this finding is that Correspondence Theory is more general than cyclic OT as a model of patterns involving surface-surface similarity and multiple faithfulness systems.

First, §2 presents justification for the claim that loanword adaptation involves a surface-to-surface similarity relation. The empirical pattern that serves as the crucial test case, loanword adaptation with special contrast, is introduced in §3. Accounts of loanword adaptation in the Correspondence Theory model and the cyclic OT model are developed and compared in §4 and §5, and the difficulties encountered by the cyclic OT model are discussed in §5 as well.

2. Why loanword adaptation involves a surface-to-surface similarity relation

When words are borrowed from a source language Ls into a borrowing language Lb, there are often Ls phonological patterns that are illegal in Lb. The non-Lb phonology in the loanword may be handled in any one of several ways. Sometimes, non-Lb elements are completely nativized. That is, Lb phonotactic violations are eliminated, and the repairs used to achieve this are themselves compatible with the Lb-internal grammar. If non-Lb phonological patterns are handled in this way, the phonological system does not need to incorporate any mechanism distinct from the ordinary Lb phonological grammar. The markedness >> faithfulness ranking that enforces the non-loan phonotactics of Lb is sufficient to drive nativization of loanwords (Yip 1993; Jacobs & Gussenhoven 2000).

There are two more ways in which Ls patterns that are illegal in Lb can be handled during loanword adaptation, but both of these options require some mechanism beyond the default Lb grammar. In one scenario, the Ls forms are still repaired, eliminating non-Lb elements from the adapted loanwords as in the case of complete nativization. However, the repair strategy used to bring the loanwords into conformity with Lb phonotactics differs from the default Lb repair (Yip 2002; Smith 2004; Paradis & La Charité 1997; Kang 2003). For example, a language may typically repair illicit clusters with deletion or featural neutralization, but the repair used in loanword adaptation may be epenthesis. Of course, under this scenario the outcome of the adaptation is compatible with the core Lb grammar, so when the loanword is subsequently produced by Lb speakers, it presumably needs no further productive “repair” in the mapping from (lexical) input forms to (surface) output forms. However, an explanation is still needed for the fact that the repair strategy chosen during the initial process of loanword adaptation differs from the Lb-internal, default repair strategy.¹

¹One possible explanation for this difference is that loanword adaptation is strictly perceptual (Peperkamp & Dupoux 2003); that is, Lb speakers misperceive an Ls form in

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The final possibility is that non-Lb elements may be faithfully retained in loanwords, even though they are impossible in non-loan forms in Lb. The post-adaptation consequence of this option for the grammar of Lb is a language with a stratified lexicon, which has been modeled in OT with loanword-specific (i.e., stratal) faithfulness constraints (Fukazawa, Kitahara, & Ota 1998; Itô & Mester 1999). However, here again, an account is needed for what happens at the point where these words are first borrowed, before lexical-stratum-specific faithfulness constraints have been incorporated into the grammar.

Both of the adaptation scenarios requiring a mechanism beyond the basic phonological grammar of Lb — the use of non-default repairs in loanword nativization, and the preservation of non-Lb elements in loanword adaptation — have recently been analyzed as an effect of *similarity constraints* that relate the loanword to its Ls source form. The basic idea behind this approach is that at the point where the word is borrowed (although not necessarily for subsequent generations of Lb speakers), the Lb speaker has access to the surface form of the Ls source word. Given the right circumstances, which may even be sociolinguistic rather than phonological in origin, the Lb grammar can rank certain Ls–Lb similarity constraints high enough to cause non-Lb-default behavior.

Several proposals have been made for the formalization of such Ls–Lb similarity constraints. Some approaches involve the introduction of novel, loanword-specific constraints like that in (1).

(1) Loanword-specific similarity constraint

MIMIC (Yip 2002: 5)

“MIMIC is the OT instantiation of active loan word incorporation, and enforces faithfulness to the percept. ... MIMIC is a faithfulness constraint, but it relates the output to a specific sub-type of input, a demonstrably foreign form.”

Another approach to formalizing Ls–Lb similarity constraints is to invoke a *correspondence relation* (McCarthy & Prince 1995), here called the SB relation, between a loanword and its Ls source form (Smith 2004, to appear; Kenstowicz 2005; see also Kang 2003). This in turn establishes a set of faithfulness constraints on strings that stand in SB-correspondence (see §4 for definitions and discussion). There are advantages to using Correspondence Theory as the formal mechanism for capturing Ls–Lb similarity effects. Formally, this approach exploits an existing mechanism in the model for handling faithfulness relationships between surface forms. Conceptually, it is attractive in explicitly modeling the language-contact aspect of borrowing — the intuition that in loanword adaptation, “someone else’s word” is incorporated into Lb.

such a way as to make it conform to Lb phonotactics, but there is no phonological process in the sense of an unfaithful input-output mapping. While this may be the explanation in some instances, not all cases of adaptation can be reduced to phonotactically driven misperception (Smith 2004; Kenstowicz 2005).

Because the SB relation is a correspondence relation between two surface forms, it can be characterized as a *surface-to-surface* correspondence relation. Another example of a surface-to-surface correspondence relation is the output-output (OO) relation, used for correspondence constraints that model phonological similarity between morphologically related words.² As noted above, an alternative approach to OO correspondence is cyclic OT. The question of interest here is whether cyclic OT can be extended from the domain of morphologically related forms in order to take the place of the Ls–Lb similarity constraints as well. The following sections demonstrate that an extension of cyclic OT along these lines is not successful.

3. The crucial pattern: Loanword adaptation with special contrast

The empirical difference between surface-to-surface correspondence and cyclic OT emerges in cases where two phones are non-contrastive in the Lb phonology, but contrastive in loanwords, a pattern called here *special contrast*. An example of this pattern involves [t] and [tʃ] in Japanese.

3.1 Complementary distribution in the non-loan phonology

In the non-loan phonology, [t] and [tʃ] are in complementary distribution. [tʃ] appears only before [i] (and [j], assumed to be featurally identical to [i]),³ while [t] appears in the elsewhere environment. Alternations between [t] and [tʃ] can be seen in verb morphology.

(2) Non-loan phonology: Alternations between [t] and [tʃ]

(a)	kat-eba	‘win-CONDITIONAL’	katʃ-itai	‘win-DESIDERATIVE’
	kat-anai	‘win-NEGATIVE’	katʃ-imasu	‘win-POLITE’
	kat-oo	‘win-VOLITIONAL’		
(b)	mot-eba	‘hold-CONDITIONAL’	motʃ-itai	‘hold-DESIDERATIVE’
	mot-anai	‘hold-NEGATIVE’	motʃ-imasu	‘hold-POLITE’
	mot-oo	‘hold-VOLITIONAL’		

²Previous work (Smith 2004; Kenstowicz 2005) treats the source form-loanword correspondence relation itself as an instance of OO correspondence. The new term *surface-to-surface correspondence* is introduced here in order to reserve the name *output-output correspondence* for the specific type of surface-to-surface relation that holds between morphologically related forms (Benua 1997). Thus, output-output correspondence and SB correspondence are both subcases of surface-to-surface correspondence. (Thanks to John McCarthy for discussion of this point.)

³Another alternant, [ts], appears before [u].

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For the grammar to enforce the predictable distribution of [t] and [tʃ], the constraint ranking must ensure that potential inputs /t/ and /tʃ/ both map to [tʃ] before [i], and to [t] elsewhere. The constraints in (3), ranked as in (4), achieve this result.

- (3) Constraints
- (a) *[tʃ] Violated by each occurrence of [tʃ] in output forms
 - (b) *[ti] Violated by each [ti] sequence in output forms (a palatalization constraint)
 - (c) IDENT[ANT] Violated when corresponding (input/output) segments differ in their [±anterior] specification (McCarthy & Prince 1995)
- (4) Ranking motivated for non-loan phonology
 *[ti] >> *[tʃ] >> IDENT[ANT]

The following tableaux confirm that the ranking in (4) predicts the appropriate distribution of [t] and [tʃ], even if the “wrong” allophone is included in the input form.

- (5) Non-loan phonology: No base; [t] and [tʃ] neutralized

(a)	/mat-itai/ ‘wait-DESID’	*[ti]	*[tʃ]	ID[ANT]
	i. matitai	*!		
	☞ ii. matʃitai		*	*

(b)	/matʃ-eba/ ‘wait-COND’	*[ti]	*[tʃ]	ID[ANT]
	☞ i. mateba			*
	ii. matʃeba		*!	

To summarize, faithfulness to [±anterior] is always overridden in the non-loan phonology, because *[ti] >> IDENT[ANT] and *[tʃ] >> IDENT[ANT]. With the faithfulness constraint dominated, the distribution of [t] and [tʃ] is phonologically predictable, as desired: In the elsewhere context, /tʃ/ maps to [t], because of *[tʃ]. But when [i] follows, /t/ and /tʃ/ both map to [tʃ], because *[ti] >> *[tʃ].

3.2 Contrastive distribution in loanwords

The distribution of [t] and [tʃ] in Japanese loanwords, on the other hand, is contrastive (Lovins 1975; Vance 1987; Itô & Mester 1995; many of the loanwords with non-Lb

distribution do also have “nativized” variants). Source-language [t] is faithfully realized before all vowels, and source-language [tʃ] appears before all vowels as well.

(6) Loan phonology: [t]/[tʃ] contrasts (Vance 1987; Arakawa 1977)

(a) _[i]:	tipikaru	‘typical’	tʃippu	‘(potato) chips’
	aisutii	‘iced tea’	tʃiizu	‘cheese’
(b) _[e]:	tekku	‘technical center’	tʃekku	‘check’
	tero	‘terrorism’	tʃero	‘cello’
	karute	‘clinical record’	dorutʃe	‘dolce (musical term)’
		< Ger. <i>Karte</i>		< Ital.

The pre-[e] environment shown in (6b) is the crucial context for confirming the non-native distribution of [tʃ] in loanwords, because surface [tʃa tʃu tʃo] can also be analyzed as Lb-compatible /tʃa tʃu tʃo/.

For [t] and [tʃ] to be contrastive, the process of loanword adaptation must map input /t/ to output [t], and input /tʃ/ to output [tʃ]. This motivates the ranking in (7).

(7) Ranking motivated for loanword adaptation

IDENT[ANT] >> {*[ti], *[tʃ]}

According to this ranking, IDENT[ANT] is ranked above the [t]- and [tʃ]-related markedness constraints, so both [t] and [tʃ] can appear in any context.

(8) Loanwords: [t] surfaces even before [i]

/tii/ ‘tea’	ID[ANT]	*[ti]	*[tʃ]
i. tii		*	
ii. tʃii	*!		*

(9) Loanwords: [tʃ] surfaces even before [e]

/tʃero/ ‘cello’	ID[ANT]	*[ti]	*[tʃ]
i. tero	*!		
ii. tʃero			*

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A comparison between the rankings motivated for the non-loan phonology and for loanword adaptation in (4) and (7) indicates that they differ crucially in the relative position of the faithfulness constraint IDENT[ANT] with respect to the markedness constraints *[ti] (>>) *[tʃ]. Loanword adaptation has a higher rank for IDENT[ANT], allowing loanwords to maintain a contrast between these two phones that are in complementary distribution in the non-loan phonology.

§2 and §3 have shown that loanword adaptation involves surface-to-surface similarity between Ls and Lb forms, and that loanword adaptation with special contrast requires a different markedness/faithfulness ranking from that needed for the default Lb phonology. Surface-to-surface correspondence and cyclic OT are appropriate formal approaches to compare in the context of loanword adaptation because both approaches were originally developed to model surface-surface similarity relations, specifically, those between morphologically related forms. Moreover, both approaches were designed to handle distinct faithfulness rankings in different subareas of the grammar, as seen in the difference between non-loan and loanword adaptation phonologies in cases like the Japanese example presented here. Despite these similarities between the two models, however, the rest of the discussion demonstrates that the special-contrast pattern in loanword adaptation can be modeled with Ls–Lb correspondence constraints, but not with cyclic OT.

4. Analyzing loanword adaptation: Surface-to-surface correspondence

The surface-to-surface correspondence approach (Benua 1997; Burzio 1994, 2005) models phonological similarity between morphologically related forms by positing, in addition to input-output (IO) correspondence, a distinct output-output (OO) correspondence relation with its associated faithfulness constraints. These OO faithfulness constraints explicitly call for phonological identity between the two related surface forms. The different faithfulness rankings required for input-output mappings and surface-to-surface similarity effects are also handled with reference to the OO correspondence relation. Because IO faithfulness constraints and OO faithfulness constraints are distinct, they are separately rankable. For example, IDENT[ANT]-OO may be ranked higher than IDENT[ANT]-IO for the grammar of a particular language.

The surface-to-surface correspondence approach to morphologically related forms can be extended to loanword adaptation as follows. First, a new surface-to-surface correspondence relation, the SB correspondence relation, can be defined to hold between the surface Ls form and the surface form of the loanword in Lb. Then, a set of faithfulness constraints can be defined on this correspondence relation, including those in (10).

(10) Loan-source similarity constraints in Correspondence Theory
(constraint formulations from McCarthy & Prince 1995: 264)

- (a) MAX-SB Every segment of $S_1(=S)$ has a correspondent in $S_2(=B)$.
(‘No deletion.’)

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- (b) DEP-SB Every segment of $S_2(=B)$ has a correspondent in $S_1(=S)$.
(‘No epenthesis.’)
- (c) IDENT[F]-SB Let α be a segment in $S_1(=S)$ and β be any correspondent of α in $S_2(=B)$. If α is $[\pm F]$, then β is $[\pm F]$.
(‘Corresponding segments are identical in feature F.’)

The process of loanword adaptation — the original borrowing of a loanword, potentially including initial phonological repairs — is proposed to proceed as follows (Smith 2004, to appear). First, an Lb speaker *establishes a representation* of the Ls output form. This step is necessary because the SB correspondence relation is part of the mental grammar of an Lb speaker, which means that the two strings related by this correspondence relation — the Ls and Lb surface forms — are both cognitively represented by a speaker of Lb. The expression *Ls surface form* as used here therefore refers, not to the phonetic output uttered by an Ls speaker, but to the Lb speaker’s cognitive representation of that form. Establishing a representation of the Ls surface form may involve some “perceptual assimilation” effects (Peperkamp & Dupoux 2003); that is, certain Lb-illegal segments or sequences may be misperceived by the Lb speaker and interpreted as phonetically similar segments or sequences that are (more) compatible with the Lb grammar (a process essentially analogous to the “perceptual scan” stage of Silverman’s (1992) model of loanword adaptation). Additionally, the Lb speaker’s representation of the Ls surface form may also include phonological information that is not phonetically perceived, such as information gleaned from orthography or explicit knowledge of Ls phonological patterns.

Once a representation of the Ls surface form has been established, the Lb speaker imports the surface Ls form as an input form (UR), in accordance with the principle of lexicon optimization (Prince & Smolensky 1993: §9), and IO correspondence constraints relate this input to the Lb speaker’s output. The Lb speaker also instantiates the surface Ls form as the Ls base, and SB correspondence constraints relate this Ls base to the Lb speaker’s output form as well. Crucially, the ranking of SB correspondence constraints is arbitrary and Lb-specific, is distinct from the ranking of IO correspondence constraints, and is probably determined in part on the basis of sociolinguistic considerations (how “foreign” to sound? which of the phonetically or phonologically similar native phonemes to substitute?).⁴

Subsequent generations of Lb speakers who learn the (etymological) loanwords from other Lb speakers have no SB correspondence relation. This means that their grammar is different from that of the speakers who initially adapted the loanwords. For the subsequent generations, nativized forms (regardless of whether the original adaptation repair was the Lb default repair or a loan-specific repair) are handled by core Lb constraints. The existence of

⁴On this view, the strong preference for epenthesis repairs in loanword adaptation identified by Paradis & LaCharité (1997) is arguably sociolinguistic, not phonological, in origin. See Smith (to appear) for additional discussion of this point.

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“foreign” forms that were adapted without full nativization, and so still violate core Lb phonotactics, may lead subsequent learners to set up a stratified lexicon with different sets of IO faithfulness constraints (Fukazawa, Kitahara, & Ota 1998; Itô & Mester 1999). Alternatively, the presence of “foreign” forms may trigger reanalysis of the core Lb grammar itself (Rice in press). In any case, the presence of an SB correspondence relation in the grammar is a characteristic only of those speakers that have contact with both the source and the borrowing languages and are involved in the process of adapting perceived Ls forms into the grammar and lexicon of Lb.

In the SB correspondence model, the distribution of Japanese [t] and [tʃ] can be analyzed as follows. The input-output faithfulness constraint IDENT[ANT]-IO is ranked below the markedness constraints *[ti] >> *[tʃ], enforcing the complementary distribution of [t] and [tʃ] in the general case. However, special contrast is found in loanword adaptation because the Ls–Lb faithfulness constraint requiring similarity to [t] and [tʃ] in the Ls base, IDENT[ANT]-SB, dominates *[ti] and *[tʃ]. (SB correspondence constraints are vacuously satisfied for non-loans because they have no Ls base forms.) The effect of adding the SB correspondence constraints to the grammar of Japanese to model loanword adaptation is shown in (11) and (12) below.

(11) Loanword adaptation: Source-language base exists; [t]/[tʃ] contrast preserved

(a)	/tii/ ‘tea’ <i>base: Eng. [ti:]</i>	ID[ANT]- SB	*[ti]	*[tʃ]	ID[ANT]- IO
	☞ i. tii		*		
	ii. tʃii	*!		*	*

(b)	/tʃero/ ‘cello’ <i>base: Eng.(?) [tʃɛlo]</i>	ID[ANT]- SB	*[ti]	*[tʃ]	ID[ANT]- IO
	i. tero	*!			*
	☞ ii. tʃero			*	

(12) Non-loan phonology: No source-language base; [t] and [tʃ] neutralized

(a)	/mat-itai/ ‘wait-DESID’ <i>(no Ls base)</i>	ID[ANT]- SB	*[ti]	*[tʃ]	ID[ANT]- IO
	i. matitai	<i>satisfied</i>	*!		
	☞ ii. matʃitai	<i>satisfied</i>		*	*

(b)	/matʃ-eba/ ‘wait-COND’ (no Ls base)	ID[ANT]- SB	*[ti]	*[tʃ]	ID[ANT]- IO
	i. mateba	<i>satisfied</i>			*
	ii. matʃeba	<i>satisfied</i>		*!	

In summary, it is the high rank of IDENT[ANT]-SB and the low rank of IDENT[ANT]-IO that allow [t]/[tʃ] to be contrastive in loanword adaptation, although they are not contrastive in Lb-internal phonology.

5. Attempting loanword adaptation with cyclic OT

In the cyclic OT approach (e.g., Kiparsky 2000, to appear; Rubach 2000), phonological similarity between morphologically related forms results from the cyclic structure of the phonological system. The output of the first phonological cycle (a morphological base) is the input to the second cycle (where an affix is added to the form). Therefore, the base is related to the derived form by IO faithfulness constraints in cycle 2. The cyclic OT approach can also handle different faithfulness rankings for base forms and derived words. In this model, *all* faithfulness constraints are IO faithfulness constraints — only one correspondence relation is recognized. However, the constraint rankings for cycles 1 and 2 may differ. Thus, for the grammar of a particular language, IDENT[ANT] may be ranked higher in one cycle than in another.

In order to extend the cyclic OT approach to the special-contrast pattern described in §3, the process of loanword adaptation could be modeled as one cycle, and the non-loan phonology could be modeled as another cycle. It turns out, however, that neither way of assigning cycles to rankings can produce the desired pattern of loanword adaptation. Suppose that loanword adaptation is the first cycle of the grammar, applying only to non-native forms. As shown in (7) above, the constraint ranking for loanword adaptation needs to have IDENT[ANT] ranked above *[ti] and *[tʃ], so this would be the ranking for cycle 1. The core Lb phonological grammar, which applies to all forms, would then be the second cycle, with the ranking from (4): *[ti] >> *[tʃ] >> IDENT[ANT]. The problem with this system is that the Ls [t]/[tʃ] contrast survives cycle 1, but is incorrectly neutralized when it enters the native phonology on cycle 2.

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(13) Problem: [t] and [tʃ] neutralized in cycle 2 (Desired output: [tʃi])

(a) Cycle 1 (loan adaptation)

/tʃi/ 'tea'	ID[ANT]	*[ti]	*[tʃ]
☞ i. tʃi		*	
ii. tʃʃi	*!		*

(b) Cycle 2 (all forms)

[tʃi] (cycle 1 output)	*[ti]	*[tʃ]	ID[ANT]
i. tʃi	*!		
✗ ii. tʃʃi		*	*

Now suppose instead that the core Lb phonological grammar is the first cycle, with the ranking $*[ti] \gg *[tʃ] \gg \text{IDENT}[\text{ANT}]$, while loanword adaptation occurs on a second cycle that applies only to non-native forms, with the ranking $\text{IDENT}[\text{ANT}] \gg \{*[ti], *[tʃ]\}$. This time, the problem arises during the first cycle. The source-form [t] is neutralized to [tʃ] in cycle 1, so the contrast cannot be recovered on cycle 2, even though faithfulness to the specification for $[\pm\text{anterior}]$ is undominated there.

(14) Problem: [t] and [tʃ] neutralized in cycle 1 (Desired output: [tʃi])

(a) Cycle 1 (all forms)

/tʃi/	*[ti]	*[tʃ]	ID[ANT]
i. tʃi	*!		
✗ ii. tʃʃi		*	*

(b) Cycle 2 (loan adaptation)

[tʃʃi] (cycle 1 output)	ID[ANT]	*[ti]	*[tʃ]
i. tʃi	*!	*	
✗ ii. tʃʃi			*

Thus, a general problem can be identified with the cyclic approach to loanword adaptation: Any pass through the non-loan stratum, whether it happens on the first or second cycle, neutralizes the [t]/[tʃ] contrast. It would seem that the only way to maintain a cyclic

OT approach to loanword adaptation would be to send loanwords and non-loans to entirely *separate* (not serially linked) cycles of the grammar; this would allow for the [t]/[tʃ] contrast to be neutralized in non-loan forms, while being maintained in loanwords. However, once this change is made, the model technically becomes a *co-grammar* model of loanword phonology, with separate constraint hierarchies for loan and non-loan forms; Fukazawa, Kitahara, & Ota (1998) present empirical arguments against a co-grammar approach. Such a separate-cycle model also has certain conceptual drawbacks. It fails to explain why many aspects of non-loan phonology do apply to loanwords as well — for example, consonant clusters and certain coda types are always repaired in Japanese, in loans and non-loans alike. More broadly, it also abandons a core principle of the original cyclic OT model, which is that one cycle provides the input to another, and this is why related forms are phonologically similar.

7. Conclusions

The crucial structural difference between the surface-to-surface correspondence approach and the cyclic OT approach is found in the parallel vs. serial evaluation of the distinct faithfulness systems. With surface-to-surface correspondence, IO faithfulness constraints and OO or SB faithfulness constraints compete in a parallel evaluation. Either type of faithfulness can compel violation of the other, depending only on their relative ranking in a given language. It is the parallel structure of the surface-to-surface correspondence approach that makes it flexible enough to apply beyond morphological derivation. Another extended application of surface-to-surface correspondence has been quite successful as well: the phonological analysis of language games (e.g., Itô, Kitagawa, & Mester 1996; Piñeros 1999; Harrikari 2000), in which game output forms are compelled to remain faithful to certain phonological characteristics of the surface forms of the (non-game) language on which they are based.

In cyclic OT, on the other hand, any interaction between distinct faithfulness systems, such as input-output vs. Ls–Lb, is strictly serial, because it is modeled as a difference in ranking *between cycles*. Information about a cycle 1 input is unavailable during a cycle 2 evaluation. This means that if *any* cycle has a markedness >> faithfulness ranking for some contrast, that contrast will be neutralized. As a result, this approach is not able to model the special-contrast pattern in loanword adaptation. Because cyclic OT cannot be extended to account for the ways that surface-surface similarity effects and different faithfulness rankings are involved in loanword adaptation, surface-to-surface correspondence is a more general model of such patterns.

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