Optimal gaps in optimal paradigms*

Curt Rice
University of Tromsø

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1 Introduction

When a morphological operation yields a form which is phonologically infelicitous, that cell in the paradigm experiences one of three fates. Either it is filled with a phonologically 'repaired' form, or it is filled with a substitution from elsewhere in the paradigm, or the cell remains empty such that there is a gap – which in turn may ultimately be filled by periphrasis or circumlocution. We refer to these three strategies for resolving phonological infelicity respectively as phonological neutralization, morphological neutralization and syntactic neutralization.

A theory of grammar must allow language specific grammars which yield any of these possible resolutions in the face of such a situation. This paper focuses on gaps of the third type – syntactic neutralization, i.e. gaps which are seemingly left unfilled by the morphology and whose target is left unrepaired

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†This is a draft; I'll be grateful for any comments you might send to me at curt.rice@hum.uit.no.

by the phonology, such that the only way to express the intended content of the cell is to turn to the syntax. A proposal for the representation of such cases is developed within the framework of Optimality Theory (Prince and Smolensky 1993) and specifically within Optimal Paradigms Theory (OP) (McCarthy 2002, 2005).

In OP, candidates are paradigms, and the there is a set of correspondence constraints – OP faithfulness constraints – exerting a leveling pressure on intraparadigmatic relations. The members of the candidate paradigms are also evaluated against the other constraints of the grammar, including markedness constraints. A relatively high ranked markedness constraint can yield a winning candidate paradigm with an 'optimal gap'. Several examples of this are given below.

One particular advantage of this approach is that a grammar may respond to phonological infelicity differently, depending on whether it occurs in the context of a paradigm or not. For example, an ill-formed consonant cluster may go unrepaired in a paradigm, resulting in a gap, while it does get repaired in the context of a borrowed place name. A second advantage of the present model is drawn in comparison to the two existing models of this kind of ungrammaticality, namely MPARSE (Prince and Smolensky 1993; McCarthy 2002) and CONTROL (Orgun and Sprouse 1999).

The analysis of gaps as part of a model of (un)grammaticality offers yet another domain in which the notion of paradigm is useful, supplementing McCarthy's (2005) appeal to processes such as attraction to the unmarked. The context for this proposal includes work on ineffability, absolute ungrammaticality, and paradigm structures, many recent instances of which appear in Downing et al. (2005).

In §2, two brief examples of phonologically motivated gaps are presented. Optimal paradigms theory is presented in §3, followed by my proposal for the representation of 'optimal gaps' in §5. §4 highlights a technical problem in optimal paradigms theory, and proposes a solution to that problem which results in a theory that optimizes gaps only in the desired situations. This slightly revised version of OP theory is then applied to two more examples of paradigmatic gaps, namely the case of Norwegian imperatives, in §5.1, and the case of Hungarian CCik verbs, in §5.2. The paper ends with a discussion of the implications of the present development.

2 Phonologically motivated gaps

The notion of a gap in a paradigm invokes the notion of a 'complete' paradigm, a point which will be of crucial importance in §5 below. A familiar metaphor for this line of discussion refers to 'cells' in a paradigm, where each cell represents the expression of a particular morphological category. A language in which there are six possible expressions of the present tense of a verb (3 persons, 2 numbers) has six cells for that part of the paradigm. When one of the cells is left empty, there is a gap in the paradigm. The are various reasons why cells might be empty; of interest here are cases in which cells are empty because the form which is expected to fill that cell is phonologically ill-formed. Subsections 2.1 and 2.2 each present an example of such a gap.

2.1 Turkish suffixation

One of the familiar examples from the literature on phonologically motivated paradigm gaps involves suffixation in Turkish (Ito and Hankamer 1989; Orgun and Sprouse 1999; Raffelsiefen 2004). The output of suffixation in Turkish must meet a phonological requirement on its shape. In particular, a suffixed form must be minimally disyllabic. When this requirement is not met, suffixation fails, and the paradigm is incomplete.

The particular danger for a gap in Turkish arises from attempts to combine monosyllabic vowel final stems with monoconsonantal suffixes. Example (1a) shows the affixation of a the genitive suffix *–m* to a CVC stem. In this case, epenthesis applies to create a well-formed disyllabic word. In (1b), however, epenthesis does not apply, since there is no immediate phonotactic violation such as an unsyllabifiable cluster (for details, see the references above). The 'intended' CVC output is phonotactically well-formed. However, it fails to meet the minimal size requirement and therefore is ill-formed. The cell remains empty.

(1) *Disyllabic minimality for bimorphemic Turkish words*

a. (i) sol^{y} 'musical note G'
   (ii) sol^{y}-üm 'my G'

b. (i) do: 'musical note C'
   (ii) *do:-m 'my C'

2.2 Swedish neuter adjectives

The phonology of Swedish can block the normal process of neuter inflection (Eliasson 1975; Iverson 1981). Swedish adjectives agree in gender with the noun they modify; when the noun is masculine, it has no endling, while the neuter variant is inflected with a *-t*, as seen in (2).

(2) *Well-formed neuter marking in Swedish*

a. en rysk pojke (masc.) 'a Russian boy'
b. et rysk-t barn (neut.) 'a Russian child'

However, when an adjective has a short vowel followed by the voiced coronal stop [d], it can only be used in these constructions with masculine or feminine nouns, but not with neuter ones. Attaching the neuter suffix yields an ungrammatical construction, as seen in (3).

(3) *Ill-formed neuter marking in Swedish*

a. en redd pojke (masc.) 'a scared boy'
b. *et redd-t barn (neut.) 'a scared child'

The ungrammatical form in (3b) is not repaired by voicing assimilation or epenthesis or any other imaginable strategy. Rather, the neuter form of the adjective is unutterable, such that the paradigm has a cell which cannot be filled synthetically. The only way to express the concept is with a phrase, such as *et barn som er redd* 'a child who is afraid'.[1] The ungrammaticality of **redd-t* in (3b) is due to the infelicity of [dt] as a coda cluster and to a grammar in which repair by devoicing the [d] is not possible, possibly due to high ranking requirements preserving the integrity of the stem.[2]

[1] Predicative adjectives in such a construction should in principle agree in gender as well, cf. *et barn som er ryskt* 'a child who is Russian', but this gender agreement requirement is weaker for the predicative construction than it is for the attributive one. Hence, *et barn som er redd* is marginally acceptable while **et reddt barn* is unambiguously ungrammatical.

[2] In fact, there are very few words having this shape – and therefore meeting this problem – in Swedish. Iverson reports only two, *redd* 'scared, afraid' and *fladd* 'flat (water)'. However, denominal examples can be constructed, e.g. *nedsnedd* 'snowed in', lit. down-snowed.

2.3 Analyzing gaps

The data given in this section from Turkish and Swedish – along with that from Norwegian and Hungarian analyzed in §5 below – present a challenge to Optimality Theory. In OT, the core strategy is not to look for an output which is perfect, but rather to find the candidate which is *best*, given a particular grammar. The architecture of OT is such that some candidate will always be best; an input is always mapped onto some output, such that there is no parallel to a crashed derivation. Yet, paradigms with gaps would seem to be situations in which no candidate is good enough.

The literature includes at least two proposals for analyzing the situations under consideration here, the 'null parse' of Prince and Smolensky (1993) and the theory of control proposed in Orgun and Sprouse (1999). Very briefly, the approach of Prince and Smolensky (1993) includes a candidate in each tableau which effectively is unpronounceable, which they call the null parse. That candidate violates certain well-formedness requirements, and will thereby be ruled out whenever the relevant constraint(s) are sufficiently high ranked. In the rare case that the relevant constraint(s) are relatively low ranked, however, this candidate will win. Since it is unpronounceable, this is essentially a model which maps an input onto no (surface) output, i.e. it is a model of absolute ungrammaticality. McCarthy (2002) expands on the formalism slightly, stipulating that the 'null parse' (which he calls the 'null output') violates exactly one constraint, MPARSE, by stipulation.

Orgun and Sprouse (1999) reject the null parse approach and propose instead a new evaluation component of the grammar – a supplement to EVAL – which they call CONTROL. CONTROL is a domain in which constraints are 'hard', i.e. their violation is fatal. The optimal output from EVAL is passed along to CONTROL; if it also satisfies the constraints in CONTROL, the form surfaces. If it does not satisfy the constraints in CONTROL, then it fails. For a recent critique of this approach, cf. Raffelsiefen (2004).

The 'optimal gaps' approach developed below is an alternative to these two, and superior to them because it allows elimination of the stipulative violation of MPARSE and because it does not require positing a new component of the grammar, cf. CONTROL theory.

3 Optimal paradigms theory

Optimal paradigms theory invokes the notion of the paradigm to define a domain for correspondence relations (McCarthy 2005). In OP theory, candidates are paradigms, such that the candidates which are in competition with one another will present different possible paradigms for some stem. The formal strategy for assessing intraparadigmatic correspondence is the OP-correspondence constraint, i.e. correspondence constraints limited to examining the stem portion of each member of the paradigm. In his paper, McCarthy (2005) summarizes the principles of the theory as in (4).

(4) *Core properties of optimal paradigms theory*

a. Candidates consist of entire inflectional paradigms.
b. Markedness and input-output (IO) faithfulness constraints evaluate all members of the candidate paradigm. The violation marks incurred by each paradigm member are added to those incurred by all the others.
c. The stem (shared lexeme) in each paradigm member is in a correspondence relation ℜOP with the stem in every other paradigm member. There is no distinctive base rather, every member of a paradigm is a base of sorts with respect to every other member.
d. There is a set of output-output faithfulness constraints on the ℜOP correspondence relation.

This model is intended to formalize a strategy for analyzing leveling effects in paradigms, and in particular cases in which the attractor is not derivationally simpler. McCarthy notes that the phonologically least marked candidate stem can triggering leveling effects throughout the paradigm. To illustrate the theory and set the stage for our enhancements, part of McCarthy's discussion of the Classical Arabic templates is briefly reviewed here.

The Classical Arabic verbal template ends in CVC]. Both CV:C] and CVCC] are impossible template shapes for verbs, although noun templates can end in either of these. Verbs and nouns share the following two properties.

(5) *Constraints on Classical Arabic verbal stems*

a. Trimoraic syllables are ungrammatical: $*\mu\mu\mu]_\sigma$
b. The stem portion of each member of the paradigm should be identical w.r.t vowel length, which can be captured, e.g., with

OP-MAX(V)-μ.

The differences between nouns and verbs falls out from the fact that there are C-initial verbal suffixes but no C-initial nominal suffixes. Since verbal suffixes may begin with a consonant, then a verbal stem ending in V:C or VCC could only be syllabified in ways violating the prohibition on trimoraic syllables: V:C.C... or VCC.C... Since the suffixes for nouns all begin with a vowel, stems may end in V:C or VCC and still be acceptably syllabified under suffixation: V:.CV... or VC.CV... A fragment of an OP tableau is given in (6), showing a hypothetical verbal input CVCV:C, and candidate paradigms which crucially include one member with the a V suffix and one with a CV suffix.

(6) *Attraction to the unmarked*

	CVCV:C	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	IO-MAX(V)μ
a)	CVCV:.CV, CVCV:C.CV	*!		
b)	CVCV:.CV, CVCVC.CV		*!	*
☞ c)	CVCV.CV, CVCVC.CV			* *

Explicating the tableau in (6), the paradigm member with the -CV suffix is of particular importance (cf. McCarthy 2001:14). In the candidate paradigm in (a), this form has a penultimate syllable with both a long vowel and a coda consonant, hence it is trimoraic, and violates the markedness constraint $*\mu\mu\mu]_\sigma$. The same form in candidate (b) shows closed syllable shortening since the vowel loses its length. Note that there is no such shortening in the form with the -V suffix, since suffixation there does not close the penultimate syllable. Hence, candidate (b) shows an alternation within the paradigm and thereby incurs a violation of OP-MAX(V)μ.

Candidate (c) picks up on the best properties of candidates (a) and (b). First of all, the highly ranked markedness constraint is respected. Secondly, there is no intraparadigmatic alternation. In other words, candidate (c) shows leveling effects, such that the vowel length is eliminated from the entire paradigm.

By now we can see that an input with an infelicitous shape (one which cannot bear a consonant initial suffix and be acceptably syllabified) will be

mapped onto a paradigm with a better stem shape. Indeed, inputs with such shapes will never be posited as lexical representations for a word. The reason for this is as follows.

The winning candidate in the hypothetical example (6) will also be the winning candidate for the input CVCVC. Given a competition between CVCV:C and CVCVC to be the lexical entry for the winning candidate (c), the principles of lexical optimization will select CVCVC, such that there will never be a reason to assume a verbal stem ending in CV:C].

Were there no C-initial suffixes, violation of the markedness constraint would not arise, and the winning candidate paradigm will preserve vowel length through the paradigm, as is the case for the nominal paradigms.

Hence, there is a gap in the lexicon. There will be no verbs which have a lexical entry with final CV:C. This follows from the interaction of markedness with the pressure for paradigm uniformity. This pressure is expressed through faithfulness constraints which hold among members of the paradigm, and which crucially dominate faithfulness constraints on other relations, especially the input-output relation. In this way, OP theory gives unmarked members of paradigms status as attractors.

The selection of a candidate paradigm with a gap as optimal will follow from the interaction of markedness and faithfulness, as is usual in OT. Markedness constraints (e.g. $*\mu\mu\mu]_\sigma$, *CCC, SONSEQ) will interact with faithfulness constraints which are focused on two different correspondence relations. Some assess intraparadigmatic faithfulness (e.g. OP-MAX-μ, OP-IDEN(VOI)) while others focus on other faithfulness relations, such as the input-output relationship (e.g. IO-MAX-μ, IO-IDENT(VOI)).

Reranking of the two categories of faithfulness constraints under the domination of markedness constraints yields the following two situations. When MARKEDNESS $\gg$ IO-FAITH $\gg$ OP-FAITH, the markedness constraints will assert themselves only on those members of the paradigm which violation the markedness constraint. On the other hand, when MARKEDNESS $\gg$ OP-FAITH $\gg$ IO-FAITH, then the effects of the markedness constraints are spread throughout the paradigm, giving leveling effects.

4 Markedness *vs.* category expression

As noted above, the standard OT strategy for dealing with gaps is to include a candidate with the null parse. The importance of bearing this in mind in

all OT analyses is emphasized in the following quotes.

> The Null Parse is a possible candidate which must always be considered. (Prince and Smolensky 1993: 193)
>
> No matter what the input, the [null output] is among the candidates emitted by Gen. (McCarthy 2002: 280)

The requirement that we consider the null parse or the null output should be reflected in optimal paradigms theory as well. Consider what this requirement would mean for the tableau in (6). We would have to include a candidate in which the paradigm is blatantly defective. For example, we would leave out all paradigm members with C-initial suffixes, keeping in mind that it is precisely those members which – when repaired – become the unmarked attractors. The defective paradigm – candidate (d) in (7) – will preserve V-length and respect OP faithfulness, and will thereby be optimal. Extending on the proposal in McCarthy (2002), the symbol ⊙ is used as a place-holder indicating a gap in a paradigm.

(7) *A defective candidate paradigm*

	CVCV:C	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	IO-MAX()μ
a)	CVCV:.CV, CVCV:C.CV	*!		
b)	CVCV:.CV, CVCVC.CV		*!	*
c)	CVCV.CV, CVCVC.CV			*! *
☞ d)	CVCV:.CV, ⊙			

Eval assigns no violations to candidate (d) for IO-MAX(V)μ either. The defective paradigm in candidate (d) has only one member, and therefore only one opportunity to violate the IO-FAITHFULNESS constraint. The sole member of the paradigm in (d) in fact does not show the loss of a mora and therefore incurs no violation of this constraint. The symbol ⊙ has no ontological status and participates in no correspondence relations, and hence provokes no violation of any faithfulness constraints. Indeed, ⊙ does not incur any markedness violations either, such that it only violates MParse,

and only then by stipulation. The proposal under development, as noted, will allow us to eliminate this stipulation from the theory.

This illustration brings out a flaw in optimal paradigms theory. EVAL assigns a violation of a markedness constraint to a paradigm for *every* violation of the constraint found within the paradigm. In (6) and (7), this means the stem ending in V:C will incur a violation of $\mu\mu\mu]_\sigma$ for every member of the paradigm having a C-initial suffix. The motivation to have fewer violations effectively rewards paradigms with gaps. Although this basic notion will be important in the model of gaps advocated here, it is not entire unproblematic.

Consider at tableau like (7), but with an input in which there is no vowel length, as in (8). If we also remove the vowel length from the candidate paradigms, then candidates (a-c) in (7) become identical, and they are therefore reduced to one candidate, candidate (a), in (8). This candidate is compared to one with a gap, as in candidate (d) in (7).

(8) *Two perfect candidates*

	CVCVC	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	IO-MAX(V)μ
☞ a)	CVCV.CV, CVCVC.CV			
☞ b)	CVCV.CV, ⊙			

The given constraints do not distinguish the two candidate paradigms in (8). Neither of them have forms with trimoraic syllables, and there are no vowel length alternations between input and output or within the paradigm, hence no violation of the two faithfulness constraints.

But, of course, the tableau is incomplete. It includes a host of low ranked markedness constraints, which will play a role in choosing between the candidates. Such constraints include prohibitions on essentially all structure. Given that a candidate paradigm is punished for every violation (e.g. of *[LABIAL] or any other such *STRUC constraint), a smaller paradigm will inevitably be preferred to a larger one. In this way, gaps will always be rewarded. To illustrate this, consider tableau (9), which includes a low ranked constraint *C as a stand-in for some relevant *STRUC constraint.

(9) *The emergence of the unmarked*

	CVCVC	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	IO-MAX(V)μ	*C
a)	CVCV.CV, CVCVC.CV				*** *!***
☞ b)	CVCV:.CV, ⊙				***

Taking this line of reasoning to its absurd extreme, the evaulation of paradigms by constraints referring to the markedness or faithfulness of phonological properties of the members of the paradigms will reward the paradigm with the most gaps. Indeed, a paradigm with gaps in every cell – *the null paradigm* – will be optimal, as seen in (10).

(10) *The null paradigm*

	CVCVC	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	IO-MAX(V)μ	*C
a)	CVCV.CV, CVCVC.CV				*!** ****
b)	CVCV:.CV, ⊙				*!**
☞ c)	⊙, ⊙				

Yet, this is not how language works. Languages do not blindly prefer paradigms that are smaller over ones that are larger. Optimal paradigms theory must be modified so that it no longer makes this prediction.

One solution would be to re-invoke the constraint MPARSE, which is violated by the null output, ⊙. With a sufficiently high ranking, this constraint will punish paradigms having gaps. But one of the appeals of optimal paradigms theory being explored in the present paper is that it allows a better understanding of gaps, and indeed allows us to eliminate from the theory a seemingly ad hoc treatment of this phenomenon.

The candidate paradigm with a gap – candidate (b) – is optimal in (9) because there is no constraint which compels the realization of the relevant morphological category. By introducing such constraints, we can introduce a tension between markedness constraints favoring ⊙ and a requirement to fill a cell. This will allow us to check the preference for an incomplete paradigm,

and very specifically limit the situations in which a gap is preferred.

A constraint requiring the realization of a morphological category will dominate the relatively low markedness constraint, e.g. *C in (9). But it will also serve to yield a gap-less paradigm as optimal, e.g. in a tableau like that in (7). To illustrate this point, we introduce the constraint in (11).

(11) MAX{1SG}:The category 1st person singular is expressed by a member of the paradigm.

Adding this constraint to tableau (7), we now correctly are able to select candidate (c) as optimal, as illustrated in (12) below. The constraint *C from (9) is removed from further consideration, not least because we now return to the input with the long vowel, such that the faithfulness constraints will play a role. The evaluation of the MAX{1SG} constraint requires that some kind of morphological tagging be included in the paradigm, as seen in (12). This tag is on the form with the CV suffix, reflecting the shape of the *-tu* 1st person singular suffix in Classical Arabic.

(12) *The defective candidate paradigm violates* MAX{CAT}

	CVCV:C	$*\mu\mu\mu]_\sigma$	OP-MAX(V)μ	MAX{1sg}	IO-MAX(V)μ
a)	CVCV:.CV, CVCV:C.$CV_{1sg.}$	*!			
b)	CVCV:.CV, CVCVC.$CV_{1sg.}$		*!		*
☞ c)	CVCV.CV, CVCVC.$CV_{1sg.}$				* *
d)	CVCV:.CV, ⊙			*!	

It remains the case that candidate (c), as in (7), violates IO-MAX(V)μ. But now this violation is irrelevant because candidate (d) violates MAX{1sg}, and MAX{1sg} $\gg$ IO-MAX(V)μ. Hence, candidate (d) is eliminated from further consideration, and candidate (c) is optimal.

The introduction of constraints requiring the realization of morphological categories solves the problem with optimal paradigms theory identified above. With such constraints, paradigms with gaps will be punished for having those gaps, and a full paradigm will be rewarded for satisfying the MAX{CAT} constraints. Yet, the set of data under primary consideration in this paper

reveals that paradigms with gaps can be optimal. This will indeed be the case exactly when some markedness constraint does dominate a MAX{CAT} constraint, and when the competing paradigms differ on their satisfaction of the highly ranked markedness constraint. Analyses with this property will select paradigms with gaps as optimal, without any recourse to ad hoc punishment of the null parse, e.g. the constraint MPARSE, and also without the CONTROL component. Two examples of such analyses are illustrated in the following sections.

5 Optimal gaps

5.1 Norwegian imperatives

Imperatives in Norwegian are identical with the stem of the word, while the infinitives usually suffix a schwa to the stem. This yields infinitive – imperative pairs such as those in (13). The identity of the stem and the imperative holds when the infinitives show a single intervocalic consonant, an intervocalic geminate, or an intervocalic cluster, cf. Rice (2003) for more data.

(13) *Norwegian imperatives from C-final stems*

a. å spise – spis! '(to) eat'
b. å snakke – snakk! '(to) talk'
c. å løfte – løft! '(to) lift'

For vowel-final stems, there is no suffixation to form the infinitive, such that both the imperative and the bare infinitive are identical, as seen in (14), again supporting the generalization that the imperative is identical to the stem.

(14) *Norwegian imperatives from V-final stems*

a. å be – be! '(to) pray'
b. å ta – ta! '(to) take'
c. å snu – snu! '(to) turn'

However, when there is an intervocalic cluster which has rising sonority, the usual strategy for forming the imperative would result in an ill-formed word, as seen in (15).

(15) *Ill-formed Norwegian imperatives*

a. å åpne – *åpn! 'open'
b. å padle – *padl! 'paddle'
c. å sykle – *sykl! 'bike'

As discussed in Rice (2003), speakers show several different strategies for expressing these infinitives. Such a form may undergo a phonological repair, e.g. by devoicing the sonorant in the cluster, or there may be a morphological solution, e.g. using the infinitive as an imperative. Of interest here is the most common solution, namely avoidance. For a speaker who avoids these imperatives, the imperative cell in the paradigm is left unfilled, and the notion has to be expressed phrasally.

An optimal paradigms theoretic grammar for a speaker who avoids ill-formed imperatives, rather than repairing them, will make crucial reference to at least four constraints. We need a markedness constraint forbidding a final cluster with rising sonority, such as SonSeq, cf. Clements (1990). The gap will be induced by high ranking of this constraint. In (16), we include a candidate in which the imperative alone is repaired through devoicing of the sonorant, and a candidate in which this repaired imperative serves as an attractor. These candidates will be suboptimal because of faithfulness violations, in the first case through both IO and OP unfaithfulness, and in the second through just OP faithfulness. Because the gap is tolerated, the Max{imperative} constraint is relatively low ranked. Indeed, the only crucial ranking in this analysis is the Max{imperative} be below the other constraints.

(16) *A Norwegian optimal gap*

	sykl	SonSeq	IO-Ident(voi)	OP-Ident(voi)	Max{imp}
a)	sykle, sykl$_{imp}$	*!			
☞ b)	sykle, ⊙				*
c)	sykle, sykl$_{\circ imp}$		*!	*	
d)	sykl̥e, sykl$_{\circ imp}$		*! *		

When the optimal paradigm is one with a gap, the 'cell' corresponding to the low ranked MAX{CAT} constraint cannot be filled synthetically. In this particular case, speakers find phrasal expressions for the category, cf. Rice (2003) for details.

5.2 Hungarian CCik verbs

Hungarian *-ik* verbs which end in consonant clusters present a phonological challenge when a consonant-initial suffix is to be used (Hetzron 1975; Törkenczy 2002). The initial consonant of the suffix, in combination with the two final consonants of the stem, creates a triconsonantal cluster. Yet the grammar of Hungarian forbids such clusters. Under these circumstances, one of two strategies is invoked: avoidance or epenthesis.

The most common strategy is to avoid constructions with consonant-initial suffixes, leaving a gap in the paradigm and a category which can only be expressed through circumlocution. Of the 115 *-ik* verbs ending in consonant clusters in Papp (1969), 87 (76%) display defective paradigms. The reamining 28 (24 %) are not defective and show epenthesis between C1 and C2. The first group is the focus of the present discussion.[3] The data in (17) are representative for this group.

(17) *A fragment of a Hungarian verbal paradigm*

a. csuklani 'to hiccup'
b. csuklottam 'I hiccupped'
c. csuklik 'he hiccups'
d. *csuklhat 'he may hiccup'

The consonant-initial suffix *-hat* cannot be attached to the stem *csukl* 'hiccup' because the resulting form would violate the prohibition on triconsonantal clusters. The response of the speaker to this situation is to leave the expression of 'he may hiccup' unformed. This is sometimes refered to as *absolute ungrammaticality*, as in Törkenczy's work.

Speakers may well find these gaps challenging, as is revealed in the following quote.

> Defective verbs of the CCik class cause actual embarrassment

[3]Thanks to Sylvia Blaho for help with the statistics, and for discussion of the Hungarian data.

> to speakers of Hungarian when speaking their language in perfectly normal circumstances. One relatively frequent occasion for such embarrassment is when someone wonders about precautions taken against possible derailment of a train or a tramway, trying to use the negative jussive form of the verb kisiklik 'derail. The expression *ki ne sikoljon 'lest it derail' [with epenthesis] may be first offered, then rejected, and then the final compromise is a paraphrase avoiding the jussive form. (Hetzron 1975: 864-5)

The analysis proposed here of Hungarian is entirely parallel to the analysis of Norwegian above. We refer here to the relevant morphological category as the *potential*, where the core of the analysis is a relatively low-ranked constraint MAX{POTENTIAL}, as seen in (18).

The candidates in (18) include just two members of the paradigm, the infinitive and the potential. In candidate (a), the forms are as we would expect from the morphology, such that the high ranked prohibition on triconsonantal clusters is violated. Candidate (c) shows the epenthesis solution in the potential, while candidate (d) levels the paradigm under the influence of the epenthesized form. The winning candidate, candidate (b), avoids the potential altogether. This is the solution speakers take, just that the optimal paradigm is one with a gap.

(18) *A Hungarian optimal gap*

	csuklik	*CCC	IO-DEP	OP-DEP	MAX{POT.}
a)	csuklani, csuklhat$_{pot.}$	*!			
☞ b)	csuklani, ⊙				*
c)	csuklani, csukVlhat$_{pot.}$		*!	*!	
d)	csukVlani, csukVlhat$_{pot.}$		*! *		

6 Conclusions

Our focus in this article has been a particular flavor of repair strategy. It is well know that morphological processes can lead to phonologically ill-formed target outputs, and that phonological repair or adjustment may result. But there are at least two other types of repairs, and the study of these is less present in the morphophonological literature. Phonologically motivated syncretism, whereby an ill-formed candidate word is replaced by another member of the paradigm is seen, for example in the Norwegian imperatives, although the details of this have not been presented here, cf. Rice (2003). The cases under consideration here represent yet another type of repair, which we might call syntactic repair. These are cases in which the target word is phonologically ill-formed, and the speaker responds to the situation by leaving the cell unfilled. That is, there is no synthetic word which expresses the morphological features associated with the cell in question. Of course, this does not mean that the notion must be left unexpressed. Rather, it means that the speaker must turn to the syntax and express the notion phrasally, either through a periphrastic expression, or phrasally.

This treatment of gaps has been formalized in McCarthy's (2005) optimal paradigms theory. A modest enhancement of the theory was proposed in §4, whereby candidate paradigms are barred from winning simply by virtue of their size, which was accomplished by introducing the MAX{CAT} constraints. With this formalism in place, optimal paradigms theory offers new insight into the treatment of phonologically motivated gaps.

This development allows a pruning of the machinery of classical OT and a related development in McCarthy (2002). There, gaps are dealt with by including a null candidate or null output or unparsed form, which then somehow becomes optimal. A stipulation has been invoked earlier to make such a candidate optimal, namely that it violates exactly one constraint, MPARSE. The relative ranking of MPARSE determines the success of the null output candidate. This stipulative approach to gaps can now be set aside, and they can instead by understood as facilitating the optimality of a candidate paradigm, given a particular grammar.

The other approach to gaps in the literature is found in Orgun and Sprouse (1999), where they propose the CONTROL component of grammar to essentially achieve a crashed derivation. This enhancement of optimality theory can now also be set aside.

Gaps are a reflex of grammatical competence. Speakers have intuitions

about them, and their competence allows them to identify situations in which a paradigm will be defective for phonological reasons. It is therefore appropriate to include treatment of gaps in a model of grammatical knowledge. The approach developed here crucially invokes a notion of paradigm, whereby forms with shared stems are in a relationship to one another. Given the usefulness of this assumption in treating gaps, the paper also constitutes a contribution to the ongoing discussion of the role of paradigms in phonological theory.

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Center for Advanced Study in Theoretical Linguistics (CASTL)
University of Tromsø
NO-9037 Tromsø, Norway

http://castl.uit.no
curt.rice@hum.uit.no