Phonological recoverability, morpheme structure constraints and ineffability

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Phonological derivations standardly consist of a mapping from underlying to surface representation, where the underlying representation (UR) consists of abstracted phonological forms of morphemes that may be altered in the surface representation (SR). I assume that a derivation consists not only of a mapping from UR to SR, but also from SR to UR. This assumption has precedents in OT learning theory (Smolensky 1996; Tesar and Smolensky 2000), and especially in Boersma's (1998 *et seq.*) model of OT phonology, which has UR-SR and SR-UR mappings as well as mappings to articulatory, perceptual and semantic forms. I adopt this assumption to provide a formalization of conditions on phonological recoverability, that is, the extent to which a language requires the SR to resemble the UR that it maps to in the SR-UR direction (see Boersma 2005 for a related precedent). I propose a violable Match constraint that demands identity between the UR that begins the derivation in the UR-SR mapping and the UR that is the product of the SR-UR mapping. In the UR-SR mapping, this constraint is vacuously satisfied, but in the SR-UR mapping, it can conflict with the Faithfulness constraints that apply between the UR and SR. If Faithfulness outranks Match, and forces a pair of non-identical URs, the derivation is categorically ill-formed. The result is that the language will permit only a UR that maps faithfully on the relevant dimension to the SR. I use this formalization of recoverability to provide a unified account of phenomena that have received separate analyses in previous work: morpheme structure constraints (McCarthy 1998) and ineffability (see the papers in Rice 2007b).

1 Phonological recoverability

I define the Match constraint as follows (see Moreton 2007 for a similar constraint on the SRs produced by perception and production mappings):

(1) Match

The representation of the UR in the UR→ SR mapping is identical to the representation of the UR in the SR → UR mapping.

The phonological derivation begins with a specified UR. The SR is computed, and then on the basis of that SR, another UR is derived. This second mapping is subject to the same constraints as the first one, but because the SR is fixed, Markedness constraints are irrelevant to the outcome (Smolensky 1996; see also Prince and Smolensky's 1993/2004 Lexicon Optimization). In the SR-to-UR mapping, Faithfulness competes only with Match.

Because Match is vacuously satisfied in the UR-to-SR mapping, we can illustrate the two mappings in a single tableau. The following tableaux show the interaction of Max ('Assign a violation mark to a consonant in the UR that is not present in the SR' McCarthy and Prince1999) with NoCoda ('Assign a violation mark to a consonant in coda position' Prince and Smolensky 1993/2004) and Match.

In the first tableau, both NoCoda and Match dominate Max. The outcome is a language with coda deletion.

(2) Coda deletion

/CVC/	NoCoda	Match	Max
☞ /CVC/ → [CV] → /CVC/			**
/CVC/ → [CV] → /CV/		* !	*
/CVC/ → [CVC] → /CVC/	* !		

In the second tableau, the ranking of Match and Max is reversed. This yields a derivation that is non-convergent, and hence categorically ill-formed. I indicate this with a dagger at the end of the sequence of mappings.

(3) Coda deletion creates an ill-formed mapping

/CVC/	NoCoda	Max	Match
/CVC/ → [CV] → /CVC/		**!	
☞/CVC/ → [CV] → /CV/ †		*	*
/CVC/ → [CVC] → /CVC/	*!		

In this second language, /CVC/ is not a possible underlying form.[1] A UR consisting of /CV/, on the other hand, does map back to itself:

(4) /CV/ is permitted

/CV/	NoCoda	Max	Match
☞/CV/ → [CV] → /CV/			

These two languages are identical in that they have only [CV] surface forms. They differ in that the second one places a higher demand on recoverability: no disparity between UR and SR is permitted. This is exactly the type of morpheme structure constraint analyzed by McCarthy (1998), as the following section shows.

2 Morpheme structure constraints

Generative phonology standardly incorporates constraints on the underlying form of morphemes, termed morpheme structure constraints (MSCs). OT solves the duplication problem (Chomsky and Halle 1968,Kenstowicz and Kisseberth 1977) by eliminating MSCs, using Output markedness constraints to filter out a rich Input (see Prince and Smolensky 1993/2004 on Richness of the Base; as well as McCarthy 2002 for clarification of common misunderstandings). One set of MSCs that can not be handled by this approach are those that resemble the hypothetical second language in the previous section: a restriction on Outputs appears to be mirrored in the Input.

[1] The grammar would still faithfully parse an underlying /CVC+V/ structure: that is, the language could have bound roots. The absence of such roots would be a lexical gap, potentially reinforced by the difficulty of learning the underlying form in the absence of the isolation form of the root.

The empirical evidence of such a restriction is the absence of alternations. In our hypothetical second language, there would be no root-final consonants that surface only when a vowel supplied by another morpheme follows, because such an alternation requires underlying /CVC/. One real case that McCarthy (1998) discusses is that of the "B" dialect of Kansai Japanese. In both the A and B dialects, there is a bimoraic minimum on words, which is reflected in that CV words from Tokyo Japanese are CV: in Kansai. The dialects differ in that Kansai A has underlying /CV/ roots that surface faithfully when they are paired with an affix, whereas Kansai B roots are minimally /CV:/. The recoverability-based analysis of this dialect difference appears in (5). The constraints are adopted from McCarthy (1998): FtBin assigns a violation to CV words, and Ident-Wt penalizes changes in vowel length between UR and SR. When Ident-Wt is ranked over Match, as in Kansai B, vowel lengthening leads to non-matching URs: again, a non-convergent derivation that is categorically ill-formed.

(5) Kansai A

/ka/	FtBin	Match	Ident-Wt
☞ /ka/ → [ka:] → /ka/			**
/ka/ → [ka:] → /ka:/		* !	*
/ka/ → [ka] → /ka/	* !		

Kansai B

/ka/	FtBin	Ident-Wt	Match
/ka/ → [ka:] → /ka/		**!	
☞/ka/ → [ka:] → /ka:/ †		*	*
/ka/ → [ka] → /ka/	*!		

3 Ineffability

Ineffability refers to a situation in which there is no grammatical Output for an Input. In an optimization-based theory of generative grammar this is problematic because every Input has a set of candidate Outputs, and one of them must be optimal. The phonological evidence for ineffability is the phenomenon of a paradigm gap (see esp. Rice 2007a; Wolf and McCarthy 2007). Adding morphologically indexed faithfulness constraints (Pater 1995, Smith 1997) to the present theory permits an analysis of gaps that covers some of the same cases as Wolf and McCarthy's M-Parse, a descendent of Prince and Smolensky's (1993/2004) constraint against the Null Parse.

We can create a simple hypothetical case by adding morphology to our /CVC/ example: the CVC words are divided into a class of nouns and a class of verbs. The indexed faithfulness constraint is Max-Noun. The effect of ranking this indexed constraint above Match, and the general Max constraint below it, is shown in (6).

(6) Recoverability analysis of a hypothetical paradigm gap

/CVC_{NOUN}/	NoCoda	Max-Noun	Match	Max
/CVC_{NOUN}/ → [CV] → /CVC_{NOUN}/		*!*		**
☞ /CVC_{NOUN}/ → [CV] → /CV_{NOUN}/ †			*	*
/CVC_{NOUN}/ → [CVC] → /CVC_{NOUN}/	*!			

/CVC$_{VERB}$/	NoCoda	Max-Noun	Match	Max
☞ /CVC$_{VERB}$/ → [CV] → /CVC$_{VERB}$/				**
/CVC$_{VERB}$/ → [CV] → /CV$_{VERB}$/			*!	*
/CVC$_{VERB}$/ → [CVC] → /CVC$_{VERB}$/	*!			

In this language, the isolation form of nouns ending in a consonant is missing from the paradigm, but the final consonant of verbs undergoes deletion.

The corresponding M-Parse analysis would be as in (7).

(7) M-Parse analysis of a hypothetical paradigm gap

/CVC$_{NOUN}$/	NoCoda	MParse-Verb	Max	MParse-Noun
[CVC]	*!			
[CV]			*!	
☞ ⊙				*

/CVC$_{VERB}$/	NoCoda	MParse-Verb	Max	MParse-Noun
[CVC]	*!			
☞ [CV]			*	
⊙		*!		

The connection between the two analyses is that they involve a ranking of a morpheme-specific faithfulness constraint with respect to a general faithfulness constraint.

There are differences between the two approaches, however. A challenge for the recoverability analysis is that epenthesis cannot be blocked by a morpheme-specific Dep constraint, under at least one view of how a morpheme-specific constraint is evaluated (Pater 2008). Since an epenthetic vowel belongs to no morpheme, Dep cannot be made to evaluate in a morpheme-specific fashion. Morpheme-specific M-Parse can be ranked above Dep, thus avoiding this issue (cf. Orgun and Sprouse 1999).

4 Conclusions

The recoverability analysis of morpheme structure conditions and ineffability is conceptually appealing in that it involves a formalization of a much-invoked functional principle. It is hard to see any such grounding for M-Parse. In that it sets a Harmony threshold (Legendre et al. 1998, McCarthy and Wolf 2007), M-Parse is also incompatible with the spirit of an optimization-based theory of grammar, and leads to unwelcome results in Harmonic Grammar (Pater 2006). Whether recoverability can handle the full range of cases dealt with using M-Parse remains to be seen.

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