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Local Harmonic Serialism

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1. Introduction

McCarthy (2007a,b,c) adopts harmonic serialism (Prince and Smolensky 1993/2004: 94-95) to address a number of problems in OT:

(1) i. Locality problems (McCarthy 2007a,b)
ii. Opacity problems (McCarthy 2007b)
iii. 'Too many solutions' problems (Wilson 2001, McCarthy 2007c)

The core assumptions of the theory, which underly the solutions to all of these problems, are the following (note that 'single operation' is implemented as 'single basic faithfulness constraint violation' in McCarthy 2007b):

(2) *Gen/Eval interaction in Harmonic Serialism*
a. Gen performs a single operation at a time
b. Each operation must result in harmonic improvement according to Eval

The approach to harmonic serialism that Prince and Smolensky (1993/2004: 95) suggest for an analysis of Berber syllabification, and which McCarthy elaborates, places no restrictions on the order of operations. Every operation can precede or follow every other one, and each operation can apply any number of times before passing the representation onto the next one. The effect of rule ordering is achieved in McCarthy's (2007b) Optimality Theory with Candidate Chains (OT-CC) as follows:

(3) i. All derivations that respect the conditions in (2) are computed, keeping track of the order in which the operations applied (that is, the order in which basic faithfulness constraints were violated)

ii. A set of PREC constraints evaluate derivations in terms of the order of operations/faithfulness violations

Here I explore a different conception of Harmonic Serialism, which mimics even more closely the rule-based analysis of opacity:

(4) Operations apply in a language-specific order, subject to the conditions in (2)

I call this variant Local Harmonic Serialism (LHS) because the constraint hierarchy evaluates only the representations in a single derivation. At each step of the derivation, Eval determines whether an operation is harmonically improving, but there is no cross-derivational comparison. The opacity cases that OT-CC accounts for as in (3) are dealt with instead in terms of (4).

Before moving on to elaborate and illustrate this theory, it is worth briefly mentioning other precedents. One is Wilson's (2006) version of Targeted Constraints Optimality Theory (TCOT), which is similarly local in that it does not invoke a comparison of derivational outcomes. TCOT differs from standard OT, and from the current theory, in that it revises the manner in which candidates are generated (by the targeted constraints themselves), the manner in which marks are assigned, and the evaluation process. The present theory takes a more traditional approach, one that harkens back in some ways to pre-OT views of constraint/operation interaction, like Paradis' (1988) Theory of Constraints and Repair Strategies (TCRS). This theory differs from TCRS (and TCOT) in that there is no formal sense in which constraints 'trigger' operations: the operations apply blindly, and their effects are then evaluated by the constraints. It also differs from TCRS in that it retains ranking from OT. It is also worth mentioning that this view of operation/constraint interaction is compatible with other views of how constraints interact: they could be weighted, or even surface-true.

2. Illustration: Opacity

Seriously addressing opacity requires in-depth analyses of individual languages. For now, a simple hypothetical example will suffice to illustrate how the theory works. The following are two interactions between open-syllable raising and coda deletion:

(5)	**Feeding**			**Counterfeeding**	
	/bet/	/be/		/bet/	/be/
Deletion	be	be	Raising	-	bi
Raising	bi	bi	Deletion	be	-
	[bi]	[bi]		[be]	[bi]

The constraints are as in (6). Another respect in which this theory may be local is in that the faithfulness constraints apply between the current representation and the candidate outcomes of the operation, rather than between candidate outcomes and the underlying form. For now, I will adopt the simplest possible Faithfulness constraint. As we will see shortly, 'R' refers to the current representation.

(6) *Constraints*

NoCoda	Assign a violation mark to a syllable ending in a consonant
Open-Hi	Assign a violation mark to a vowel that is final in a syllable and that is not [high]
Faith	The segmental content of the candidate representation = R

The relevant operations are the following. For this illustration, I assume raising is the addition of a monovalent [HIGH] feature, lacking on mid vowels. For simplicity of exposition, I use a single operation for consonant deletion (cf. McCarthy 2007c):

(7) *Operations*

Insert[HIGH]	Insert the feature [HIGH]
Delete[C]	Delete a consonant

I assume that constraint and operations interact as in (8):

(8) i. Operations are in an ordered list

ii. Each operation is applied iteratively subject to the harmonic improvement criterion. When an operation ceases to improve harmony, we move on to the next operation in the list. When there are no more operations to apply, the derivation terminates.

Somewhat more formally:

(9) Given representation R, list of operations ($O_1...O_n$) (n set initially to 1), and constraint hierarchy C

i. Apply O_n to all loci in R, creating a set of candidate representations R-prime{$R_1...R_n$}
ii. Evaluate R and R-prime by C. If the most harmonic candidate (W) is a member of R-prime, replace R with W, and return to i
iii. If R=W, keep R, and add 1 to n
If O_n is in O, return to i.
If O_n is not in O, terminate.

The feeding case - deletion before raising. Application of operations, and choice of 'R', the representation to be passed along in the derivation, is done according to (9).

(10) O = (DELETE[C], INSERT[HIGH])

/bet/		NOCODA	OPEN-HI	FAITH
R = [bet]	[bet]	*		
DELETE[C]	☞ [be]		*	*
	[et]	*		*
R= [be]	☞ [be]		*	
DELETE[C]	[e]			*
R=[be]	[be]		*	
INSERT[HIGH]	☞ [bi]			*

The counterfeeding case - raising before deletion:

(11) O = (INSERT[HIGH], DELETE[C])

/bet/		NOCODA	OPEN-HI	FAITH
R=[bet]	☞ [bet]	*		
INSERT[HIGH]	[bit]	*		*
R=[bet]	[bet]	*		
DELETE[C]	☞ [be]		*	*
	[et]			*
R=[be]	☞ [be]			
DELETE[C]	[e]		*	*

3. Local optionality

Vaux (2003) points out that 'local optionality', as Riggle and Wilson (2005) call it, is a problem for standard OT approaches to variation. One of the cases Riggle and Wilson discuss is deletion of schwa in French (Dell 1980), which applies optionally in the context of a following C. In a phrase like the one in (58), which has a sequence of 4 underlying schwas, deletion can apply to any subset of them, as long as the result does not create an ill-formed consonant cluster (Riggle and Wilson adopt the simplification, which I will adopt as well, that the blocking context is a triconsonantal cluster). Under this restriction, 'maximal' deletion in the example in (12) is the loss of two schwas, as in (12e-f).

(12) Some pronunciations of *envie de te le demander* 'feel like asking you for it'
a. envie d_ te le demander
b. envie de t_ le demander
c. envie de te l_ demander
d. envie de te le d_mander
e. envie d_ te l_ demander
f. envie de t_ le d_mander
g. envie de te le demander

An OT partially ranked grammar (conveniently simplified constraints):

(13) *CCC >> *SCHWA, MAX

Two outcomes (not all candidates are included):

(14) *CCC >> *SCHWA >> MAX

envie de te le demander	*CCC	*SCHWA	MAX
a. envie d_ te le demander		***	*
b. envie de t_ le demander		***	*
c. envie de te l_ demander		***	*
d. envie de te le d_mander		***	*
☞ e. envie d_ te l_ demander		**	**
☞ f. envie de t_ le d_mander		**	**
g. envie de te le demander		****	
h. envie de t_ l_ d_mander	*	*	***
i. envie d_ t_ l_ d_mander	**		****

(15) *CCC >> Max >> *Schwa

envie de te le demander	*CCC	Max	*Schwa
a. envie d_ te le demander		*	***
b. envie de t_ le demander		*	***
c. envie de te l_ demander		*	***
d. envie de te le d_mander		*	***
e. envie d_ te l_ demander		**	**
f. envie de t_ le d_mander		**	**
☞ g. envie de te le demander			****
h. envie de t_ l_ d_mander	*	***	*
i. envie d_ t_ l_ d_mander	**	****	

As Riggle and Wilson put it, only maximal deletion (14e-f), and no deletion (15g) emerge as optimal. Attested intermediate degrees of deletion (a-d) are *collectively harmonically bounded* by (e-f) and (g).

In Local Harmonic Serialism, the constraint hierarchy is consulted multiple times in the derivation. If some of the constraints are unordered or probabilistically ordered, then whether or not deletion is harmonically improving will depend on which ranking is chosen. The following shows a derivation that produces a single instance of deletion. For expository ease, I only show one of the candidates that undergoes Delete-V each time. With the full candidate set (R-prime) produced by Delete-V, a choice between the tied candidates would have to be made randomly, or by lower ranked constraints.

(16) O = (Delete-V)

envie de te le demander		*Schwa	Max
R = envie de te le demander	envie de te le demander	****	
Delete-V	☞ envie d_ te le demander		*
		*Max	*Schwa
R = envie d_ te le demander	☞ envie d_ te le demander	*	
Delete-V	envie d_ te l_ demander		

Since in the second step the winner is R, the derivation terminates.

It seems that outcome is different from what would happen if we did this case in McCarthy's (2007b) OT-CC with partially ordered constraints. In that theory, all legitimate derivations are computed, and the outcome is chosen by a comparison of the outcomes in Eval. The ranking state in that final pass through Eval would presumably choose only the outcomes chosen by standard OT with a partially ordered hierarchy.

References

McCarthy, John J. 2007a. Restraint of analysis. In Sylvia Blaho, Patrik Bye, and Martin Kraemer (eds) *Freedom of Analysis*. The Hague: Mouton. (Also in *Wondering at the natural fecundity of things: Essays in honor of Alan Prince*. http://repositories.cdlib.org/ lrc/prince/10).

McCarthy, John J. 2007b. *Hidden Generalizations: Phonological Opacity in Optimality Theory*. London: Equinox Publishing.

McCarthy, John. 2007c. Slouching Toward Optimality: Coda-Reduction in OT-CC. Phonological Studies (Journal of the Phonological Society of Japan) 7. ROA-878.

Paradis, Carole. 1988. On constraints and repair strategies. *The Linguistic Review* 6. 71-97.

Prince, Alan, and Paul Smolensky. 1993/2004. *Optimality Theory: Constraint interaction in generative grammar*. Technical Report, Rutgers University and University of Colorado at Boulder, 1993. Revised version published by Blackwell, 2004. [ROA-537].

Riggle, Jason, and Colin Wilson. 2005. Local optionality. Proceedings of NELS. (available at http://www.linguistics.ucla.edu/people/wilson/RiggleWilsonNELS35.pdf).

Vaux, Bert. 2003. Why the phonological component must be serial and rule-based. Talk presented at The 77th Annual Meeting of the Linguistic Society of America.

Wilson, Colin. 2006. Unbounded spreading is myopic. Handout from the conference on current perspectives on phonology, Bloomington, Indiana. (available at http://www.linguistics.ucla.edu/people/wilson/Myopia2006.pdf).